Federal Energy Regulatory Commission

Office of Energy Projects

December 2015

East Tennessee Natural Gas, LLC Docket No. CP15-91-000

Loudon Expansion Project

Environmental Assessment

Tennessee Valley Authority

Washington, DC 20426

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426

OFFICE OF ENERGY PROJECTS

In Reply Refer To:
OEP/DG2E/Gas 4
East Tennessee Natural Gas, LLC
Loudon Expansion Project
Docket No. CP15-91-000

TO THE PARTY ADDRESSED:

The staff of the Federal Energy Regulatory Commission (FERC or Commission) has prepared an environmental assessment (EA) for the Loudon Expansion Project, proposed by East Tennessee Natural Gas, LLC (East Tennessee) in the above-referenced docket. East Tennessee requests authorization to construct and operate natural gas facilities in Monroe and Loudon Counties, Tennessee. The Loudon Expansion Project would provide up to 40,000 decatherms per day of natural gas to Tate & Lyle Americas Ingredients, LLC, a manufacturer of artificial sweeteners and ethanol products, that is planning to convert its existing coal fired boilers to natural gas and install a new natural gas fueled combined cycle electric power plant.

The EA assesses the potential environmental effects of the construction and operation of the Loudon Expansion Project in accordance with the requirements of the National Environmental Policy Act. The FERC staff concludes that approval of the proposed project, with appropriate mitigating measures, would not constitute a major federal action significantly affecting the quality of the human environment.

The proposed Loudon Expansion Project includes the following facilities:

- 10.2 miles of new 12-inch-diameter natural gas pipeline (Loudon Mainline Extension) from East Tennessee's existing 3200 mainline in Monroe County, Tennessee to the Tate & Lyle Plant in Loudon County, Tennessee;
- one 12-inch mainline valve, two 12-inch tee taps, above- and below-ground piping, and a pig launcher barrel in Monroe County, Tennessee;
- one new meter facility, above- and below-ground piping, flow measurement and control equipment, a filter/separator, a pig receiver barrel, aboveground valve operators for below ground valves, blowdowns, and a condensate tank in Loudon County, Tennessee; and
- a pressure regulator at existing Meter Station 59039 on its Loudon-Lenoir City Lateral Line 3218D-100 in Loudon County, Tennessee.

The FERC staff mailed copies of the EA to federal, state, and local government representatives and agencies; elected officials; environmental and public interest groups; Native American tribes; potentially affected landowners and other interested individuals and groups; newspapers and libraries in the project area; and parties to this proceeding. In addition, the EA is available for public viewing on the FERC's website (www.ferc.gov) using the eLibrary link. A limited number of copies of the EA are available for distribution and public inspection at:

Federal Energy Regulatory Commission
Public Reference Room
888 First Street NE, Room 2A
Washington, DC 20426
(202) 502-8371

Any person wishing to comment on the EA may do so. Your comments should focus on the potential environmental effects, reasonable alternatives, and measures to avoid or lessen environmental impacts. The more specific your comments, the more useful they will be. To ensure that the Commission has the opportunity to consider your comments prior to making its decision on this project, it is important that we receive your comments in Washington, DC on or before **January 27, 2016.**

For your convenience, there are three methods you can use to file your comments with the Commission. In all instances please reference the project docket number (CP15-91-000) with your submission. The Commission encourages electronic filing of comments and has expert staff available to assist you at 202-502-8258 or efiling@ferc.gov.

(1) You can file your comments electronically using the eComment feature located on the Commission's website (www.ferc.gov) under the link to Documents and Filings. This is an easy method for submitting brief, text only comments on a project;

(2) You can also file your comments electronically using the eFiling feature on the Commission's website (www.ferc.gov) under the link to Documents and Filings. With eFiling, you can provide comments in a variety of formats by attaching them as a file with your submission. New eFiling users must first create an account by clicking on "eRegister." You must select the type of filing you are making. If you are filing a comment on a particular project, please select "Comment on a Filing"; or

(3) You can file a paper copy of your comments by mailing them to the following address:

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street NE, Room 1A
Washington, DC 20426

Any person seeking to become a party to the proceeding must file a motion to intervene pursuant to Rule 214 of the Commission's Rules of Practice and Procedures (18 CFR 385.214).[1] Only intervenors have the right to seek rehearing of the Commission's decision. The Commission grants affected landowners and others with environmental concerns intervenor status upon showing good cause by stating that they have a clear and direct interest in this proceeding which no other party can adequately represent. **Simply filing environmental comments will not give you intervenor status, but you do not need intervenor status to have your comments considered.**

Additional information about the project is available from the Commission's Office of External Affairs, at **(866) 208-FERC,** or on the FERC website (www.ferc.gov) using the eLibrary link. Click on the eLibrary link, click on "General Search," and enter the docket number excluding the last three digits in the Docket Number field (i.e., CP15-91). Be sure you have selected an appropriate date range. For assistance, please contact FERC Online Support at FercOnlineSupport@ferc.gov or toll free at (866) 208-3676, or for TTY, contact (202) 502-8659. The eLibrary link also provides access to the texts of formal documents issued by the Commission, such as orders, notices, and rulemakings.

In addition, the Commission offers a free service called eSubscription which allows you to keep track of all formal issuances and submittals in specific dockets. This can reduce the amount of time you spend researching proceedings by automatically providing you with notification of these filings, document summaries, and direct links to the documents. Go to www.ferc.gov/docs-filing/esubscription.asp.

[1] See the previous discussion on the methods for filing comments.

Loudon Expansion Project
ENVIRONMENTAL ASSESSMENT

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

TECHNICAL ACRONYMS AND ABBREVIATIONS

AQCR	air quality control region
ATWS	additional temporary work space
bgs	below ground surface
CAA	Clean Air Act
CEQ	Council on Environmental Quality
Certificate	Certificate of Public Convenience and Necessity
CFR	Code of Federal Regulations
CO	carbon monoxide
CO_2	carbon dioxide
CO_{2e}	carbon dioxide equivalents
COE	U.S. Army Corps of Engineers
Commission	Federal Energy Regulatory Commission
dB	decibel
dBA	decibels on the A-weighted scale
Dth/d	dekatherms per day
DOT	U.S. Department of Transportation
E&SCP	Erosion and Sediment Control Plan
EA	environmental assessment
East Tennessee	East Tennessee Natural Gas, LLC
EI	environmental inspector
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
FWS	U.S. Fish and Wildlife Service
GHG	greenhouse gas
GWP	global warming potential
HAPs	hazardous air pollutants
HCAs	high consequence areas
HDD	horizontal directional drill
L_{dn}	day-night sound level
L_{eq}	equivalent sound level
MAOP	maximum allowable operating pressure
MOU	memorandum of understanding
MP	milepost
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NGA	Natural Gas Act
NEPA	National Environmental Policy Act
NOI	*Notice of Intent to Prepare an Environmental Assessment for the Proposed Loudon Expansion Project and Request for Comments on Environmental Issues*
NO_x	nitrogen oxides
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places

NSA	noise sensitive area
PCBs	polychlorinated biphenyls
PGA	peak ground acceleration
PHMSA	Department of Transportation Pipeline and Hazardous Materials Safety Administration
Plan	FERC's *Upland Erosion Control, Revegetation, and Maintenance Plan*
Procedures	FERC's *Wetland and Waterbody Construction and Mitigation Procedures*
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter
PM_{10}	particulate matter less than 10 microns in diameter
Project	Loudon Expansion Project
ROI	region of influence
SHPO	State Historic Preservation Officer
SO_2	sulfur dioxide
SPCC Plan	Spill Prevention, Control, and Countermeasures Plan
Tate & Lyle	Tate & Lyle Americas Ingredients, LLC
TDEC	Tennessee Department of Environment and Conservation
TDOT	Tennessee Department of Transportation
TVA	Tennessee Valley Authority
TWRA	Tennessee Wildlife Resource Agency
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
VOCs	volatile organic compounds

A. PROPOSED ACTION

1. Introduction

On February 20, 2015, East Tennessee Natural Gas, LLC (East Tennessee) filed an application with the Federal Energy Regulatory Commission (FERC or Commission) in Docket No. CP15-91-000 under Section 7(c) of the Natural Gas Act (NGA), and Part 157 of the Commission's regulations requesting a Certificate of Public Convenience and Necessity (Certificate) to modify and expand its existing natural gas infrastructure in Monroe and Loudon Counties, Tennessee. The Loudon Expansion Project (Project) would provide up to 40,000 Dekatherms per day (Dth/d) of firm transportation service to the Project shipper, Tate & Lyle Americas Ingredients, LLC (Tate & Lyle), to service a new natural gas fueled combined cycle electric power plant to be constructed at Tate & Lyle's existing manufacturing facility. East Tennessee has proposed to construct, own, and operate the following Project facilities: 10.2 miles of 12-inch-diameter natural gas pipeline; a 12-inch mainline valve and related appurtenant facilities at the interconnection of the new pipeline with East Tennessee's existing 12-inch-diameter Line 3200 mainline; and a new meter facility with related appurtenant facilities at the Tate & Lyle Plant. East Tennessee would also install a new pressure regulator and appurtenant facilities at Meter Station 59039 on its existing Loudon-Lenoir City Lateral Line 3218D-100.

The Project location is shown in figures 1 and 2.

We[1] prepared this Environmental Assessment (EA) in compliance with the requirements of the National Environmental Policy Act of 1969 (NEPA), (Title 40 of the Code of Federal Regulations, Parts 1500-1508 [40 CFR 1500-1508]), and with the Commission's implementing regulations under 18 CFR 380. The EA is an important and integral part of the Commission's decision on whether to issue East Tennessee a Certificate to construct and operate the proposed facilities. Our principal purposes in preparing this EA are to:

- identify and assess potential impacts on the natural and human environment that could result from implementation of the proposed action;
- identify and recommend specific mitigation measures, as necessary, to minimize environmental impacts; and
- assess reasonable alternatives to the proposed action that would avoid or minimize adverse effects to the environment.

[1] "We," "us," and "our" refers to environmental staff of the Office of Energy Projects.

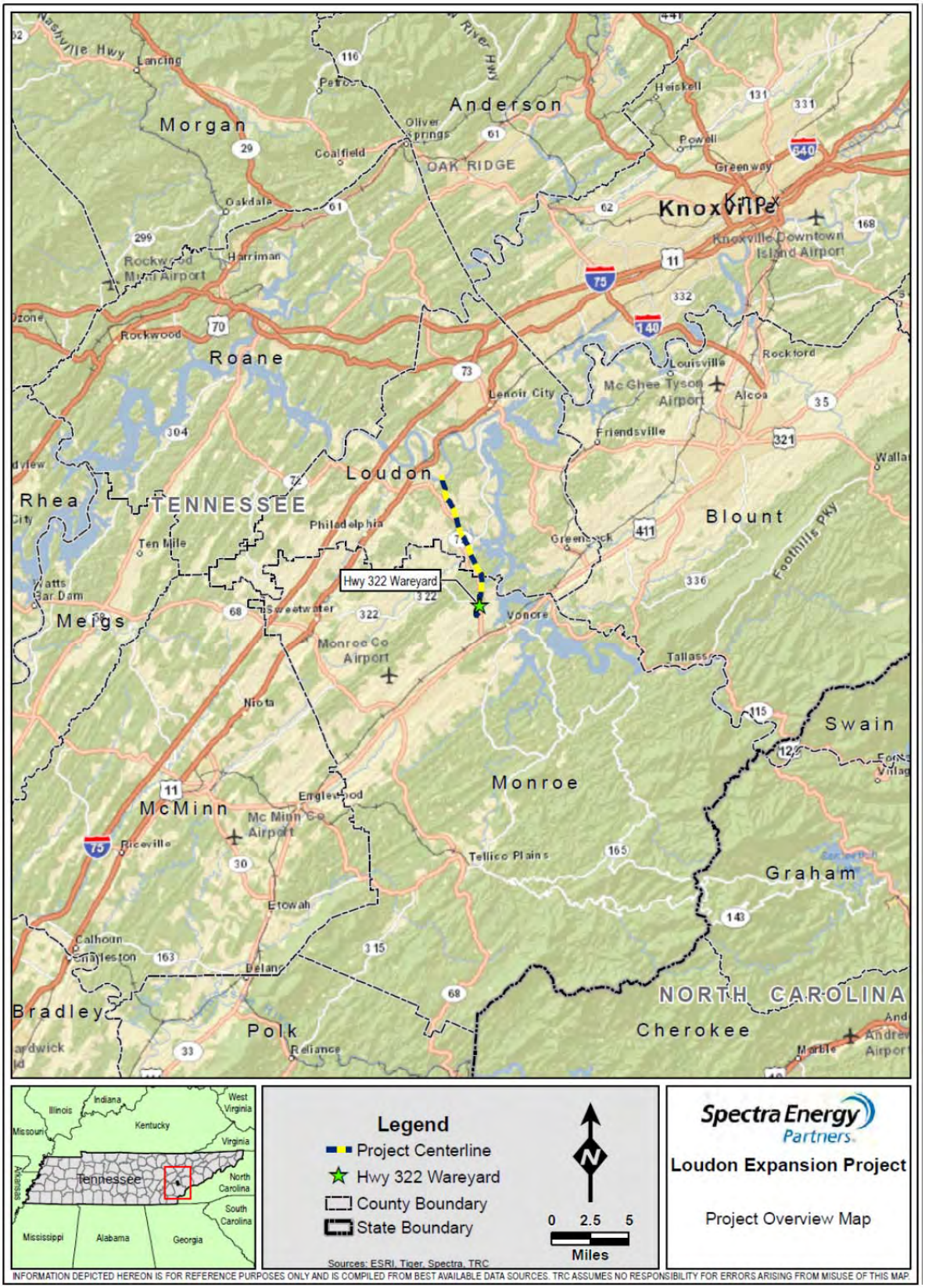


Figure 1: Overview Map of the Loudon Expansion Project

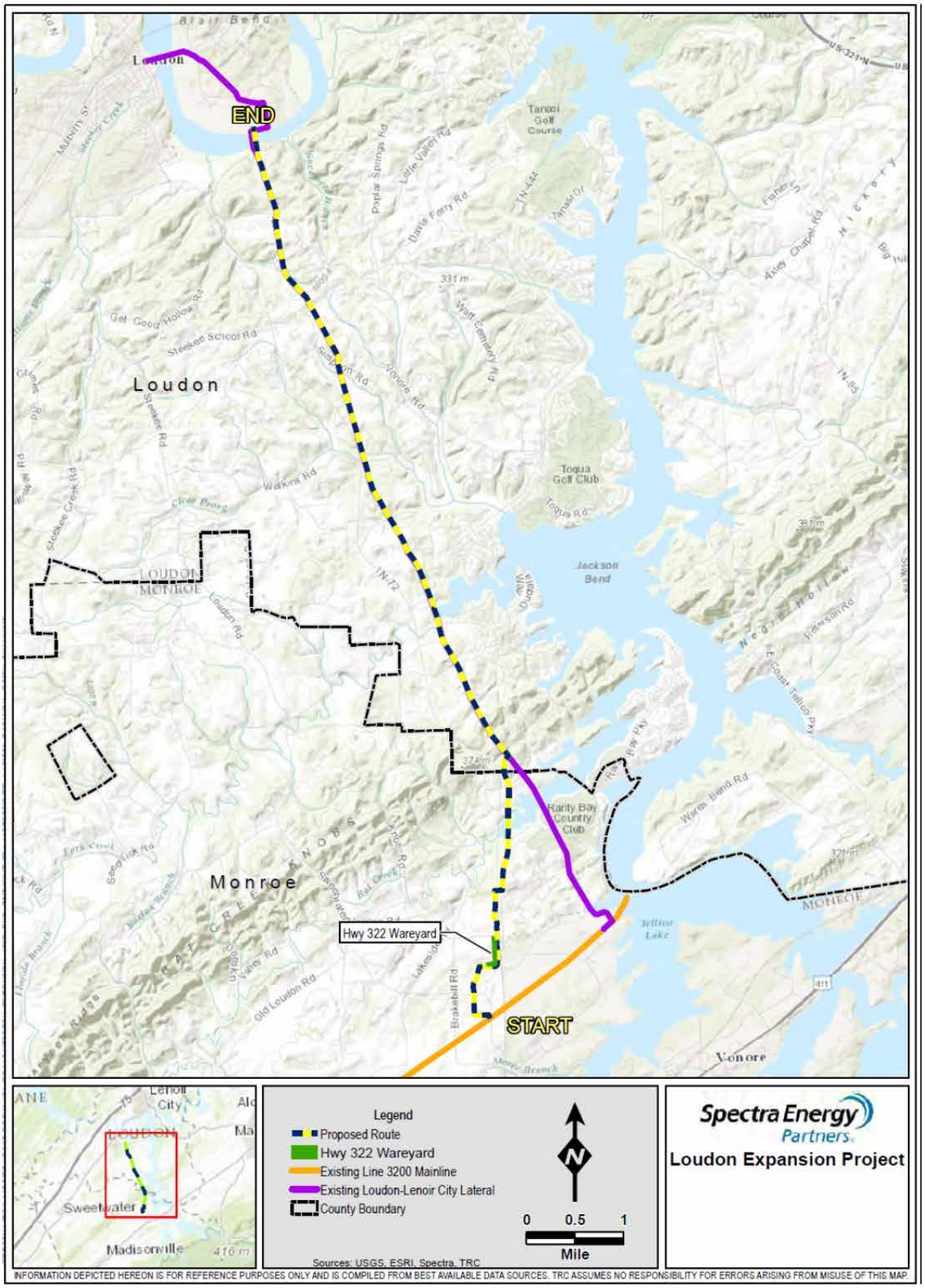


Figure 2: Location of the Loudon Expansion Project

We prepared this EA to assess the environmental impacts that would likely occur as a result of the construction and operation of the proposed facilities. We have developed and incorporated measures into this EA that we believe would appropriately and reasonably avoid, minimize, or mitigate environmental impacts associated with construction and operation of the Project.

2. Purpose and Need

Under Section 7 of the NGA, the Commission determines whether interstate natural gas transportation facilities are in the public convenience and necessity and, if so, grants a Certificate to construct and operate them. The Commission bases its decision on technical competence, financing, rates, market demand, gas supply, environmental impact, long-term feasibility, and other issues concerning a proposed project.

East Tennessee has stated that the Loudon Expansion Project is to provide firm transportation service from East Tennessee's existing 12-inch-diameter Line 3200-1 to the Tate & Lyle Plant through the proposed Loudon Mainline Extension. The Project would provide up to 40,000 Dth/d of natural gas to Tate & Lyle, a manufacturer of artificial sweeteners and ethanol products that is planning to convert its existing coal fired boilers to natural gas, and install a new natural gas fueled combined cycle electric power plant. Under the February 13, 2015 precedent agreement, East Tennessee would provide to Tate & Lyle the natural gas service for a primary term of 20 years from the service commencement date.

3. Public Review and Comment

On March 24, 2015, the Commission issued a *Notice of Intent to Prepare an Environmental Assessment for the Proposed Loudon Expansion Project and Request of Comments on Environmental Issues* (NOI). The NOI was published in the Federal Register and mailed to interested parties, including federal, state, and local officials; agency representatives; environmental and other conservation organizations; Native American tribes; local libraries and newspapers; and property owners potentially affected by the proposed facilities as defined in the Commission's regulations (i.e., landowners wither directly affected by or abutting a proposed construction areas or right-of-way). Written comments were requested from the public on specific concerns about the project or issues that should be considered during the preparation of the EA. The NOI asked agencies with jurisdiction by law and/or special expertise with respect to the environmental issues of this project to formally cooperate with us in the preparation of the EA; the Tennessee Valley Authority (TVA) accepted.

We received multiple comments from four landowners concerned that the route on the west side of Highway 72 would remove mature trees between their properties and Highway 72. The commenters noted that the trees provide privacy and a barrier between

themselves and the noise and air pollution from heavy truck highway traffic, as well as absorb water runoff from the roadway. The commenters also were concerned that trenching would impact karst features on their properties, altering current drainage patterns, which could in turn cause property-wide flooding after heavy rain events. The commenters expressed concern that the proposed horizontal directional drill (HDD) would cross Tellico Lake on the west side of Highway 72 under a particularly shallow portion of the lake, and any inadvertent release of drilling fluid from the Project would lead to further siltation of that portion of the lake. Commenters were also concerned that the crossing of Bat Creek would limit fishing on the creek, and the use of Bat Creek Shores Lane and Lakeside Road as access roads for heavy construction equipment would further erode already damaged roadways.

To eliminate these issues, on July 10, 2015, East Tennessee filed with the FERC a route realignment that deviates from the originally proposed pipeline route at milepost (MP) 1.6, crosses under Highway 72 to the east, then proceeds north paralleling the highway for approximately 1.2 miles, crosses under Tellico Lake where it is deeper, and rejoins the original route at approximate MP 3.3. East Tennessee also incorporated route variations at approximate MPs 0.4 and 0.6 to address landowner requests to avoid karst features. East Tennessee requested that the FERC review this new route as the proposed route, which this EA does.

To provide newly affected landowners with an opportunity to comment on the revised Project, on July 28, 2015, the Commission issued a *Supplemental Notice of Intent to Prepare an Environmental Assessment for the Proposed Loudon Expansion Project and Request of Comments on Environmental Issues* (supplemental NOI). The supplemental NOI was published in the Federal Register and mailed to interested parties, including federal, state, and local officials; agency representatives; environmental and other conservation organizations; Native American tribes; local libraries and newspapers; and property owners potentially affected by the proposed facilities as well as landowners on other potential alternate routes. No comments were received on the supplemental NOI.

A list of the remaining substantive comments raised and where they are addressed in the EA is provided in table A-1.

Table A-1: Issues Identified During Scoping for the Project	
Comment/Concern	**EA Section Addressing Comment**
Widening of proposed access roads and post-construction restoration	A.7
Impacts on wildlife/concern about wildlife leaving the area	B.4.3
Impacts on bald eagles	B.4.4
Effects on HDD crossing under waterbodies	A.8.1; B.3
Impacts on trees/concern about deforestation	B.4.1
Safety of pipelines	B.10
Use of odorant in natural gas for this Project/Safety of odorant	B.10
Natural gas leak through karst features	B.1
Concern about the resale value of property with a natural gas pipeline	A.8.1
Impact of Project on Robinson Mill, which is listed in the National Register of Historic Places	B.7

4. Cooperating Agency

The TVA was established by an Act of Congress in 1933 (U.S. Code 831-831dd) as a federal corporation to improve the navigability of and provide flood control for the Tennessee River; to provide reforestation and ensure the proper use of marginal lands in the Tennessee Valley; to provide agricultural and industrial development of the Tennessee Valley; to provide for the national defense; and for other purposes. Within a few years of its establishment, the TVA built a series of multi-purpose dams on the Tennessee River system. Today, the TVA provides electricity for business customers and local power distributors serving 9 million people in parts of seven southeastern states.[2]

The TVA, as a federal agency with NEPA responsibilities, agreed to be a cooperating agency on this EA. A cooperating agency is defined by Council on Environmental Quality (CEQ) regulations as any federal agency other than a lead agency having jurisdiction by law or special expertise with respect to any environmental issue involved in a proposal (40 CFR 1508.5).

The TVA's jurisdiction under Section 26a of the TVA Act applies to both the location of construction projects and the types of activities carried out. The TVA's jurisdiction is implemented through Section 26a regulations (18 CFR 1304) and the Shoreline Management Policy. The 26a regulations apply at locations across, along, or in the Tennessee River or any of its tributaries. A tributary is any watercourse whose contents, if not obstructed, diverted, or consumed, will ultimately flow into the Tennessee

[2] The TVA's service area covers most of Tennessee, portions of Alabama, Mississippi, and Kentucky, and small slices of Georgia, North Carolina, and Virginia.

River. The TVA's jurisdiction thus extends to the limits of the Tennessee River watershed. On TVA reservoirs that jurisdiction typically applies to the limits of the 500-year floodplain or to the upper limits of TVA flowage easement rights, whichever is higher. On regulated river and stream reaches where the TVA has not obtained land or land rights and on all unregulated tributary streams, that jurisdiction typically applies to the limits of the 100-year floodplain.

Although permission must be obtained from the TVA before conducting any activities on TVA land, in the administration of Section 26a it has been determined that certain activities do not constitute obstructions and therefore do not require a TVA Section 26a permit. These include but are not limited to: (1) the excavation of a trench for a submarine sewer, telephone, or other utility line, in which the trench is backfilled to the original contour and is located outside the area of a marked navigation channel; and (2) directional boring (or HDD) under streams or rivers for the installation of utilities or pipelines where no new obstructions are permanently placed within the floodplain and the contour of the stream or river bed is not altered.

As this Project is currently proposed, there would be 3 on-reservoir crossings which would be completed by HDD and 14 off-reservoir stream crossings in which the pipeline crossing would be backfilled to the original contour or completed using an HDD. If constructed as proposed, this work would not be considered an obstruction requiring approval under Section 26a of the TVA Act. East Tennessee has requested a 30-year term easement from the TVA for use of approximately 2.19 acres of TVA property, which would allow continued operation of those pipeline portions affecting TVA land or land rights.

5. Proposed Facilities

The Loudon Expansion Project consists of both pipeline and aboveground facilities, all in Tennessee.

5.1 Pipeline

East Tennessee would construct 10.2 miles of new 12-inch-diameter natural gas pipeline (Loudon Mainline Extension) from East Tennessee's existing 3200 mainline in Monroe County to the Tate & Lyle Plant in Loudon County.

5.2 Aboveground Facilities

To connect the proposed Loudon Mainline Extension to the existing 3200 mainline, East Tennessee would install a 12-inch mainline valve, two 12-inch tee taps,

above- and below-ground piping, and a pig[3] launcher barrel. These facilities would be constructed within an approximately 0.07-acre fenced area within the operational right-of-way of the Loudon Mainline Extension at MP 0.0 in Monroe County.

To connect the proposed Loudon Mainline Extension to the Tate & Lyle Plant, East Tennessee would install a new meter facility, above- and below-ground piping, flow measurement and control equipment, a filter/separator, a pig receiver barrel, aboveground valve operators for below ground valves, blowdowns, and a condensate tank. These facilities would be constructed within an approximately 0.3-acre fenced area within the Tate & Lyle Plant at MP 10.2 in Loudon County.

East Tennessee would also install a pressure regulator at existing Meter Station 59039 on its Loudon-Lenoir City Lateral Line 3218D-100 in Loudon County. The pressure regulator would be sited within the fence line of the existing meter station. East Tennessee would use a portion of its existing Loudon-Lenoir City Lateral Line right-of-way as temporary workspace.

The installation of the pressure regulator at existing Meter Station 59039 on the Loudon-Lenoir City Line 3218-D-100 would allow East Tennessee to maintain the ability to provide firm gas service to the Loudon-Lenoir City Lateral from Line 3100. To maintain and maximize deliveries from Line 3100 to the Loudon-Lenoir City lateral requires a delivery pressure of 300 pounds per square inch gauge at Meter Station 59039. The Loudon Expansion Project design results in a pressure of 416 pounds per square inch gauge at the south side of Meter Station 59039. The proposed pressure regulator allows for this pressure differential to exist while still enabling East Tennessee to deliver existing firm volumes to the Loudon-Lenoir City lateral from Line 3100.

6. Non-Jurisdictional Facilities

Under Section 7 of the NGA, the FERC is required to consider, as part of its decision to certificate jurisdictional facilities, all factors bearing on the public convenience and necessity. The jurisdictional facilities for the Project include the 10.2-mile-long 12-inch-diameter pipeline, a mainline valve, meter facility, new pressure regulator and related appurtenant facilities. Occasionally, proposed projects have associated facilities that do not come under the Commission's jurisdiction. These non-jurisdictional facilities may be integral to the need for the proposed facilities (i.e., a power plant at the end of a jurisdictional pipeline) or they may be minor, non-integral components of the jurisdictional facilities that would be constructed and operated as a result of the proposed facilities (i.e., electric power lines).

[3] A pipeline "pig" is a device used to clean or inspect the pipeline. A pig launcher/receiver is an aboveground facility where pigs are inserted or retrieved from the pipeline.

East Tennessee has stated that the purpose of the Project is to provide a natural gas source to Tate & Lyle's new natural gas fueled combined cycle electric power plant. Tate & Lyle plans to install two new cogeneration units, each of which consists of a natural gas fired combustion turbine and natural gas fired heat recovery steam generator. The cogeneration units would be used to generate electricity and steam to support Plant operations. Tate & Lyle would also convert the Plant's existing coal fired boilers to natural gas and maintain them in a backup status. Tate & Lyle anticipates construction to be completed in 2016.

Tate & Lyle's new facilities are not part of the proposed action and not subject to the Commission's jurisdiction. However, we are providing the public and the Commission with the available information on the associated impacts in order to make a fully informed decision in the cumulative impacts analysis in section B.11.

7. Land Requirements

As shown in table A-2, construction activities would affect approximately102.84 acres, with approximately 59.53 acres permanently maintained as new permanent right-of-way, aboveground facilities, and access roads.

Table A-2: Land Requirements for the Loudon Expansion Project

Facility Name County	Length (miles)	Construction Impacts (acres)	Operational Impacts (acres)
Pipeline Facilities			
12" Mainline Extension	2.98	**102.84**	**59.53**
Aboveground Facilities			
New Mainline Valve (MP 0.0) Monroe County	n/a	0.14	0.14
New Meter Facility (MP 10.2) Loudon County	n/a	0.33	0.33
New Pressure Regulator (Meter Station No. 59039) Loudon County	n/a	0.26	0.26
Subtotal:		**0.73**	**0.73**
Other Workspaces			
ATWS	n/a	15.59	0
TAR	1.65	4.65	0
PAR	0.52	1.36	1.36
HWY 322 Wareyard	n/a	7.15	0
Subtotal:		**28.75**	**1.36**
TOTAL:		**132.32**	**61.62**

Notes:
ATWS: additional temporary work space; TAR: temporary access road; PAR: permanent access road

To install the 10.2-mile-long Loudon Mainline Extension, East Tennessee would utilize standard open trench construction, except when crossing Tellico Lake and the Tennessee River, where it would utilize an HDD. For approximately 35 percent of the Project not collocated with other utilities, East Tennessee would use an 85-foot-wide right-of-way to construct the pipeline portion of the Project and a 50-foot permanent right during operation. During construction, the 35-foot-wide spoil side of the right-of-way would be used for topsoil, spoil, and rock storage generated from trench excavation and cut and fill for side slope terrain. The 50-foot-wide working side would be used by crews and equipment for the pipeline construction. Figures illustrating typical right-of-way configurations and the alignment sheets are included in Appendix A.

For approximately 65 percent of the Project, the Loudon Mainline Extension from MP 3.15-MP 9.85 would be collocated with East Tennessee's existing Loudon-Lenoir City Lateral Line 3218D-100. For this portion of the route, the Loudon Mainline Extension would be offset from the existing Loudon-Lenoir City Lateral Line 3218D-100 by approximately 20 feet. Due to collocation, the proposed construction right-of-way for the Loudon Mainline Extension would utilize all of the existing Loudon-Lenoir City Lateral right-of-way and approximately an additional 35 feet. The proposed operational right-of-way for the Loudon Mainline Extension would utilize all of the existing Loudon-Lenoir City Lateral operational right-of-way; therefore, no new operational right-of-way would be needed for the collocated portion of the proposed pipeline.

East Tennessee would establish one 7.15-acre wareyard at MP 1.0 on agricultural land adjacent to the Loudon Mainline Extension and State Highway 322, which would provide ingress and egress to the yard. To access work locations along the Loudon Mainline Extension, East Tennessee would use a combination of paved, graveled, and dirt existing public and private roads. As shown in table A-3, 10 private roads would be used as temporary access roads and 3 would be used as permanent access roads. East Tennessee has stated that while the majority of the unpaved roads are generally flat and level, roads would be expanded to 20 feet or wider as necessary to accommodate curves and facilitate safe ingress and egress. Roads would be widened and graded with gravel to establish suitable turning radii and to remove potholes or ruts. Landowners expressed concern that the roads East Tennessee has proposed for use during construction would not be restored to pre-construction condition. In response to this comment, East Tennessee has stated that following construction, and in coordination with landowners, it would restore temporary access roads to approximately 12-15 feet wide and as near original condition as practicable.

Table A-3: Access Roads Associated with the Loudon Expansion Project							
Access Road ID	**County**	**Approximate MP**	**Easting Road Surface**	**Length (ft)**	**Width (ft)**	**Acres**	**Land Use**
Loudon Mainline Extension							
PAR-0.00	Monroe	0.0	Dirt	3	20	<0.01	Agricultural
TAR-1.21	Monroe	1.2	Dirt	116	25	0.07	Road
TAR-1.63	Monroe	1.6	Dirt	854	25	0.45	Road/Pasture
TAR-2.20	Monroe	2.2	Dirt	430	25	0.25	Forest
TAR-3.14	Loudon	3.1	Gravel/Dirt	1,420	25	0.82	Road/Agriculture
TAR-3.75	Loudon	3.8	Grave	2,374	20	1.09	Road
TAR-5.65	Loudon	5.7	Dirt	676	25	0.39	Road
TAR-8.03	Loudon	8.0	Dirt	320	25	0.18	Road
TAR-8.82	Loudon	8.8	Gravel	1,278	25	0.73	Road
TAR-9.84	Loudon	9.9	Dirt	334	30	0.24	Road/ROW
TAR-10.12	Loudon	10.1	Gravel	945	20	0.43	Road
PAR-10.20	Loudon	10.2	Gravel	1,966	20	0.89	Road
Loudon-Lenoir City Lateral Line							
PAR-M&R 59039	Loudon	MP 10.73 on Line 3218D-100	Paved	818	25	0.47	Road

PAR: Permanent Access Road

TAR: Temporary Access Road

ROW: Right-of-Way

Note: All proposed temporary and permanent roads are private. All roads proposed for the Loudon Mainline Extension would be graded and graveled to accommodate construction equipment. No widening would be required for PAR M&R 59039 as it is currently a paved road.

East Tennessee has also proposed to use 88 additional temporary workspaces (ATWS) affecting 15.6 acres as shown in Appendix B. ATWS are typically required for construction at areas of steep slopes, unstable terrain, areas with soil limitations, road and waterbody crossings, areas with shallow bedrock, for safety concerns, and for other potential site-specific constraints. Although East Tennessee has identified areas where ATWS would be required, additional or alternative areas could be identified in the future due to changes in site-specific construction requirements, and East Tennessee would be required to file information on each of those areas for Commission review and approval prior to use.

8. Construction, Operation, and Maintenance Procedures

The Project would be designed, constructed, operated, and maintained in accordance with applicable requirements defined by the U.S. Department of Transportation (DOT) regulations in 49 CFR 192, *Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards*; by FERC's *Guidelines to be*

Followed by Natural Gas Pipeline Companies in the Planning, Clearing and Maintenance of Right-of-Way and the Construction of Aboveground Facilities in 18 CFR 380; and by other applicable federal and state safety regulations. East Tennessee also would construct and maintain the Project in accordance with its *Erosion and Sediment Control Plan* (E&SCP), which incorporates our May 2013 *Upland Erosion Control, Revegetation, and Maintenance Plan* (Plan), and *Wetland and Waterbody Construction and Mitigation Procedures* (Procedures)[4]. Additionally, East Tennessee would implement its *Spill Prevention, Control, and Countermeasures* (SPCC Plan), *Waste Management Plan*, *Blasting Plan,* and *Best Drilling Practices, Monitoring and Clean-up of Horizontal Directional Drilling Inadvertent Returns for the Loudon Expansion Project Plan* (*HDD Inadvertent Returns Plan*) (see Appendix C) to protect sensitive resources from inadvertent releases during construction activities. The *Blasting Plan* describes the blasting procedures and safety, use, storage, and transportation of explosives that East Tennessee's contractor would follow should blasting be necessary. East Tennessee would also follow its *Karst Mitigation Plan* to facilitate construction in karst areas and protect geological resources. Resource-specific plans are discussed in more detail in section B of this EA and within section 8.1 below.

The *Waste Management Plan* would be implemented should areas of contaminated soils or sediment be encountered during construction. The contractor would stop activity at the discovery location, evaluate and characterize the suspected soil or sediments, and manage any contaminated materials in accordance with local, state, and federal regulations.

East Tennessee's SPCC Plan describes the measures East Tennessee would implement during construction to reduce the risk of a potential spill/release of oil or hazardous materials as well as the spill response, cleanup, disposal, and reporting procedures that would be implemented in the event of a spill/release. We have reviewed East Tennessee's SPCC Plan and find it acceptable.

East Tennessee proposes to follow all applicable requirements of its E&SCP during all phases of Project construction, with the exception of requested site-specific modifications as summarized in Appendix D. We have reviewed the requested modifications and find that they are reasonable; as such we approve them.

[4] The FERC Plan and Procedures are a set of construction and mitigation measures that were developed in collaboration with other federal and state agencies and the natural gas pipeline industry to minimize the potential environmental impacts of the construction of pipeline projects in general. The FERC Plan can be viewed on the FERC internet website at http://www.ferc.gov/industries/gas/enviro/plan.pdf. The FERC Procedures can be viewed on the FERC internet website at http//www.ferc.gov/industries/gas/enviro/procedures.pdf.

8.1 Construction Procedures

Pipeline Construction Procedures

Conventional open-cut pipeline construction techniques would be used for the majority of the Project. Construction of the Project would require one spread and would consist of phased sequential construction. A general pipeline construction sequence is illustrated in figure 3.

Prior to ground-disturbing activities, a standard survey and staking would be conducted to identify right-of-way and workspace boundaries and locate existing foreign utility lines. Sensitive resources would be located and marked to prevent accidental damage during pipeline construction. East Tennessee has stated that landowners would be notified approximately 3 to 5 days before the start of construction unless they requested earlier notice during easement negotiations.

Following the completion of the surveys, the construction right-of-way would be cleared of vegetation and debris. Within wetlands, trees and brush would either be cut with rubber-tired and/or tracked equipment, or hand-cut. Unless grading is required for safety reasons, wetland vegetation would be cut off at ground level, leaving existing root systems intact, and the removed vegetation chipped or hauled off site to approved disposal locations. In uplands, tree stumps and rootstock would be left in the temporary workspace wherever possible to encourage natural revegetation. Stumps would be removed from the permanent right-of-way and sent to disposal locations or made available to landowners upon request. Timber would be removed from the right-of-way to approved locations to be sold for lumber or pulp, burned, or chipped. Brush and tree limbs would be burned or chipped and hauled off site to approved disposal locations. Chipped wood would be sold as fuel or other marketable products, spread in approved locations and used as mulch, or hauled off site for disposal.

After vegetation is cleared, the right-of-way would be graded to allow for the safe passage of equipment. Rock would be removed from all actively cultivated or rotated crop land prior to grading. The size, density, and distribution of rock left in construction work areas should be similar to adjacent areas not disturbed by construction, unless otherwise approved in writing by the landowner.

Trenching (creating a ditch for pipeline placement) would be accomplished using a trenching machine, backhoe, or similar equipment. For typical conditions, the trench would be excavated to a depth of approximately 6 feet to allow for a minimum of 3 feet of cover over the pipe as required by 49 CFR 192. Deeper burial is required in specific areas such as road, railroad, and stream crossings. Typically the bottom of the trench would be cut at least 12 inches wider than the width of the pipe. The width at the top of

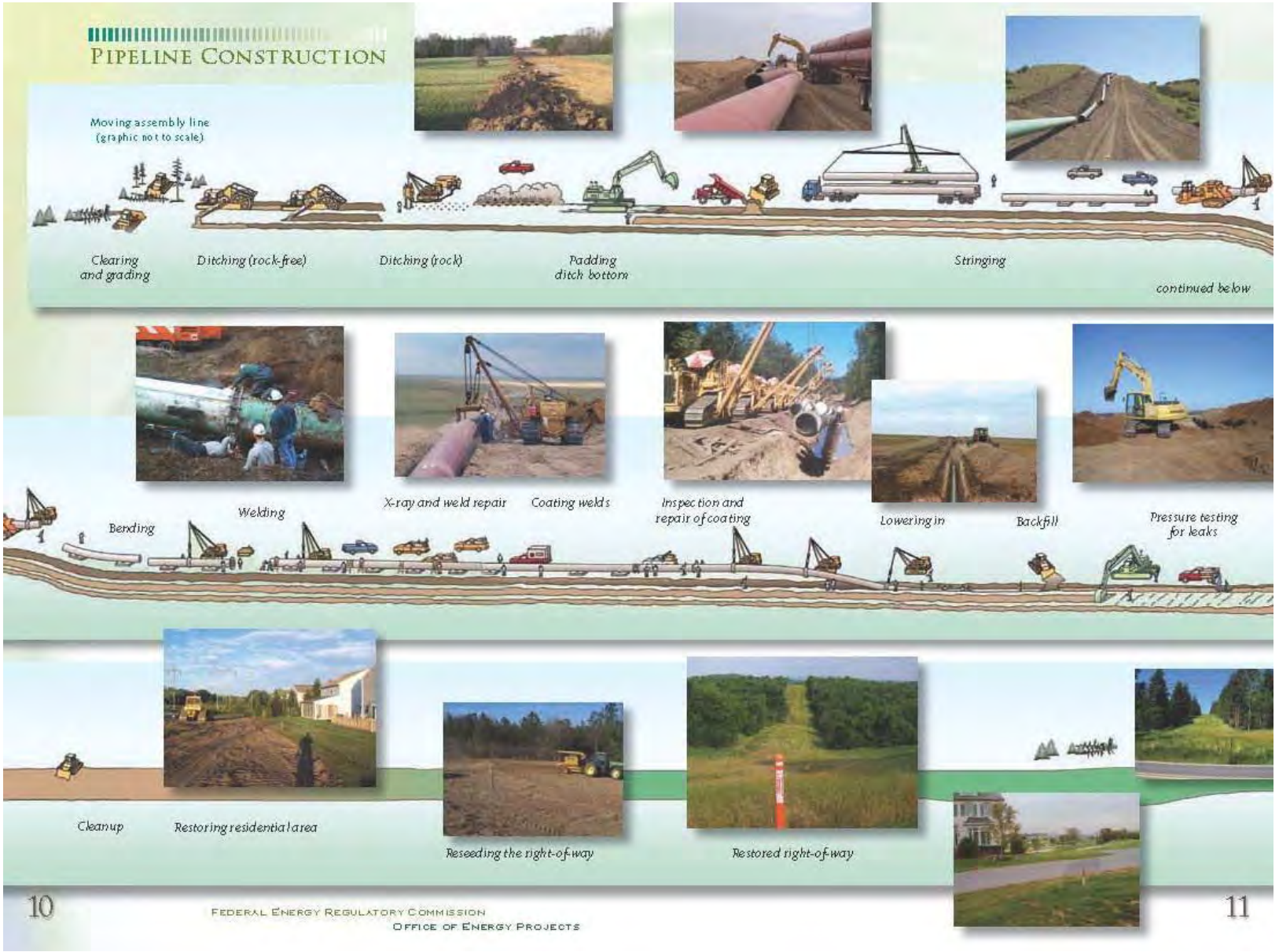


Figure 3: General Pipeline Construction Sequence

the trench would vary to allow the side slopes to be adapted to local conditions at the time of construction. Should it become necessary to remove accumulated ground or rain water from the trench, it would be pumped to an off-right-of-way, stable, well-vegetated upland area and/or filtered through a filter bag or siltation barrier.

Topsoil would be stripped, segregated from subsoil, and stockpiled along the right-of-way from either the full work area or the ditch plus spoil area through agricultural lands, in residential areas (to the extent practicable), and in wetland (except when standing water or saturated soils are present). Topsoil may be replaced with appropriate imported material, as necessary.

Following preparation of the trench, the new pipe would be strung and distributed along the right-of-way parallel to the trench. Depending on available workspace, some pipe may be fabricated off-site and transported to the right-of-way in differing lengths or configurations. Pipe would be bent by hydraulic bending machines, as necessary, to conform the pipe to the trench geometry. Once in place along the right-of-way, pipe lengths would be aligned, bends fabricated, and joints welded together. All welds would be coated for corrosion protection and visually and radiographically inspected for defects. The pipeline would be visually inspected prior to lowering into the trench.

Completed sections of pipe would be lifted off the temporary supports by side boom tractors or similar equipment and placed into the trench. Prior to lowering-in, the trench would be visually inspected to ensure that it is free of rock and other debris that could damage the pipe or the coating. Any water present in the trench would be pumped out into a well-vegetated, upland area and/or into an approved filter, with the exception of wetland areas where the "push pull" installation may be required. In sandy soils, the trench is shaped to support the pipe. In areas where the trench contains bedrock, sand bedding and/or pads made of sandbags and/or clay would be placed at regular intervals along the trench bottom to trench to support the pipe. Tie-in welding and pipeline coating would occur within the trench to join the newly lowered-in section with the previously installed sections of pipe. Additionally, a cathodic protection[5] system would be installed to protect all underground and submerged pipeline facilities constructed of metallic materials from external, internal, and atmospheric corrosion.

The trench then would be backfilled with the previously excavated material and crowned to approximately 6 inches above its original elevation to compensate for subsequent settling, except in wetlands, where the crown could introduce hydrology issues, or paved areas, where standard compaction methods would be employed. In areas where excavated material is unsuitable for backfilling, additional fill may be required. Segregated topsoil would then be spread across the graded construction right-of-way.

[5] Cathodic protection is a technique to reduce corrosion (rust) of the natural gas pipeline through the use of an induced current or a sacrificial anode (like zinc) that corrodes at a faster rate.

The soil would be inspected for compaction and scarified as necessary. In conjunction with backfilling operations, any woody material and construction debris would be removed from the right-of-way.

Following backfilling of the trench, East Tennessee would send a cleaning pig through the pipeline to remove any dirt, water, or debris that may have been inadvertently collected within the line during installation. After cleaning, the pipeline would be hydrostatically tested to ensure that the system is free from leaks and is capable of safely operating at the design pressure. Hydrostatic testing would be conducted in accordance with DOT's requirements in 49 CFR 192, East Tennessee's testing specifications, and applicable discharge permits. Sections of pipe installed by HDD would be hydrostatically tested to prove the integrity of the pipe prior to installation. Upon completion of the hydrostatic test and discharge of the water, additional "drying" pig runs would be made, if necessary, to remove any residual water from the pipeline. Water utilized for hydrostatic testing of the pipeline would be withdrawn from surface waterbodies as further described in EA section B.3.2.

Following pipeline installation and backfilling, disturbed areas would be restored and graded to preconstruction contours as closely as practicable. Weather and soil conditions permitting, final cleanup and installation of permanent erosion control measures would be conducted within 20 days of backfilling the trench. In residential areas, restoration activities would be completed within 10 days of backfilling. Lawns and landscaping would be restored immediately after clean-up or per landowner agreements. The right-of-way then would be fine-graded to prepare for restoration. Fences and walls would be restored or repaired as necessary.

Revegetation would be completed in accordance with permit requirements and written recommendations on seeding mixes, rates, and dates obtained from the federal and states agencies with soil conservation authority. The right-of-way would be seeded within 6 working days following final grading, weather and soil conditions permitting. Alternative seed mixes may be used that are specifically requested by the landowner or required by agencies.

Specialized Construction Procedures

In addition to conventional pipeline construction techniques, specialized construction techniques would be utilized in sensitive resource areas including waterbody crossings; rugged topography and areas with side slopes; karst topography; residential areas; agricultural lands; road and utility crossings; and areas necessitating blasting.

Waterbody Crossings. To construct the proposed Project, East Tennessee would cross 19 waterbodies. East Tennessee would minimize impacts on water quality through the implementation of measures outlined in its E&SCP. The pipeline trench would be

excavated immediately prior to pipe installation and construction completed within 24 hours for minor waterbodies (10 feet or less across the water's width at the time of construction).

In accordance with its E&SCP, East Tennessee would cross waterbodies that are dry or non-flowing at the time of crossing using standard upland construction techniques, provided that the environmental inspector (EI) verifies that water would be unlikely to flow between initial disturbance and final stabilization of the feature. In the event of perceptible flow, East Tennessee would use one of the following dry ditch methods to cross the waterbodies, as well as any upland and agricultural swales, ditches, and other such non-jurisdictional conveyances that may have flowing water present at the time of construction:

- *Flume Crossing Method*: This method involves diverting the flow of water across the construction work area through one or more flume pipes placed in the waterbody. The trench is then excavated underneath the flume pipe.

- *Dam and Pump Crossing Method*: This method would be used at waterbodies where pumps can adequately transfer stream flow volumes around the work area, and where there are no concerns about sensitive species passage. This method is similar to the flume crossing method except that pumps and hoses would be used instead of flumes to move water across the construction work area.

- *Wet or Open-Cut Crossing Method*: This method involves trench excavation, pipeline installation, and backfilling in a waterbody without controlling or diverting stream flow (i.e., the stream would fill the trench and flow through the work area during construction). This is generally the fastest crossing method, though construction sedimentation or turbidity impacts may be higher.

Excavated materials would be stored at least than 10 feet from the edge of the waterbody and temporary erosion control devices would be utilized to prevent the sediment from reentering the waterbody. The pipeline may be welded and lowered-in, or a section of pipe long enough to span the entire crossing would be fabricated on one bank and either pulled across the bottom to the opposite bank, floated across the stream, or carried into place and submerged into the trench. Where these methods are employed, ATWS would be required for assembly of the pipe strings and storage of the spoil. The trench would then be backfilled and the bottom of the watercourse and banks restored and stabilized.

Table A-4 details the locations East Tennessee has proposed to cross 3 waterbodies using the HDD technique. To facilitate the HDD installations, East Tennessee would hand-clear small trees, limbs, and brush from one to two paths of sufficient width, not to exceed 5 feet wide, above and parallel to each HDD centerline to

allow placement and surveying of an electric guide wire coil (closed loop system) along the ground surface between each HDD entry and exit point. This coil is used to facilitate tracking of the location of down-hole drilling equipment and to determine steering inputs during advancement of the pilot bore. Wireline guidance systems typically require two guide wires for HDD crossings that parallel the centerline of an installation with a variable spacing or offset on each side of the centerline depending on the depth of the particular HDD installation. At waterbody crossings, clearing for guide wires would stop at the water's edge, with no guide wire coil placed within the waterbody.

Table A-4:
Proposed Locations of Horizontal Directional Drilling Operations

HDD ID	Entry Milepost	Exit Milepost	HDD Length (feet) [a/]
HDD 1	2.84	2.18	3,566 [b/]
HDD 2	4.73	4.51	1,777
HDD 3	10.18	9.85	1,778

Notes:
a/ Length measured from bore hole to bore hole.
b/ HDD 1 is in Monroe County. HDDs 2 and 3 are in Loudon County.

Following the completion of the pilot hole, reaming tools would be utilized to enlarge the hole to accommodate the pipeline diameter. The reaming tools would be attached to the drill string at the exit point and then rotated and drawn back to incrementally enlarge the pilot hole. During this process, drilling mud consisting of bentonite clay and water would be continuously pumped into the pilot hole to remove cuttings and maintain the integrity of the hole. The sources and required volumes of water for drilling mud are further discussed in section B.3.2. When the hole has been sufficiently enlarged, a prefabricated segment of pipe would be attached behind the reaming tool on the exit side of the crossing and pulled back through the drill hole towards the drill rig. In the event that a particular drill is unsuccessful or results in the release of drilling mud, East Tennessee would implement its *HDD Inadvertent Returns Plan* (see Appendix C).

Rugged topography and areas with side slopes. As table A-5 details, approximately 2,256 feet, or 4.1 percent of the Project, would cross areas of rugged topography that would require construction on steep vertical inclines and side slopes. To work in such conditions, East Tennessee's contractors would utilize specialized construction techniques such as hand clearing the right-of-way and removing the cut timber with the use of a "yarder"[6] type apparatus; or a "winch line" that incorporates a series of D-8 dozers cabled together in an anchoring manner to safely lower and retrieve excavators, dozers, or sideboom tractors up and down the steep slopes. In areas of side

[6] A yarder is piece of logging equipment which uses a system of cables to pull or fly logs from the stump to the landing. It generally consists of an engine, drums, and spar, but has a range of configurations and variations.

slope terrain, the upslope side of the construction right-of-way would be cut during grading. The material removed from the cut would be used to fill the downslope edge of the right-of-way to provide a safe and level surface from which to operate heavy equipment ("two-tone construction") requiring ATWS downslope to accommodate the fill material.

Table A-5: Topographic Slope on the Construction Right-of-Way for the Project

Approximate Location (milepost)	Length (feet)	Slope Range a/	Specialized Construction Techniques b/ c/
3.0	178	30% to 50%	Winch Line, Anchor Pipe, Hand Cut, Increased Slope Breakers, Increased ECDs and Restoration Techniques
3.2	204	40% to 50%	Winch Line, Anchor Pipe, Hand Cut, Increased Slope Breakers, Increased ECDs and Restoration Techniques
3.2	164	30% to 50%	Anchor Pipe, Hand Cut, Increased Slope Breakers, Increased ECDs and Restoration Techniques
3.6	176	40% to 50%	Anchor Pipe, Increased Slope Breakers, Increased ECDs and Restoration Techniques
3.7	104	30% to 50%	Winch Line, Anchor Pipe, Hand Cut, Increased Slope Breakers, Increased ECDs and Restoration Techniques
3.8	129	30% to 40%	Anchor Pipe, Increased Slope Breakers, Increased ECDs and Restoration Techniques
4.2	317	Side Slope	Two-tone Technique, Increased ECDs and Restoration Technique
6.5	65	30% to 40%	Anchor Pipe, Increased Slope Breakers, Increased ECDs and Restoration Techniques
8.7	164	30% to 40%	Anchor Pipe, Increased Slope Breakers, Increased ECDs and Restoration Techniques
8.9	256	Side Slope	Two-tone Technique, Increased ECDs and Restoration Technique
9.3	66	30% to 40%	Anchor Pipe, Increased Slope Breakers, Increased ECDs and Restoration Techniques
9.6	433	30% to 40%	Anchor Pipe, Increased Slope Breakers, Increased ECDs and Restoration Techniques

Notes:
ECDs: erosion control devices
a/ Slope Range represents an average across the construction right-of-way; localized features may exhibit steeper slopes and require specialized techniques.
b/ Additional specialized construction techniques will be employed as needed, based on field conditions, weather, etc., and include hand clearing, two-tone construction, slope breakers, super silt fence, erosion control matting, and hydro-mulching during restoration.
c/ The selected contractor would develop specific safety procedures that address items such as additional personal protective equipment, winch cable inspection, communication during winching, procedures for working below winched equipment and would present and reinforce these measures during daily safety meetings held on-site.

Once the pipe is strung and welded, the pipe may be anchored using specialized methods to prevent a pipe "string" from inadvertently moving downslope. In addition to the aforementioned techniques, ATWS may be required at strategic locations and site-specific measures may be implemented to provide safe working conditions.

To adequately minimize erosion and sedimentation, both temporary and permanent erosion controls would be employed in areas of rugged terrain and side slopes. In accordance with East Tennessee's E&SCP and/or the Tennessee Department of Environment and Conservation (TDEC) requirements, temporary slope breakers would be installed at least every 100 feet in the steep rugged terrain with slopes greater than 30 percent. Temporary slope breakers are intended to reduce the runoff velocity and divert water off of the right-of-way and can be constructed of materials such as soil, silt fence, staked straw bales or sand bags. Temporary trench breakers may be used in conjunction with the temporary slope breakers to adequately channel the surface flow off of the right-of-way. In terrain with slopes too steep to safely and adequately construct the temporary slope breakers and temporary trench plugs, they may be placed where practicable, at the discretion of the EI.

Permanent trench breakers would be installed as necessary to slow the flow of subsurface water along the trench. Permanent trench breakers may be constructed of materials such as sand bags or polyurethane foam. Permanent slope breakers may be stalled to reduce water runoff velocity, divert water off the construction right-of-way, and/or prevent sediment deposition into sensitive resources. Permanent slope breakers may be constructed of materials such as soil, stone or some functional equivalent. East Tennessee would follow its E&SCP to determine the placement of permanent trench and slope breakers.

During grade restoration, the spoil would be placed back in the cut and compacted to restore original contours. Springs or seeps found in the cut could be diverted off of the construction workspace to stable areas or carried downslope through drain pipes and/or gravel French drains that may require installation as part of the cut restoration. In the event a spring or seep must be diverted during restoration, East Tennessee would notify the landowner and discuss the site-specific conditions and any proposed plans for diversion of the water during restoration. East Tennessee would seek landowner concurrence with these plans prior to final implementation.

During final restoration, seed would be applied at an increased application rate to increase the probability of establishment and rapid stabilization. In rugged terrain, additional types of temporary erosion controls such as silt fence, erosion control matting, and hydro-mulching may be used during construction and restoration activities.

Blasting. Based on field reconnaissance and review of soil and geologic maps of the Project area, East Tennessee anticipates that approximately 6,350 feet, or 11.7 percent of the proposed pipeline route, would cross areas of shallow bedrock (less than 5 feet deep) that would require blasting during construction. Prior to blasting, East Tennessee would first attempt to remove shallow bedrock using one of the below techniques. The technique that would be selected is dependent on the relative hardness, fracture susceptibility, and expected volume of the material.

- Conventional excavation with an excavator;
- ripping with a dozer followed by backhoe excavation;
- hammering with a pointed backhoe attachment followed by an excavator;
- blasting followed by an excavator; or
- blasting surface rock prior to excavation.

East Tennessee would conduct all blasting in accordance with its *Blasting Plan,* 27 CFR 55, 29 CFR 1910, 30 CFR 715.19, Tennessee Code Annotated 68-105 (and all other state and local laws, when required); and regulations applicable to obtaining, transporting, storing, handling, blast initiation, ground motion monitoring, and disposal of explosive materials and/or blasting agents that apply to controlled blasting and limiting blast vibration near structures and underground utilities. All blasting activity would be performed by licensed professionals according to strict guidelines designed to control energy release. Charges would be kept to the minimum required to break up the rock. Where appropriate, mats made of shredded rubber tires, heavy steel mesh or other comparable material or trench spoil would be utilized to prevent the scattering of rock and debris.

East Tennessee would conduct pre-blast surveys, with landowner permission, to assess the conditions of structures, wells, springs, and utilities within 150 feet of the proposed construction right-of-way. If the contractor has to blast near buildings or wells, a qualified independent contractor would inspect structures or wells within 150 feet, or farther if required by local or state regulations, of the construction right-of-way prior to blasting, and with landowner permission. Post-blast inspections by an East Tennessee representative would also be performed as warranted. Recording seismographs would be installed by the contractor at selected monitoring stations under the observation of East Tennessee personnel.

Large rock not suitable for use as backfill material may be windrowed along the edge of the right-of-way, with permission from the landowner, used to construct all-terrain vehicle ATV barriers across the right-of-way, permanently stored in existing sinkholes subject to TDEC permit requirements and land approval, or buried on the right-of-way. East Tennessee would negotiate with the landowner and obtain permission to permanently store rock along, over, through, or across the right-of-way. Otherwise the excess rock would be hauled off-site and disposed of in an appropriate manner. Any remaining rock would be used as trench backfill to the top of the existing bedrock profile. In any such instances, the pipe would be appropriately padded or otherwise protected.

Karst Topography. Karst features such as sinkholes, caves, and caverns can form as a result of the long-term action of groundwater on soluble carbonate rocks (e.g., limestone and dolomite). Based on a review of publically available geographic

information system geologic data, the Project area is located within an area of karst or karst-like features, which include fissures, tubes, and caves over 1,000 feet long; 50 feet to over 250 feet in vertical extent; in moderately to steeply dipping beds of carbonate rock. According to East Tennessee's survey of the construction right-of-way, six sinkholes would be either directly adjacent to or below the trench line.

If an unanticipated sinkhole or other karst feature is found during construction with the potential for collapse or subsurface erosion of the geologic materials supporting the pipeline, the feature would be avoided by minor route realignment, if possible. If the feature cannot be routed around, East Tennessee would then implement its *Karst Mitigation Plan*.

A Project geotechnical engineer would analyze the karst feature to see if it could be filled with graduated rock to stabilize the area. If so, then the void would be excavated to expose the throat[7]. Once the limit of the throat is determined, the opening would be filled with a mixture of graded large rock, coarse aggregate backfill, flowable fill or geotextile fabric, and compacted soil that would be applied to cap the surface. East Tennessee states that this remedial technique minimizes the potential for surface water runoff intrusion into the ground water while allowing continued percolation or recharge of water to the karst system. The technique also provides new and enhanced stability to the void and increases the long term stability and integrity to the pipeline right of way. Final grading of contours and any necessary permanent erosion and sediment controls would be designed to prevent runoff from accumulating in the area of the void.

Post-construction, East Tennessee would conduct visual inspections of the pipeline right-of-way to evaluate the success of the mitigation activities performed for any karst features or voids. The frequency of inspections would generally comply with those required under the TDEC general stormwater permit and FERC's *Plan* and *Procedures*, but would more specifically be based on severity of the mitigation activities and the Project's geotechnical engineer's recommendations.

Residential Areas. The edge of the proposed Project construction workspace would be within 50 feet of a total of 19 residences, structures, and man-made features and within 25 feet of 11 of the same. Site-specific drawings for residences and businesses within 25 feet of the edge of the construction workspace are provided in Appendix E. In accordance with its E&SCP, Tennessee would implement the following measures in residential areas:

- Install safety fence at the edge of the construction right-of-way for a distance of 100 feet on either side of the residence or business establishment.

[7] Throat of a sinkhole: A narrow passage, often appearing as a column, leading to the bedrock drain that can be a larger opening.

- No temporary work areas would be located within 10 feet of a residence unless the landowner agrees in writing, or the area is within the existing maintained right-of-way.
- If crushed stone/rock access pads are used in residential areas, rock would be placed on nonwoven synthetic geotextile fabric to facilitate rock removal after construction.
- Attempt to leave mature trees and landscaping intact within the construction work area unless the trees and landscaping interfere with the installation techniques or present unsafe working conditions, or as specified in landowner agreements.
- Segregate topsoil from subsoil (unless otherwise approved by the landowner) except where the topsoil is being replaced, or unless the landowner or land managing agency specifically approves otherwise.

Prior to commencement of construction activities, East Tennessee would mail a letter to affected landowners notifying them of the construction activities and provide local contact information should they have construction-related concerns. For a distance of 100 feet on either side any residence or business establishment, a minimum distance of 25 feet would be maintained between any structure and the edge of the construction work area. In those areas where the 25 feet cannot be maintained, smaller spreads of labor and equipment, operating independent of the mainline work force, would utilize either the stove pipe/sewer line or drag section pipeline construction techniques during construction.

The stove pipe construction technique is typically used when the pipeline is to be installed in very close proximity to an existing structure or when an open trench would adversely impact a residence or business establishment. The technique involves installing one joint of pipe at a time whereby the welding, weld inspection, and coating activities all would be performed in the open trench. At the end of each day after the pipe is lowered-in, the trench would be backfilled and/or covered with steel plates or timber mats. Alternatively, the trench may be left open to facilitate tie-ins or other activity, provided the site would be adequately secured with safety fencing or equivalent and a night watch person is present to secure the site during non-working hours. The length of excavation performed each day would not exceed the amount of pipe installed.

The drag section construction technique involves the trenching and installation of a prefabricated length of pipe containing several segments all in one day. At the end of each day after the pipe is lowered-in, the trench would be backfilled and/or covered with steel plates or timber mats. Alternatively, the trench may be left open to facilitate tie-ins or other activity, provided the site would be adequately secured with safety fencing or equivalent and a night watch person is present to secure the site during non-working hours. Use of the drag section technique typically requires adequate staging areas outside

of the residential and/or business establishment for assembly of the prefabricated sections.

Restoration, including final grading, topsoil replacement, and installation of permanent erosion control structures, would be completed within 10 days after backfilling the trench. If seasonal or other weather conditions prevent compliance with this time frame, East Tennessee would maintain temporary erosion controls (i.e., temporary slope breakers, sediment barriers, and mulch) until conditions allow restoration. All lawn area and landscaping would be restored immediately following cleanup including performing compaction mitigation, removing excess rock from the top 12 inches of soil (unless otherwise approved by the landowner); importing top soil (if necessary and approved by the landowner) that is certified as free of noxious weeds and soil pests; and reseeding all disturbed lawns with a seed mixture acceptable to landowner or comparable to the adjoining lawn. East Tennessee has stated that landowners would be compensated for damages in a fair and reasonable manner, and as specified in the damage provision within the controlling easement on each property.

One commenter expressed concern about the resale value of property with a natural gas pipeline. The effect a pipeline easement may have on property value, including resale ability, is not a wholly quantifiable issue. The impact a pipeline may have on the value of a tract of land depends on many factors, including size, the values of adjacent properties, existence of other utility easements, the current value of the land, and current land use. Appraisal methods used to value land are based on objective characteristics of the property; subjective valuation is generally not considered in appraisals. This is not to say that a pipeline would not impact resale values. A potential purchaser of a property would make a decision to purchase based on his or her planned use of the property in question (e.g., residence; agriculture; business; future subdivision), with each purchaser considering differing factors that affect the purchasing decision. It is possible that a potential purchaser would decide not to purchase the property. However, each potential purchaser has different criteria and differing capabilities to purchase land.

Agricultural Land. About 3.8 miles, or 37 percent, of the Project would impact agricultural lands. In accordance with East Tennessee's E&SCP, topsoil would be stripped and placed separate from subsoil when excavating the trench in agriculturally cultivated or rotated croplands, pastures, and hayfields, which often requires ATWS. East Tennessee would maintain water flow in crop irrigation systems, unless shutoff is coordinated with affected parties, and would repair any damage to irrigation systems as soon as practical. After the pipe has been lowered into the ditch, the subsoil would be used for backfilling and topsoil would then be spread across the graded right-of-way.

During restoration, East Tennessee would test the topsoil and subsoil disturbed by construction activities for compaction at regular intervals. If testing reveals compaction has occurred, East Tennessee would plow severely compacted soils with a paraplow or

other deep tillage implement, decompacting the subsoil before replacing the segregated topsoil. Any soil imported for use within agricultural areas would be certified as free of noxious weeds and soil pests, unless otherwise approved by the landowner. Additionally, East Tennessee would remove excess rock from at least the top 12 inches of soil in all cultivated or rotated cropland, managed pastures, hayfields. The size, density, and distribution of rock on the construction work area would be similar to adjacent areas not disturbed by construction, or the landowner or land management agency may approve other provisions in writing.

If drain tiles have been installed in agricultural lands, East Tennessee would attempt to locate existing drain tiles and systems within the proposed area of disturbance and check them for damage after construction. East Tennessee would ensure that the depth of cover over the proposed pipeline is sufficient to avoid interference with drain tile systems (existing or proposed). If drain tiles or systems are found to be damaged by construction, East Tennessee would hire a local (if available), qualified drain tile specialist to conduct or monitor repairs. Damaged drain tiles would be repaired to their original or better condition.

Road, Railroad, and Utility Crossings. East Tennessee would cross 20 roads and 5 railroads to construct the Project. Prior to construction, East Tennessee's contractors would employ the "Call Before You Dig" or "One Call" system, or would directly contact state or local utility operators so facilities that may intersect, or be in close proximity to, the proposed pipeline can be identified and marked. The contractor may elect to excavate the utilities to confirm their location. Appropriate traffic management, signage, and necessary safety measures would be developed and implemented in compliance with applicable permits for work in the public roadway. Traffic safety personnel would be present during construction. Construction would be scheduled for work within roadways and specific crossings so as to avoid commuter traffic and schedules for school buses to the greatest extent practical.

East Tennessee has proposed to cross roadways and railroads using the following methods:

- *Open Cut.* This method would be implemented for driveways and roads with low traffic densities where pipeline installation would not adversely impact the general public. For driveways and small roads, a temporary bypass roadway may be constructed. For multi-lane roads, one lane may be closed for construction and traffic diverted to the other lane(s) with construction progressing one lane at a time. Alternatively, traffic could be detoured around the work area using adjacent roadways. If the roadway surface is paved, pavement over the proposed trench would be cut, removed, and properly disposed of, the pipeline installed in the trench, and the trench backfilled. The trenched area would then be repaved and properly compacted to reduce stresses on the pipeline and ensure the roadway

supports the traffic load without settling. The existing trench subsoil may be used in the backfill, if it can be compacted properly and is authorized by the permitting agency. In most cases, backfill material would be obtained from an outside source and hauled in.

- *Bored.* On roads with higher traffic densities, the pipeline may be installed by boring a hole under the road with a drill that contains a cutting head. Dummy casing that is slightly larger in diameter than the proposed pipeline is installed immediately behind the cutting head. An auger is placed inside the pipe to remove any cuttings. Next, a pipeline section is welded to the boring pipe, pulled into place, and the boring pipe is removed. Any voids between the pipeline and the subsoil are filled with grout (a sand-cement mix) to prevent settlement of the roadway surface, allowing the road to remain in service while the installation process takes place and eliminating the potential for trench settlement.

- *Cased Bore.* The procedure for a cased crossing is similar to a bored crossing with one exception. A section of steel casing pipe, which is several inches greater in diameter than the pipeline, is bored into place. Casing sections are welded together to ensure water does not enter the casing. Once the casing pipe has been installed, the pipeline is pulled through the casing. To prevent potential corrosion of the pipeline due to contact between the pipeline and the casing, the pipeline is insulated from the casing pipe, either through the use of plastic insulators spaced along the pipeline or with a concrete coating on the inner pipe. To prevent water from entering the casing, the ends of the casing are sealed with rubber or polyethylene seals. The space between the casing and the pipeline is vented to the atmosphere through the use of sections of small diameter pipe (vent pipe), which are welded to the casing ends and run from the casing to several feet above the surface of the ground. Casing pipe is installed when required by permit or when there is a likelihood of encountering rock during the boring. Generally, crossings of major state highways are installed with casings.

- *Hammer technique.* This technique consists of driving casing pipe that is slightly larger in diameter than the proposed pipeline under the roadway with a horizontal air-operated reciprocating hammer. The casing pipe is placed against the end of the trench near the edge of the roadway and driven under the paved road. Once in place, the material inside the casing is augured out and the pipe is installed through the casing. The casing pipe is then removed while grout is placed around the pipeline. Where required, the casing pipe may be left in place.

- *HDD.* This technique was described above in the *Waterbodies* subsection.

Crossings of private roadways would be coordinated with residents to minimize access impacts. In those areas where the excavation of a longer length of trench would not pose a safety problem, the pipeline would be installed using the standard open trench

method. Open trenches would either be fenced or covered with steel plates during all non-working hours. Steel plates would be kept on site at each crossing so that a temporary platform could be made across the trench as required (e.g., emergency vehicles). All roadway surfaces would be quickly restored to the specifications of permit requirements. Roadway markings and striping would be added as necessary.

Aboveground Facility Construction Procedures

East Tennessee would construct aboveground and appurtenant facilities in accordance with industry standards and its E&SCP. The aboveground facilities would be within either the construction workspace for the pipeline or the existing Meter Station No. 59039, and the timing of work on aboveground and appurtenant facilities would coincide with construction of the pipeline. Aboveground facility sites would be cleared and graded as necessary in preparation for construction. High pressure piping would be coated for protection against corrosion, and East Tennessee would install a cathodic protection to protect buried piping. Aboveground and appurtenant facilities would be pressure tested prior to being put in-service. Final grading and landscaping of disturbed areas would be consistent with East Tennessee's E&SCP for restoration of uplands.

8.2 Operations and Maintenance

East Tennessee would operate and maintain the new pipeline, aboveground facilities, and modified facilities in accordance with all applicable federal and state requirements, including DOT's safety standards in 49 CFR 192 and maintenance provisions of East Tennessee's E&SCP.

Operational activity on the pipeline would be limited primarily to maintenance of the right-of-way and inspection, repair, and cleaning of the pipeline itself. Periodic ground inspections by pipeline personnel would identify soil erosion that may expose the pipe, conditions of vegetation cover (e.g., dead or stressed vegetation may indicate a leak in the line), state of erosion control measures, unauthorized encroachment on the right-of-way (e.g., buildings, land disturbance activities) and other conditions that could present a safety hazard or require preventative maintenance or repairs. The pipeline cathodic protection system also would be monitored and inspected periodically to ensure proper and adequate corrosion protection.

To maintain accessibility to the right-of-way and accommodate pipeline integrity surveys, vegetation along the permanent pipeline right-of-way would be cleared periodically using mechanical mowing or cutting where necessary. In accordance with East Tennessee's E&SCP, routine vegetation maintenance would be conducted not more than once every 3 years to maintain the permanent right-of-way in an herbaceous to low scrub-shrub cover state. However, East Tennessee may maintain a 10-foot-wide strip centered on the pipeline more frequently to allow for periodic corrosion and leak surveys.

In no case would routine vegetation maintenance clearing occur between April 15 and August 1 of any year. This restriction is designed to minimize potential impacts on migratory birds. Active cropland would be allowed to revert to pre-construction use for the full width of the right-of-way.

East Tennessee personnel also would perform regular operation and maintenance activities on meter stations and appurtenant facilities. These activities would include calibration, inspection, and scheduled maintenance. East Tennessee would test safety equipment to ensure proper functioning and correct identified problems.

9. Environmental Compliance Inspection and Monitoring

Prior to construction, East Tennessee would conduct environmental training for the company and contractor personnel. The level of training would be commensurate with the type of duties of the personnel. The training program would focus on the requirements of our Plan and Procedures (as incorporated in East Tennessee's E&SCP), Certificate conditions, other Project-specific permit conditions, and Project-specific mitigation plans.

East Tennessee would use two EIs for the Project. The EIs' responsibilities would include: (1) monitoring the contractor's compliance with environmental measures required by the Certificate, other environmental permits or approvals, and all other construction, restoration, and mitigation plans; (2) taking corrective actions, including issuing stop-activity orders to the contractor; (3) documenting compliance with environmental requirements; and (4) preparing status reports for submittal to the Commission's environmental staff.

East Tennessee would conduct post-construction monitoring to document restoration and revegetation of the right-of-way and other disturbed areas, and to address any landowner concerns in accordance with our Plan and Procedures. East Tennessee would monitor upland areas, as necessary, to determine the success of revegetation; at a minimum, inspections would occur after the first and second growing seasons following restoration and would continue until revegetation is successful. East Tennessee would also submit quarterly activity reports to FERC to document the status of revegetation in disturbed areas. These reports would describe the results of post-construction inspections, any problem areas, and corrective actions taken. In addition, FERC staff would inspect the Project throughout construction to independently verify compliance with the Commission's orders. FERC staff would continue to monitor and inspect the vegetation along the Project route until restoration and revegetation are deemed successful.

10. Construction Schedule and Workforce

East Tennessee anticipates that construction of the Project would start in March 2016, continue through August 2016, and would be placed into service in September 2016. East Tennessee estimates an average construction workforce of 152 workers and a peak workforce of 265, with approximately 15 percent of the peak workforce hired locally. No permanent workers would be hired during operation of the Project.

11. Future Plans and Abandonment

At this time, East Tennessee has not identified any specific plans for future expansion or abandonment of the facilities proposed in this docket. If additional demand for natural gas requires future expansion, East Tennessee would seek the appropriate authorizations from FERC. When and if an application for additional facilities is filed, the environmental impact of the new proposed facilities would be examined.

12. Permits and Consultations

Table A-6 lists federal and state permits related to construction and operation of the Project. East Tennessee would provide all relevant permits and approvals, including those listed in table A-6 below, to its construction contractor who would be required to be familiar with applicable documents. East Tennessee would be required to obtain all necessary permits regardless if they appear in the table or not.

Table A-6: Environmental Permits, Approvals, and Consultations for the Loudon Expansion Project		
Agency	**Permit/Approval/Consultations**	**Date for Commencing Formal Permit and Consultation Procedures**
FEDERAL		
Federal Energy Regulatory Commission	Certificate of Public Convenience and Necessity to construct, install, own, operate, and maintain a pipeline under §7(c) of the Natural Gas Act (15 USC § 717f (c))	Application filed February 20, 2015. Re-route of proposed pipeline filed July 10, 2015.
U.S. Army Corps of Engineers Nashville District Regulatory Office	Nationwide Permit No. 12 (NWP-12) under §404 of the Clean Water Act (CWA) and §10 of the Rivers and Harbors Act	Pre-Construction Notification submitted March 2015. Re-route of proposed pipeline filed July 15, 2015.
U.S. Fish and Wildlife Service Cookeville Field Office	Consultation under §7 of the Endangered Species Act (ESA), the Bald and Golden Eagle Protection Act (BGEPA) and the Migratory Bird Treaty Act (MBTA)	Clearance request submitted March 2015. Re-route of proposed pipeline filed July 31, 2015. Clearance for ESA, BGEPA, and MBTA received October 18, 2015.
Tennessee Valley Authority	30-Year Easement for Utility Line Crossing Consultation regarding cultural resources.	Right-of- Way Easement Consultation on-going.
STATE OF TENNESSEE		
Tennessee Wildlife Resource Agency, Region IV	Review and consultation regarding state listed endangered and threatened species.	Clearance request submitted March 2015. Re-route of proposed pipeline filed July 7, 2015. Clearance received September 28, 2015.
Tennessee Department of Agriculture – Division of Forestry	Permit for Open Burning required to be obtained by applying online or contacting the Division of Forestry by phone.	As close to the burn date as possible – must be obtained in advance for weekends and holidays.
Tennessee Department of Environment and Conservation – Division of Natural Areas – Natural Heritage Inventory Program	Review and consultation regarding state listed endangered and threatened species.	Consultation initiated on September 12, 2014. Information received September 24, 3014. Consultation complete.

Table A-6: Environmental Permits, Approvals, and Consultations for the Loudon Expansion Project		
Agency	**Permit/Approval/Consultations**	**Date for Commencing Formal Permit and Consultation Procedures**
STATE OF TENNESSEE		
Tennessee Department of Environment and Conservation – Division of Water Pollution Control	CWA §401 Water Quality Certification (programmatic for NWP-12)	Programmatic Water Quality Certification issued April 9, 2012.
	Water Withdrawal Authorization not required if withdrawal is not greater than 10 percent of waterbody	n/a
	Aquatic Resource Alteration Permit (ARAP), General Permit for Utility Line Crossings CN-1091	ARAP request submitted March 2015. Re-route of proposed pipeline filed July 15, 2015. ARAP NRS15.060 received August 10, 2015.
	Tennessee General Permit for Modification of Karst Features CN-	Consultation initiated on September 15, 2014.
	Tennessee General Permit No. TNR100000 for Stormwater Discharges Associated with Construction Activities.	Consultation initiated on September 15, 2014. NOI to be submitted 90 days prior to construction.
	General National Pollutant Discharge Elimination System Permit for Discharges of Hydrostatic Test Water.	Consultation initiated on September 15, 2014. NOI to be submitted 90 days prior to construction.
Tennessee Department of Environment and Conservation – Division of Archaeology & Tennessee Historical Commission	National Historical Preservation Act (NHPA) §106 clearance. Agency will review, consult, and comment on cultural resources studies and mitigation plans.	Clearance requests submitted March, April, June, and July 2015. Clearance received July 21, 2015.
TRIBAL		
Cherokee Nation	NHPA §106 Consultation	Consultation initiated on September 11, 2015. Re-route of proposed pipeline submitted June 22, 2015. No comment received to date.
Eastern Band of Cherokee Indians	NHPA §106 Consultation	Consultation initiated on September 11, 2015. Re-route of proposed pipeline submitted June 22, 2015. No comment received to date.
United Keetoowah Band of Cherokees	NHPA §106 Consultation	Consultation initiated on September 11, 2015. Re-route of proposed pipeline submitted June 22, 2015. No comment received to date.

B. ENVIRONMENTAL ANALYSIS

Construction and operation of the Project would have temporary, short-term, long-term, and permanent impacts. As discussed throughout this EA, temporary impacts are defined as occurring only during the construction phase. Short-term impacts are defined as lasting up to 3 years. Long-term impacts would eventually recover, but require more than 3 years. Permanent impacts are defined as lasting throughout the life of the Project. No wetlands would be crossed or impacted by the Project so no discussion of them is included.

1. Geology and Soils

1.1 Geology

This section describes the physiography and geologic setting of the Loudon Expansion Project, mineral resources in the project area, and geologic hazards that could affect the Project. Aboveground facilities would be constructed within the same geologic setting as the pipeline facilities and, therefore, are not considered separately in the following discussion.

Physiographic and Geologic Setting

The Project would be located in the Valley and Ridge physiographic province in southeastern Tennessee. The province is characterized by northeast to southwest trending linear ridges that are comprised of relative resistant sandstone and cherty carbonate bedrock and parallel lowlands underlain by less resistant shales, limestone, and dolomite. With the exception of about 0.8 mile of the pipeline alignment, the lithology is predominantly comprised of carbonate bedrock consisting of Cambrian to Ordovician-age limestone and dolomite. The remaining 0.8 mile of the alignment between MPs 2.32 to 2.47 and 9.94 to 10.03 is comprised of shale bedrock.

Mineral Resources

Per East Tennessee's communication with Mr. Dennis Conger of the Mine Permitting Section, TDEC, Water Resources Division, regarding the availability and commercial use of mineral resources in Loudon and Monroe Counties, Mr. Conger stated that the only commercial mineral resources in the counties consist of construction sand, gravel, and limestone surface quarries.

A review of TDEC Interactive Mapping Portal indicates that the only current minerals mining operation near the Project is the Vulcan Construction Materials LP – Sweetwater Quarry. This facility is 5.16 miles west of the Project. The active Vulcan Sweetwater facility quarries limestone and produces crushed and broken limestone.

Geologic Hazards

Geologic hazards and limitations including seismicity (e.g. earthquakes), surface faults, soil liquefaction, landslides, flash flooding, karst topography, subsidence, and shallow bedrock were evaluated for the Project and are discussed below.

Seismicity, Ground Rupture and Soil Liquefaction

Most earthquakes are generated due to fault displacement or movement along a fault plane. The Project is within the East Tennessee Seismic Zone (southern Appalachian Seismic Zone) in southeast Tennessee. The East Tennessee Seismic Zone is capable of a 7.5 magnitude event on the Richter scale (Wheeler and Frankel 2000). Recurrence of a 5 to 6 magnitude event has been estimated to occur once every 200-300 years (Bollinger et al. 1989; Chapman 2000). Data compiled from the U.S. Geological Survey (USGS) show 86 recorded earthquakes between 1973 and 2015, all with magnitudes in the range of 1.0 to 4.7 in eastern Tennessee (USGS 2015).

Ground shaking is typically the greatest hazard during an earthquake. Probabilistic approaches to assessing seismic hazards use statistics of earthquakes in a region to estimate the level of ground motion and are most commonly expressed as the peak ground acceleration (PGA). The USGS produces seismic hazard maps for the conterminous United States that include PGA for a range of return periods (USGS, 2014). For buried natural gas pipelines, the design operational earthquake is considered to be the PGA associated with a 10 percent probability of exceedance in 50 years (475-year return period), for aboveground facilities the 2 percent probability in 50 years (2,500-year return period).

Based on USGS probability mapping, the Project area could experience a PGA with a 10 percent probability in 50 years between 10 and 20 percent gravity (g), and a 2 percent probability in 50 years between 40 and 80 percent g (USGS 2014a). PGA between 10 and 20 percent g could produce earthquakes with an instrumental intensity of between VI and VII on the Modified Mercalli Intensity Scale[8], which would be perceived at ground surface as strong to very strong ground shaking, with the potential for light to moderate damage. A PGA of between 40 and 80 percent g could produce earthquakes with an instrumental intensity of between VIII and IX, which would be perceived as severe to violent ground shaking with the potential for moderately heavy to heavy damage (USGS 2006).

[8] Modified Mercalli Intensity Scale: a scale composed of increasing levels of intensity based on observed effects that range from imperceptible shaking to catastrophic destruction to describe the effects of earthquakes. Designated by Roman numerals ranging from I to X, the lower numbers of the intensity scale generally deal with the manner in which the earthquake is felt by people. The higher numbers of the scale are based on observed structural damage. Structural engineers usually contribute information for assigning intensity values of VIII or above.

A review of the USGS Quaternary Faults and Fold Database (USGS 2014b) did not identify any Quaternary-age faults within the project area. The nearest Quaternary-age faults lie to the west in the New Madrid Seismic Zone along the Mississippi River.

Liquefaction occurs when strong ground shaking cause water-saturated, loose cohesionless sediments to liquefy and erupt upward onto the surface. There are three physical conditions necessary for soil liquefaction to occur:

1. lack of cohesive soils;
2. near-surface groundwater saturation; and
3. active seismicity.

Sediments/soils that are susceptible to liquefaction during a seismic event are generally limited to unconsolidated, clean sand (up to 35 percent non-plastic fines), lying below the water table. The greater the intensity and duration of a seismic event, the more likely liquefaction of these materials could occur.

Alluvial deposits that are encountered along the Project route are found on lower slopes in valleys where the water table is less than 10 feet below ground surface (bgs). The expected PGA for the 10 percent probability in 50 years of 10 to 20 percent g (design operational earthquake for a buried pipeline) could allow for liquefaction to occur in these valleys. All aboveground facilities are located outside of areas with the potential for soil liquefaction. Where alluvial soils occur with shallow depths to groundwater, and could be subject to soil liquefaction, would be crossed utilizing HDD, with the alignment passing through bedrock.

Additionally, seismic performance studies of natural gas transmission lines in southern California studied by O'Rourke and Palmer (1966) found that lateral movement and damage to modern electric arc-welded natural gas pipelines perform well in seismically active areas of the United States. Specific site conditions, including earthquake potential, are considered in the design of a pipeline. The design and construction of all Project pipeline and aboveground facilities would be in accordance with all applicable federal, state regulations and county building and construction ordinances to adequately minimize the potential effects of seismicity on the Project. We do not anticipate that area seismicity, and potential concurrent soil liquefaction of soils in the alluvial valleys would affect the pipeline construction or integrity. Section B.10 of this EA discusses pipeline safety measures.

Landslide

According to the landslide overview map of the Conterminous United States (Radbruch-Hall, D.H., et al. 1982), the Project area shows a moderate to low incidence of landslides (1.5 to 15 percent of the area involved), and a moderate susceptibility for landslides to occur. No specific landslide hazard areas have been identified along the

Project alignment that requires special design. However, if during construction a significant landslide hazard is identified, East Tennessee would implement mitigation measures to stabilize the area. These measures could include burial of the pipeline below the potential landslide depth and the implementation of additional drainage controls including slope and ditch breakers, subsurface gravel or cobble drains, culverts and drainage ditches to divert water away from the right-of-way. In areas with a high potential for landslides, slope gauges may be used to monitor slope movement during Project operation.

Restoration would be conducted in accordance with East Tennessee's E&SCP and would include permanent slope breakers, and erosion controls, and the establishment of permanent vegetation.

Subsidence

Common causes of subsidence include the presence of karst terrain, collapse of underground mines, rock quarry dewatering, and other fluid withdrawals from production in oil-producing regions.

Karst

Karst or karstic terrain is underlain by soluble rocks such as carbonate and gypsum bedrock that have undergone significant dissolution by natural waters manifested at ground surface by closed depressions of various size, disrupted surface drainage, surficial and submerged caves and cave systems, and an underground drainage system. As discussed above, with the exception of about 0.8 mile of the pipeline alignment, the lithology is predominantly comprised of carbonate bedrock consisting of Cambrian to Ordovician-age limestone and dolomite. Karst terrain is present in the Project area and along the Project alignment. Based on site reconnaissance of the Project area conducted by East Tennessee, approximately 31 sinkhole/closed depressions and karst features were identified along the proposed 10.2-mile-long pipeline route. These features were classified as sinkhole/closed depressions (past collapses without an obvious surficial opening/void) or karst features (past collapses with an actual opening observed). Of the 31 identified features, 14 were located outside of the construction workspace, 8 were directly adjacent to the construction work space, 3 were within the construction work space, 1 was within the construction work space and directly adjacent to the trench line, and 5 were directly below the trench line. Table B-1 provides information on each of the 31 identified features, including type and location.

Table B-1: Karst Features Identified Along the Pipeline Alignment			
Location	**Feature ID**	**Feature Type**	**Feature Location**
MP 0-MP 1	LE-27	Sinkhole/closed depression	Outside the CWS
	LE-25	Sinkhole/closed depression	Outside the CWS
	LE-26	Sinkhole/closed depression	Outside the CWS
	LE-24	Karst feature	Outside the CWS
	LE-23	Sinkhole/closed depression	Outside the CWS
	LE-22	Sinkhole/closed depression	Outside the CWS
	LE-21	Karst feature	Directly adjacent to the CWS
	LE-19	Karst feature	Directly adjacent to the CWS
MP 1-MP 2	LE-28	Sinkhole/closed depression	Outside the CWS
	LE-32	Sinkhole/closed depression	Within the CWS (landowner preferred pipeline location)
	LE-33	Sinkhole/closed depression	Below the trench line (landowner preferred pipeline location)
MP 4-MP 5	LE-17	Karst feature	Outside the CWS
	LE-18	Sinkhole/closed depression	Outside the CWS
	LE-20	Karst feature	Outside the CWS
MP 5-MP 6	LE-14	Sinkhole/closed depression	Below the trench line
	LE-13	Sinkhole/closed depression	Directly adjacent to the CWS
	LE-15	Sinkhole/closed depression	Directly adjacent to the CWS
	LE-12	Sinkhole/closed depression	Outside the CWS
	LE-11	Sinkhole/closed depression	Directly adjacent to the CWS
	LE-10	Sinkhole/closed depression	Outside the CWS
MP 6-MP 7	LE-29	Sinkhole/closed depression	Below the trench line
MP 8-MP 9	LE-16	Sinkhole/closed depression	Below the trench line
	LE-2	Sinkhole/closed depression	Directly adjacent to the CWS
	LE-1	Sinkhole/closed depression	Within the CWS
MP 9-MP 10	LE-3	Sinkhole/closed depression	Outside the CWS
	LE-4	Sinkhole/closed depression	Within the CWS
	LE-5	Sinkhole/closed depression	Within the CWS and directly adjacent to the trench line
	LE-6	Sinkhole/closed depression	Below the trench line
	LE-7	Sinkhole/closed depression	Directly adjacent to the CWS
	LE-8	Sinkhole/closed depression	Outside the CWS
	LE-9	Sinkhole/closed depression	Directly adjacent to the CWS
Note: CWS: construction work space			

For the nine features within the construction work space adjacent and below the trench line, East Tennessee has proposed monitoring the features during construction and mitigating them as necessary in accordance with its *Karst Mitigation Plan* (Appendix F). Smaller voids would be excavated to expose the throat of the opening. Once the limit of

the throat is determined, the opening would be filled with clean, graded rock fill. Fill material would consist of graded large rock, coarse aggregate backfill, flowable fill or geotextile fabric, and compacted soil that would be applied to cap the surface. In those instances where the pipeline would traverse a large open void or cave feature, large rock several feet in diameter would be placed and wedged into the opening in order to stabilize the opening and minimize disturbance of the cave. Next, angular rock up to 2 feet in size would be placed on top of the large rock, followed by a layer of non-woven filter fabric. The remaining open space would be capped with suitable graded rock and soil backfill.

East Tennessee states that the purpose of these remedial techniques is to allow for stability of the void and/or cave and increase the long-term stability and integrity to the pipeline right-of-way. East Tennessee further states that these techniques are designed to allow for continued infiltration of recharge waters to reach the groundwater system. Final grading of contours and any necessary permanent erosion and sediment controls would be designed to prevent runoff from accumulating in the area of the feature.

While we find this approach acceptable for the three features within the construction work space that would not be directly impacted by the trench line or are unknown at this time, we disagree with this approach for the one feature directly adjacent to the trench line and the five features directly below the trench line. East Tennessee states excavation of karst/sinkhole features would be done during construction. In the event that a sinkhole or karst feature requires implementation of the Karst Mitigation Plan, construction work in the immediate area would be stopped and the appropriate company and contractor supervisor would also be alerted. A designated Project geotechnical engineer/geologist would be contacted and directed to the feature to conduct a detailed evaluation. Based on the evaluation, a minor field realignment of the pipeline may be conducted. If a minor field alignment is not feasible and/or does not prevent or otherwise minimize impacts on the feature or the integrity of the pipeline, the geotechnical engineer/geologist would implement the karst mitigation measures contained in East Tennessee's *Karst Mitigation Plan* to stabilize the feature.

Based on the relative mature nature of the carbonate karst terrain in the Project area, we foresee that this approach could halt construction for several days as the Project geotechnical engineer/geologist investigates and coordinates with the construction contractor and East Tennessee staff regarding a solution. Additionally, if the results of the investigation show that the *Karst Mitigation Plan* measures could not sufficiently maintain pipeline integrity and pipeline realignment would be warranted, we foresee that such a realignment could require re-routing the pipeline outside the approved construction right-of-way, possibly affecting previously unaffected landowners.

Therefore, **we recommend that:**

- **<u>Prior to construction</u>, East Tennessee should file with the Secretary of the Commission (Secretary), for review and written approval by the Director of the Office of Energy Projects (OEP), a Karst Investigation Report. East Tennessee should develop the Karst Investigation Report showing the results of a detailed evaluation and the remediation strategy for each of the six sinkholes (Feature IDs LE-5, LE-6, LE-14, LE-16, LE-29, and LE-33) that would be directly adjacent to or below the trench line. East Tennessee's evaluation should define the dimensions of each feature using a combination of surface geophysical techniques, geotechnical borings, and excavation to expose the throat of the solution opening.**

Post-construction, East Tennessee would monitor the pipeline right-of-way to evaluate the success of the karst mitigation measures. The frequency of these inspections would comply with the requirements of the TDEC stormwater permit. If a new karst feature or sinkhole were to develop within the permanent right-of-way, East Tennessee would direct its geotechnical engineer/geologist to evaluate the feature to design and implement any necessary additional remedial measures.

One commenter expressed concern that an undetected gas leak would fill and travel through the karst features common throughout the area. We note that the Loudon Expansion Project would convey natural gas, not a liquid product. The primary component of natural gas is methane and low concentrations of ethane. In the very unlikely event of an underground release from the pipeline facilities, the gas would migrate to the surface and dissipate into the atmosphere and not contaminate or travel through subsurface media.

<u>Underground Mines and Oil and Gas Production</u>

No underground mining activities or active oil and gas permits were identified in the Project area.

<u>Rock-Quarry Dewatering</u>

Sweetwater Quarry is about 5.16 miles west of the Project. The quarry pumps and discharges treated wastewater and stormwater collected in the mine and groundwater that seeps into the mine. Sweetwater Quarry is a surface mine; mine-dewatering is primarily in response to stormwater inputs, therefore drawdown of groundwater is not expected. In addition, the mine is more than 5 miles from the Project so the potential for significant hydrologic impacts on the Project by mine dewatering and lowering of the water table in this karst area would be unlikely due to distance.

Flooding

Flood hazard areas identified on the Flood Insurance Rate Map are identified as a Special Flood Hazard Area, which is defined as the area that will be inundated by a flood event having a 1 percent chance of being equaled or exceeded in any given year (the 1 percent annual chance flood is also referred to as the "base flood" or 100-year flood). Moderate flood hazard areas are also shown on the Rate Map, and are the areas between the limits of the base flood and the 0.2 percent annual chance (or 500-year) flood.

The greatest potential for flash flooding to occur in the Project area is along waterbodies during or following a large storm event. East Tennessee proposes to cross the two major water bodies along the pipeline route utilizing HDD. The entry and exit locations for these crossings lie outside of the 1 percent annual flood area, and within the 2 percent flood area. As such, impacts during HDD construction are not anticipated.

Shallow Bedrock

As shown in table B-2, East Tennessee anticipates that approximately 1.2 miles of the pipeline alignment could encounter bedrock that is within 60 inches of the ground surface, requiring removal by conventional excavator with the aid of breaking the rock by ripping, hammering, or by blasting.

Table B-2: Shallow Bedrock and Potential Blasting Locations Along the Proposed Pipeline Alignment of the Project

Milepost Range	Crossing Length (ft)	Depth to Bedrock (in)
0.5-0.7	778	58
2.5-2.5	61	58
2.5-2.5	268	34
2.5-2.6	189	22
2.6-2.6	211	22
2.8-2.8	63	22
2.8-2.8	337	34
2.8-2.9	161	34
2.9-2.9	140	58
3.9-4.1	1232	20
4.1-4.2	239	40
4.2-4.2	116	34
4.2-4.2	170	34
4.2-4.3	103	48
4.3-4.3	396	40
4.3-4.6	1366	20
4.8-4.9	520	20
TOTAL:	**6,350 ft (1.2 miles)**	

If blasting is required, East Tennessee would conduct all blasting in accordance with its Project *Blasting Plan*. Measures contained in the blasting plan to minimize or mitigate impacts on nearby structures and wells include:

- pre-blast inspections of all structures, wells, springs, and utilities within 150 feet of the construction right-of-way;
- pre-construction water well evaluations to determine well yield and water quality, water quality testing would include fecal coliform, water hardness and other water chemistry including chlorides, sulfates, calcium, iron, and magnesium;
- monitoring of blast activities;
- limiting the size of charges and by using charge delays, which stagger each charge in a series of explosions to minimize vibrations;
- use of matting or other suitable cover, as necessary, to prevent fly-rock from damaging adjacent protected natural resources; and
- conducting post-blast inspections all structures, wells, springs, and utilities within 150 feet of the proposed construction right-of-way.

We find that implementation of East Tennessee's Blasting Plan to be protective of nearby structures, wells, and environmental resources.

Horizontal Directional Drilling – Results of Geotechnical Investigations and Feasibility Analysis

East Tennessee proposes to cross the Tennessee River at MP 9.9, and Tellico Lake at MPs 2.1 and 4.4 using an HDD. Use of the HDD technique typically avoids disturbing a waterbody bed and banks and minimizes environmental impacts. However, an inadvertent return of drilling fluids from the drilled borehole through hydrofractures could reach the surface along the drill path. Additionally, some materials such as loose coarse gravel are not amenable to HDD due to the potential for borehole collapse. East Tennessee conducted geotechnical borings along the length of each crossing to characterize the subsurface along the drill path and conducted a hydrofracture analysis based on the planned depth of the alignment and the expected drilling pressures.

Along the proposed crossing path of Tellico Lake between MP 2.18-MP 2.84, East Tennessee drilled four geotechnical boreholes to depths of 220 feet bgs; between MP 4.51-MP 4.73 East Tennessee drilled two borings to depths of 120 feet bgs. For the Tennessee River crossing between MP 9.85-MP 10.18, three geotechnical borings were drilled to depths of 86, 240, and 150 feet bgs for borings HDD-03-01, -02, &-03, respectively. Per the findings of East Tennessee's geotechnical investigation, the lithology along each HDD crossing consists of weathered and fractured limestone with indications of minor solution openings, as shown by percent bedrock core recovery, rock quality designation, and observation of drilling fluid losses while advancing the borings through the upper 20-30 feet of the limestone bedrock. Below this depth, the overall

bedrock quality improves, and greater percentages of bedrock core recoveries and greater rock quality designation percentages are found. In addition, the borings show that a relatively thin veneer of saprolite and some alluvial deposits are also present above the bedrock at the first Tellico crossing and at the crossing for the Tennessee River.

The figures in Appendix G the pipeline alignment profile at each of the proposed crossings, along with the geotechnical boring locations. The horizontal length of the HDD crossing at the first Tellico Lake Crossing is 3,516 feet, and the maximum depth of the pipeline would be approximately 155 feet below the lake. At the second Tellico Lake crossing, the horizontal length of the crossing would be 1,159 feet, and the maximum depth would be approximately 62 feet below the lake. For the Tennessee River crossing, the horizontal length of the crossing would be 1,740 feet, with the maximum depth of the pipeline about 49 feet below the center of the river.

The results of East Tennessee's hydrofracture analysis showed that the potential for an inadvertent release of drilling fluids was greatest near the entry and/or exit locations where the borehole would pass through the subsurface at shallower depths and through more friable bedrock materials. Drilling fluid is comprised of a mixture of water and non-toxic, naturally occurring bentonite clay, which in small quantities is not detrimental to vegetation, fish, or wildlife. In larger quantities, the release of drilling fluids into a waterbody could affect fisheries and vegetation by causing turbidity, sedimentation, and changes to aquatic habitat.

To reduce the chance of an inadvertent release of fluids, East Tennessee's contractor (Hatch Mott MacDonald) recommended that East Tennessee install temporary conductor/surface casing at each of the entry and exit locations where highly weathered and friable bedrock conditions occur. This measure would reduce the potential for a substantial loss of drilling fluids and would help maintain borehole stability while drilling through the shallower weathered/friable portions of the limestone bedrock. Additionally, Hatch Mott MacDonald recommended the use of conductor casing due to the elevation differences between the borehole entry and exit locations, and due to the potential for drilling fluids to drain toward the lower elevation leaving the portion of the borehole at the higher elevation free from supporting drilling fluids. However, East Tennessee's *HDD Inadvertent Returns Plan* does not include the installation of temporary surface casing at the HDD borehole entry and exit locations. Therefore, **we recommend that:**

- **Prior to construction, East Tennessee should file with the Secretary, for review and written approval by the Director of OEP, a revised *HDD Inadvertent Returns Plan.* The revised plan should provide for the use of temporary surface casing at each of the HDD borehole entry and exit locations, and installed to a sufficient depth (per the results of the geotechnical boring logs) through the highly weathered and karstic**

zones in the bedrock to prevent an inadvertent release of drilling mud into Tellico Lake and the Tennessee River.

East Tennessee's *HDD Inadvertent Returns Plan* provides the procedures to monitor and mitigate the potential effects of an inadvertent release of drilling fluids. This Plan states that East Tennessee would monitor the volume of drilling fluids and the borehole pressures during drilling to determine if a substantial loss of drilling fluid circulation is occurring. An inadvertent release of drilling fluid within upland areas would be immediately contained with barriers such as hay bales, sand bags, or silt fencing. Collected drilling mud would be returned to the drill rig operations or disposed of at a disposal site. If it is determined that an inadvertent release has occurred within a waterbody, the characteristics of the release and location would be assessed and appropriate containment and recovery procedures implemented. If a release occurs near a shoreline and/or in shallow waters, a cofferdam may be established to contain and recover the drilling fluids. If the release were to occur in deeper waters, the HDD superintendent would assess the drilling parameters and modify these parameters (depth, annular pressure, and drill fluid characteristics) and make any necessary changes to stop or minimize the release, or to cease drilling, if necessary. In its *HDD Inadvertent Returns Plan*, East Tennessee has identified the state agencies that would be notified and provided with all available details and consulted with for additional guidance on mitigating the release. The Plan, however, does not include any jurisdictional federal agencies. Therefore, we recommend that:

- **Prior to construction, East Tennessee should include in its revised *HDD Inadvertent Returns Plan* the federal agency contact information: the U.S. Army Corps of Engineers (COE), Nashville District, Regulatory Branch, Mark McIntosh (865) 986-7296 and TVA, River Forecast Center (865) 632-6065 to be notified in the event of an inadvertent release of drilling fluid.**

1.2 Soil Resources

The Natural Resources Conservation Service (NRCS) Major Land Resource Areas provides a large-scale (regional) interpretation of soils that would be crossed by the Project. The Project is within the Southern Appalachian Ridges and Valleys (Major Land Resource Area 128), which is characterized by heavily populated areas, privately owned land, small to medium-sized farms, and areas of hardwoods or mixed hardwood and pine forests. The dominant soil orders are Udults, and to a lesser extent, Udepts. These soils are predominantly well drained, and have a thermic, mesic, or frigid soil temperature regime depending on the latitude and elevation, and an udic soil moisture regime (USDA 2006).

The soils crossed by the proposed Project were identified and assessed using the NRCS soil surveys and digital data from the NRCS Soil Data Mart and Soil Survey Geographic Database, which provides detail-level soil information for natural resource planning. Based on this database, individual soil series and associated soil attributes that would be affected by the Project, including soil and wind erosion potential, farmland designation, hydric soil conditions, compaction potential, depth to bedrock, revegetation potential, and drainage class, are provided in Appendix H. The individual attributes and the mitigation measures that would be employed during construction are discussed below.

Prime Farmland

The U.S. Department of Agriculture (USDA) defines prime farmland as "land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops" (USDA, 2015a). This designation includes cultivated land, pasture, woodland, or other lands that are either used for food or fiber crops, or are available for these uses. The Project would cross 1.02 miles of prime farmland, about 10.5 percent of the Project area.

Hydric Soils

Hydric soils are formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. Hydric soils are subject to flooding and experience high water tables. Limitations for pipelines are primarily experienced during construction as trench water accumulates and must be discharged to create dry working conditions. Hydric soils account for about 0.47 mile (4.9 percent) of soils along the Project alignment.

Compaction Potential

Soil compaction modifies the structure of soil, altering its strength and drainage properties. Soil compaction decreases pore space and water-retention capacity, which restricts the transport of air and water to plant roots. As a result, soil productivity and plant growth rates may be reduced, soils may become more susceptible to erosion, and natural drainage patterns may be altered. Susceptibility of soils to compaction varies based on moisture content, composition, grain size, and density of soil. All soils encountered along the Project alignment are considered to have a low potential for compaction.

Erosion Potential

Erosion is a natural process that can be accelerated by human disturbance. Factors such as soil texture, structure, slope, vegetation cover, rainfall intensity, and wind intensity can influence the degree of erosion. Soils most susceptible to erosion by water

typically have bare or sparse vegetation cover, non-cohesive soil particles with low infiltration rates, and are found on moderate to steep slopes. Soils more resistant to erosion by water include those that occupy low relief areas, are well vegetated, and have high infiltration capacity and internal permeability. The location and degree of slope angles as well as the intensity of prevailing winds are also factors that can accelerate soil erosion. Less than 1 percent of the soils along the Project alignment have a severe erosion hazard.

Revegetation Potential

Revegetation potential is a rating of the ability of the soil to support revegetation efforts following construction-related disturbance. With the exception of bedrock outcrop and stony or rocky soils, which would account for 620.5 ft (1.2 percent) of the Project alignment, all remaining soils that would be affected by the Project are considered to have high revegetation potential.

Shallow Bedrock Areas

The presence of shallow bedrock, which is defined as bedrock within 60 inches of the ground surface, is often used as an indicator of the potential for introduction of rock to surface layer soils. Introducing stones and rock fragments to surface soil layers could reduce soil moisture-holding capacity resulting in poor revegetation of disturbed areas. The majority of this bedrock is lithic (hard) and may require ripping, blasting, or other special construction techniques during pipeline installation. Blasting might be necessary because pipeline construction would require a 5-foot to 6-foot deep trench. Blasting is discussed in section B.1.1. Along the Project alignment, 1.2 miles (12.3 percent) of the soils have bedrock within 60 inches of the ground surface.

Contaminated Soils

No hazardous waste sites, landfills, or other sites with the potential soil contamination were identified within 0.25 mile of the Project. If a contaminated or hazardous waste site is encountered during construction of the Project, East Tennessee would stop work activities in the immediate vicinity of the site, notify the appropriate state and federal agencies, and proceed in accordance with those agencies' regulations and East Tennessee's *Waste Management Plan*.

Impacts and Mitigation

Construction activities such as clearing, grading, trench excavation, installation, backfilling, and the movement of construction equipment along the right-of-way would impact soil resources. Clearing removes protective vegetation cover and exposes the soil to the effects of wind, rain, and runoff, which increases the potential for soil erosion and

sedimentation in sensitive areas. Grading, spoil storage, and equipment traffic can compact soil, reducing porosity and increasing runoff potential. Trenching of stony/rocky or shallow-to-bedrock soils can bring stones or rock fragments to the surface that could interfere with agricultural practices and hinder restoration of the right-of-way. Construction activities can also affect soil fertility and facilitate the dispersal and establishment of weeds. In addition, contamination due to spills or leaks of fuels, lubricants, and coolant from construction equipment could adversely affect soils.

To minimize soil impacts from Project construction activities, East Tennessee has prepared soil mitigation procedures in its E&SCP, which is consistent with our Plan and Procedures. East Tennessee would utilize erosion control devices and interceptor diversions such as straw bales, silt fencing, slope breakers, and trench plugs to minimize soil erosion and sedimentation in nearby waterbodies. Where deemed necessary, East Tennessee would spread mulch consisting of straw and/or erosion-control fabric over the ground surface to minimize water and wind erosion and to preserve moisture in areas requiring revegetation. East Tennessee would likewise reduce impacts associated with fugitive dust during construction by reducing vehicle speeds on unpaved roads and by applying water, when necessary, in active construction areas. To minimize the introduction of subsoil rocks into agricultural topsoil, East Tennessee would segregate topsoil from subsoil along the construction right-of-way and other work areas and replace the original soil layers during backfilling and final grading. Prior to construction, East Tennessee would contact landowners to locate and identify irrigation systems, and should any damage to these systems occur from Project construction activities, East Tennessee would repair and restore the full function of these systems.

Contamination from spills or leaks of fuels, lubricants, and coolant from construction equipment could affect soils. The effects of such events are typically minor. East Tennessee has developed an SPCC Plan that specifies procedures to minimize accidental spills and to ensure that any spill is quickly contained, cleaned up, and disposed of. In addition, East Tennessee would follow the refueling protocols in our Plan and Procedures.

Based on the information discussed above and with implementation of our recommendations, East Tennessee's E&SCP, SPCC Plan, and our Plan and Procedures, no significant impacts on soil resources would occur as a result of the Project.

2. Groundwater

2.1 Existing Groundwater Resources

The Project area is located in the East Tennessee aquifer system, which occurs in the Valley and Ridge and Blue Ridge physiographic provinces. This aquifer system is composed of formations ranging in age from Precambrian to Mississippian. Limestone,

dolomite, and calcareous shale are the principal water-bearing rocks of the area. Unlike the other regional aquifers, the East Tennessee aquifer system is delineated on the basis of its distinct structural and physiographic setting and not on its stratigraphy. Groundwater occurrence in this aquifer, particularly in the Valley and Ridge province, is unique because the water-bearing formations have been deformed by faulting and folding (USGS, 1986). Water flows through complex geologic structures, resulting in highly variable karst aquifer characteristics with a wide range of groundwater residence times, geochemical characteristics, and aquifer compartmentalization.

Regional lateral flow in the permeable formations does not generally occur. For the most part, circulation is restricted to fractures that have been enlarged by solution. Faults that commonly occur within weak shale beds result in discontinuities that tend to isolate groundwater movement into discrete compartments (USGS 1986). The most important aquifers in the Valley and Ridge province are northeast- to east-trending carbonate rocks. Undifferentiated sedimentary rock aquifers that consist mostly of sandstone and yield moderate volumes of water separate the bodies of carbonate rocks.

The Project would cross the Valley and Ridge Aquifer (a sandstone and carbonate rock aquifer) in Loudon and Monroe Counties, Tennessee. Average groundwater depth in the Project area is within approximately 300 feet of the ground surface. The water moves from the ridges where the water levels are high toward lower water levels adjacent to major streams that flow parallel to the long axes of the valleys. Most of the groundwater is discharged directly to local springs or streams, but some of it moves along the strike of the rocks, following highly permeable fractures, bedding planes, and solution zones to finally discharge at more distant springs or streams. Although fracture zones locally are present in the clastic rocks, the highly permeable zones, which are primarily present in the carbonate rocks, act as collectors and conduits for the water. Based on soil and topographical conditions, the depth of surficial groundwater ranges between 22-66 inches bgs and is spread across approximately 3,000 feet, or 5.6 percent, of the length of the pipeline construction right-of-way.

The groundwater is hard water and typically has a dissolved-solids concentration of 170 milligrams per liter or less. Groundwater wells in the Project area yield anywhere from 1 to 2,500 gallons per minute, and are used for public water supply, domestic and commercial uses, agricultural uses, mining, and thermoelectric power.

No hazardous waste sites, landfills, or other sites with the potential groundwater contamination were identified within 0.25 mile of the Project. If a contaminated or hazardous waste site is encountered during construction of the Project, East Tennessee will stop work activities in the immediate vicinity of the site, notify the appropriate state and federal agencies, and proceed in accordance with those agencies' regulations and East Tennessee's *Waste Management Plan*.

Designated Sole Source Aquifers

The U.S. Environmental Protection Agency (EPA) designates Sole Source Aquifers, which are defined as "an aquifer that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer" (USEPA, 2012). There are no EPA Sole Source Aquifers in the Project area.

Wellhead Protection Areas

Under a 1986 amendment to the Safe Drinking Water Act, each state is required to develop and implement a wellhead protection program in order to identify the land and recharge areas contributing to public supply wells, and prevent the contamination of drinking water supplies. The Act was later updated in 1996 with an amendment requiring the development of a broader-based Source Water Assessment Program, which includes the assessment of potential contamination to both groundwater and surface water through a watershed approach. States assess and delineate groundwater protection areas under a combination of these mandates.

The Loudon Mainline Extension would cross the Loudon Utility Board – Piney Spring Wellhead Protection Area between MPs 8.0-9.7. The wellhead itself is approximately 1,347 feet from the Project construction workspace. This groundwater source, with additional surface water systems, serves a population of over 12,400 in the Project area.

Public and Private Water Supply Wells

Two private water wells are within 150 feet of the Project (table B-3). There are no public water supply wells within 500 feet of the Project.

Table B-3: Private Water Supply Wells Within 150 Feet of the Project

Milepost	County	Distance from Centerline (feet)	Distance from Construction Workspace (feet)
0.35	Monroe	164	96
3.6	Loudon	90	55

Springs

East Tennessee has not identified any springs within 150 feet of the Project.

Impacts and Mitigation

Construction of the pipeline would require trenching and backfilling to a depth of approximately 3 to 9 feet bgs, depending on location. Trenching and backfilling could

potentially cause minor localized fluctuations in groundwater levels and/or increase turbidity within the zone of shallow groundwater adjacent to the trench. Any shallow groundwater disturbance would be temporary and localized to the immediate area of the trenching and backfilling activity and would not affect the overall quality of groundwater in the Project area.

Aquifers generally lie beneath the typical trench excavation depth, but the HDD crossings would be drilled through local aquifers, which could be affected by an inadvertent release of drilling fluids. To minimize the potential of an inadvertent release, we have recommended that East Tennessee use temporary surface casing at each HDD borehole entry and exit locations. (See section B.1.1.)

Surficial groundwater could sustain impacts from changes in overland water flow and recharge caused by clearing and grading of the right-of-way. In forested areas, water infiltration, which is normally enhanced by vegetation, would be reduced until vegetation is re-established. Additionally, near surface soil compaction caused by heavy construction vehicles could reduce the soil's ability to absorb water. Following final grading and in accordance with its E&SCP, East Tennessee would test the soil for compaction, decompact as necessary, and revegetate the construction right-of-way using native and other species recommended by the NRCS or as required in landowner easement agreements. East Tennessee would monitor disturbed areas to determine the post-construction success for two growing seasons.

During construction, trench excavation may intersect the water table, requiring trench dewatering which could affect local water table elevations and result in elevated turbidity in areas of shallow groundwater. However, pipeline construction activities within a particular location are typically completed within several days, and any lowering of localized groundwater from pumping and dewatering is expected to be temporary. East Tennessee proposes to discharge water from dewatering activities into well-vegetated upland areas, or into hay bale structures if vegetation is insufficient to minimize erosion, which would recharge the local aquifer and prevent silt-laden waters from flowing into streams. Implementation of these procedures and use of dewatering structures as applicable should minimize groundwater impacts during dewatering operations.

Spills or leaks of hazardous liquids have the potential for long-term impacts on groundwater resources. Potential spill-related impacts from the construction of the Project would be mainly associated with fuel storage, equipment refueling, and equipment maintenance. To avoid or mitigate such impacts on groundwater, East Tennessee would implement its SPCC Plan that includes preventative measures to avoid spills and leaks, as well as mitigation measures to minimize potential impacts should a spill or leak occur. Upon finalization by the construction contractor, the SPCC Plan would designate refueling areas; spill response procedures, spill response materials, and

training; mitigation measures/response; and hazardous liquids quantities, storage, and disposal. Should a spill occur within the Loudon Utility Board – Piney Spring Wellhead Protection Area, East Tennessee would contact the Loudon Utility Board and local directors of the Tennessee Emergency Management Agency as included in the SPCC Plan.

Because shallow bedrock has been identified along the construction right-of-way, (see section B.1.1 and B.1.2), East Tennessee anticipates blasting would be necessary to construct the Project. In accordance with East Tennessee's *Blasting Plan*, if any water supply wells are identified within 150 feet of a blasting location, East Tennessee has committed to conducting pre- and post-construction monitoring of well yield and water quality, with the landowner's permission, and pre-blast and post-blast inspections. The *Blasting Plan* also includes the methods for determining well yield and spring discharge and the water quality parameters that would be tested.

During blasting, East Tennessee would monitor ground vibrations at the nearest structure or water well that is within 150 feet of the blast site. All blasting would be performed by registered licensed blasters, in accordance with all applicable federal, state and local regulations, and would be monitored by certified blasting inspectors. The contractor would be responsible for supplying explosives and blasting materials that are perchlorate[9]-free in order to eliminate the potential for perchlorate contamination of groundwater. In accordance with East Tennessee's E&SCP, a toll-free landowner hotline would be established for landowners to use in reporting complaints or concerns. In the unlikely event that any water supply well was damaged as a result of blasting, East Tennessee would ensure that a temporary source of water is provided until the damaged water well is restored to its former capacity and quality, that a replacement source is provided, or that the landowner is fairly compensated for the damages. In order to ensure that any impacts on wells are properly mitigated, **we recommend that:**

- **<u>Within 30 Days of placing the facilities in service</u>, East Tennessee should file a report with the Secretary identifying all water supply wells/systems damaged by construction and how they were repaired or replaced. The report should also include a discussion of any other complaints concerning well yield or water quality and how each problem was resolved.**

We believe the implementation of the above construction procedures and mitigation measures would adequately protect groundwater resources, including wells, because disturbances would be temporary, erosion controls would be implemented, and

[9] Perchlorate is a chemical that is used in the manufacture of explosives, among other things. Because of its potential to cause endocrine system and reproductive problems, perchlorate is considered a "likely human carcinogen" by the EPA.

natural ground contours would be restored. Thus, the proposed Project should not result in any significant long-term or permanent impacts on groundwater resources.

3. Surface Water

3.1 Existing Surface Water Sources

The Project is located in the Watts Bar Lake and Lower Little Tennessee Watersheds. As detailed in table B-4, the Project would cross 18 waterbodies. Fifteen waterbodies are ephemeral, which exist for a short period following precipitation or snowmelt. The remaining three (Tellico Lake, the Tennessee River, and one of the tributaries to Clear Prong Creek) are perennial, which have continuous water or flow year-round during years of normal rainfall. In addition, one intermittent waterbody (i.e., has flowing water periods during the wet season [winter-spring] but is normally dry during hot summer months) would be crossed by t an access road via an existing culvert.

East Tennessee anticipates that the 16 ephemeral waterbody crossings would be dry at the time of construction. All are considered minor waterbodies (water's width of 10 feet or less), and East Tennessee would utilize standard upland construction methods, which are described in section A.8.1. The perennial tributary to Clear Prong Creek (also a minor waterbody) would be crossed using either the flume or dam and pump dry ditch crossing method, which are described in section A.8.1. The other two perennial waterbodies – Tellico Lake, which would be crossed twice, and the Tennessee River – are major waterbodies (water width greater than 100 feet) and would be crossed utilizing the HDD method.

TDEC, which is charged with the protection of the chemical, physical, biological, and aesthetic integrity of water resources and aquatic environment of Tennessee, has classified all waterbodies that would be crossed as able to support fish and aquatic life and livestock watering and wildlife. Further, the two major waterbodies (Tellico Lake and the Tennessee River) meet all seven of TDEC's water criteria including: recreation; irrigation; drinking water supply; navigation; and industrial water supply.

The COE has jurisdictional authority pursuant to section 404 of the Clean Water Act, which governs the discharge of dredged or fill material into waters of the United States. East Tennessee identified two waterbodies – the unnamed tributary to the Little Tennessee River at MP 3.7 that would be crossed by a culverted access road, and an unnamed tributary to Clear Prong Creek at MP 6.5 – as subject to COE permit requirements.

A discussion of waterbody crossing methods is included in section A.8.1.

Table B-4: Waterbodies Crossed by the Loudon Mainline Extension					
MP	Waterbody Name	Flow Type [a/]	State Water Quality Classification [b/]	Approximate Crossing Width (feet)	Proposed Construction Method [c/]
0.5	UT to Bat Creek	E	1, 4	8	Upland Construction Crossing [d/]
1.6	UT to Bat Creek	E	1, 4	5	Upland Construction Crossing
2.4 2.7	Tellico Lake [d/]	P	1, 2, 3, 4, 5, 6, 7	900 960	Single HDD crosses both segments
2.8	UT to Bat Creek	E	1, 4	0.5	HDD
2.9	UT to Bat Creek	E	1, 4	3	Upland Construction Crossing [d/]
4.0 4.1	UT to Fork Creek	E	1, 4	2 2	Upland Construction Crossing [d/]
4.6	Tellico Lake [e/]	P	1, 2, 3, 4, 5, 6, 7	600	HDD
4.9	UT to Little Tennessee River	E	1, 4	5	Upland Construction Crossing [d/]
4.9	UT to Little Tennessee River	E	1, 4	5	Upland Construction Crossing [d/]
5.1	UT to Little Tennessee River	E	1,4	2	Upland Construction Crossing
5.7	UT to Clear Prong Creek	E	1, 4	5	Upland Construction Crossing
5.9	UT to Little Tennessee River	E	1, 4	3	Upland Construction Crossing
5.9	UT to Clear Prong Creek	E	1, 4	5	Upland Construction Crossing
6.5	UT To Clear Prong Creek	P	1, 2, 3, 4	10	Dry Ditch Crossing
7.4	UT to Clear Prong Creek	E	1, 4	2	Upland Construction Crossing
8.4	UT to Clear Branch	E	1, 4	4	Upland Construction Crossing
8.6	UT to Clear Branch	E	1, 4	5	Upland Construction Crossing
9.2	UT to Tennessee River	E	1, 4	2	Upland Construction Crossing or Bore
10	Tennessee River	P	1, 2, 3, 4, 5, 6, 7	500	HDD

Notes:

UT: Unnamed Tributary

At MP 3.7, an access road would cross an unnamed intermittent tributary to the Little Tennessee River using an existing culvert. The crossing length would be 2.5 feet.

a/ E= Ephemeral; P = Perennial

b/ Tennessee Department of Environment and Conservation Waterbody Use Classifications:

(1) Fish and aquatic life (4) Livestock watering and wildlife (7) Industrial water supply
(2) Recreation (5) Drinking water supply
(3) Irrigation (6) Navigation

c/ When waterbody crossings are dry at the time of construction and the EI has verified that flow would be unlikely between initial disturbance and final stabilization of the feature, standard upland construction methods can be employed.

d/ Potential blasting locations based on shallow depth to bedrock, as determined by published soil surveys.

e/ Tellico Lake is an impoundment of the Little Tennessee River.

Sensitive Waterbody Crossings

FERC considers sensitive surface waters to include surface waters with impaired water quality, waters containing federally or state-listed threatened or endangered species

or critical habitat, and any waters afforded special national, regional, or state status designations for a variety of other reasons.

Section 303(d) of the Clean Water Act requires all states to submit a list every 2 years for EPA approval of all surface waters in the state for which beneficial uses, such as drinking, recreation, aquatic habitat, and industrial use, are impaired by pollutants. A review of TDEC's 2012 303(d) list and the 305(b) report on the status of the state's water quality reveal that the two largest waterbodies to be crossed by the Project – the Tennessee River and Tellico Lake – have been placed on the list with a Category 5 designation, "waters are impaired or threatened and a Total Maximum Daily Loads[10] is needed." Both waterbodies' listings are based upon polychlorinated biphenyls (PCBs) from contaminated sediment; additionally the Tennessee River has low dissolved oxygen while Tellico Lake contains mercury from atmospheric deposition.

In addition to the TVA's jurisdiction under U.S. Code 831-831dd, the TVA also monitors the water quality of its 31 jurisdictional reservoirs and the health of the aquatic flora and fauna therein. The following five parameters are measured:

- **Dissolved Oxygen** – A good rating means plenty of oxygen is present to support fish and other aquatic life.
- **Chlorophyll** – A measure of algae in the water, a good rating means that algal growth is within the expected range. If levels are too low, the reservoir's food web can be affected; if levels are too high, water treatment costs may increase and oxygen levels in the bottom layer of water may suffer from decaying algae.
- **Fish** – A good rating means there are a large number and good variety of fish species.
- **Bottom dwellers** – A good rating means that there are plenty of aquatic invertebrates such as worms, insects and snails thriving on the reservoir floor.
- **Sediment** – A good rating means sediment is free from PCBs, pesticides, and large concentrations of metals.

When monitoring the water, the TVA takes samples from up to four locations, depending on the reservoir's size:

- **Forebay** – The deep, still water near a dam.

[10] A Total Maximum Daily Load is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that load among the various sources of that pollutant. Pollutant sources are characterized as either point sources that receive a wasteload allocation (such as wastewater treatment facilities and some stormwater discharges that are subject to regulation under the National Pollutant Discharge Elimination System); or nonpoint sources that receive a load allocation, which include all remaining sources of the pollutant as well as anthropogenic and natural background sources.

- **Mid-reservoir** – Location where the transition occurs from a river-like environment to a lake-like one.
- **Embayment** – A large slough or cove.
- **Inflow** – The river-like area at the extreme area at the extreme upper end of a reservoir.

Tellico Lake is downstream of Tellico Reservoir, and the Tennessee River crossing is downstream of the Watts Bar Reservoir. A summary of the TVA's most recent ecological health measurements for each reservoir are provided in table B-5.

Table B-5: Ecological Health Indicators for the Tellico and Watts Bar Reservoirs

Monitoring location	Dissolved oxygen	Chlorophyll	Fish	Bottom life	Sediment
Tellico Reservoir — 2011					
Forebay	Poor	Poor	Good	Poor	Fair
Mid-reservoir	Good	Fair	Good	Poor	Fair
Watts Bar Reservoir — 2012					
Forebay	Poor	Poor	Fair	Fair	Fair
Mid-reservoir	Good	Poor	Fair	Good	Fair
Tennessee River inflow	-	-	Good	Poor	-
Clinch River inflow	-	-	Fair	Fair	-

Notes: - : No measurement taken

Similar to TDEC's assessment of Tellico Lake and the Tennessee River, the TVA's sediment rating of "fair" for both the Tellico and Watts Bar Reservoirs is based on the detection of PCBs and arsenic concentrations slightly above suggested background levels, which occurs naturally in the local soils and sediments generally near suggested background levels. The TVA's sediment testing also revealed the presence of the pesticides chlordane and aldrin. Although banned in the 1970s and 1980s, these pesticides continue to be sporadically detected due to their persistence in the environment.

The Project would not cross any rivers in the Nationwide Rivers Inventory, any national wild and scenic rivers, or any included in the state's Scenic Rivers Program.

Surface Water Intakes and Source Water Protection Areas

Source Water Protection Areas are enforced by TDEC in an effort to prevent contamination of groundwater sources as well as surface water sources, including streams, reservoirs, and lakes. In Tennessee, delineation of Source Water Protection Areas for public water systems using surface water includes the portion of the watershed area upstream of the water intake using time of travel (the time it takes for water to travel a given distance) and a 1,000-foot corridor on either side of the stream. According to

TDEC's Division of Water Pollution Control, there is one source water intake approximately 0.5 mile downstream of MP 10.0 on the Tennessee River that is used by Tate & Lyle for process water. The Tennessee River is considered the Source Water Protection Area.

Impacts and Mitigation

Pipeline construction could affect surface waters by clearing and grading stream banks, in-stream trenching, trench dewatering, or backfilling. These activities could affect waterbodies by changing the existing aquatic habitat, by increasing the rate of in-stream sediment loading, by increasing water turbidity levels (water cloudiness caused by suspended sediments), by reducing dissolved oxygen concentrations, or by leaking construction-related chemicals into the waterbody, such as fuels and lubricants that could contaminate and degrade downstream water quality and aquatic habitat.

Additionally, ground disturbing activities expose soils, which can wash into nearby waterbodies and increase the water's sediment loads. In-water work could move streambed sediments into different contours, which could cause a change in water current flow, stream channel locations, and floodplain structure.

The degree of impact from Project construction would depend on a number of factors including the size of the waterbody, flow at the time of crossing, frequency of rain events during construction, crossing method and duration, sediment loads in the waterbody, stability of the stream bed prior to construction, and the type of substrate in the streambed.

East Tennessee anticipates that most or all of the ephemeral waterbodies would be dry at the time of construction. If that is the case, East Tennessee would use standard upland construction methods to cross the features. However, if water is flowing at the time of construction, East Tennessee would reduce impacts on water quality by isolating the work area from flowing water by using either the dam and pump or flume crossing dry ditch method as described in section A.7.1.

East Tennessee would minimize potential adverse impacts on waterbodies using construction procedures specified within its E&SCP, which incorporates our Plan and Procedures. Measures include minimizing clearing of streamside vegetation, installing and maintaining temporary and permanent erosion controls, and minimizing of the duration of in-stream construction. Near perpendicular crossings are proposed for waterbodies.

For the one perennial stream and any other waterbody that has flow at the time of construction, disruption to water flow would be limited to only that necessary to construct the crossing, reducing the suspension and deposition of sediments downstream of the

crossing location. In accordance with its E&SCP, East Tennessee would maintain adequate flow rates to limit the potential effects to aquatic life. Temporary equipment crossing bridges would be installed to allow equipment access across waterbodies. East Tennessee would implement its SPCC Plan to prevent accidental leaks or spills of materials that could affect surface water and to ensure that inadvertent spills are contained, cleaned up, and disposed of in an appropriate manner.

As identified in table B-4, East Tennessee anticipates that blasting would be required at five crossings that East Tennessee anticipates would be dry at the time of construction. To facilitate planning for blasting activities for waterbody crossings, rock drills or test excavations may be used in the waterbody (or dry channel) to evaluate the presence of rock in the trench line. In accordance with East Tennessee's *Blasting Plan*, the 24-hour construction work window within the waterbody would not start until the blast rock is removed from the trench line. East Tennessee would apply all E&SCP provisions as well as any Project-specific permit conditions during blasting operations. During restoration, stream bed and bank contours would be restored to pre-construction conditions and the banks would be stabilized and revegetated as soon as possible after construction activities have been completed.

East Tennessee would cross three waterbodies using the HDD approach, also described in section A.8.1. This method would avoid impacts on the waterbodies unless an inadvertent release of drilling mud occurred in or near the waterbody. An inadvertent release could discharge drilling mud into the water; this discharge could affect aquatic species by increasing turbidity, smothering eggs and suspension feeders, or clogging fish gills. Any contaminated sediments in either the Tennessee River or Tellico Lake are not expected to be disturbed due to utilizing the HDD crossing method.

HDD entry and exit point drilling activities have the highest chance of causing an inadvertent release. East Tennessee would reduce potential impacts of inadvertent releases by siting the HDD staging areas (which include the entry and exit points) away from riparian areas and by following the measures identified in its *HDD Inadvertent Returns Plan* (Appendix C). Some of these measures include visually inspecting the drill path for evidence of a release, monitoring of the drilling mud pressures and return flows, and having spill containment equipment on site, including portable pumps, hand tools, hay bales, and silt fencing.

3.2 Hydrostatic Test Water

To ensure the structural integrity of the Project, East Tennessee would hydrostatically test all piping in accordance with DOT regulations prior to placing the Project in service. No biocides or other chemicals would be added to the test water. East Tennessee proposes to use approximately 340,000 gallons of water to hydrostatically test the Loudon Mainline Extension and 5,000 gallons to test aboveground facility piping.

East Tennessee anticipates acquiring test water from municipal sources, Tellico Lake, Clear Pong Creek, and/or the Tennessee River. Depending on weather and site conditions at the time of construction, approximately 250,000 gallons of water may also be needed for dust control.

In addition to hydrostatic testing, HDDs also use a large volume of water. The HDD method uses this water to create clay and water slurry for drilling fluid in order to reduce the friction between the machinery and the rock during the drilling process. East Tennessee estimates that it would use approximately 110,000 gallons of water for the three HDD crossings.

East Tennessee has stated that final volume of water needed and specific withdrawal and discharge locations would be included in a Hydrostatic Testing Plan, which would be submitted with its Implementation Plan for FERC review and approval prior to construction.

East Tennessee would implement measures outlined in its E&SCP to minimize impacts on waterbodies during water withdrawals, including:

- screening the intake hose to minimize the potential entrainment of fish;
- maintaining adequate flow rates to protect aquatic life, provide for all waterbody uses, and provide for downstream withdrawals of water by existing users; and
- locating the test manifolds outside wetlands and riparian areas to the maximum extent possible.

Upon completion of each test section, the hydrostatic test water would be sampled and reported in accordance with applicable state permit requirements and then discharged either in a well vegetated upland area or into an energy dissipation device to minimize erosion and sedimentation in compliance with the Project E&SCP, SPCC Plan, and all applicable state and federal regulations.

Based on our recommendations in section B.1.1 and East Tennessee's implementation of its E&SCP, SPCC Plan, *Blasting Plan*, *Waste Management Plan*, and *HDD Inadvertent Returns Plan*, we conclude that impacts on surface water resources would be minor and temporary.

4. Vegetation and Wildlife

4.1 Existing Vegetation

The Project would be located in the Northern Ridge and Valley Province of Tennessee. Because much of this area lies in the rain shadow of the Allegheny Mountains, vegetation reflects drier conditions, and forests are dominated by oak,

hickory, pine, and some northern hardwoods (USDA, 1994). Construction and operation of the Project would affect upland forest, scrub land (including existing right-of-way), and open land (pastures, residential lands, and agricultural fields). Impacts on industrial/commercial, agricultural, and residential lands are discussed in section B.6.

Upland Forest

The dominant upland forest canopy species include: red oak, white oak, red maple, red ash, Eastern red cedar, post oak, Virginia pine, and black cherry. Sub-canopy species observed include ironwood, Autumn olive, and sassafras. Herbaceous species observed in the forested understory include Bermuda grass, Bahia grass, Canada goldenrod, bluegrass, greenbrier, blackberry, Cleaver's bedstraw, Jimson weed, burdock, rough cocklebur, Canada thistle, tick-trefoil, and running cedar. A pine plantation is present between MP 6.0 – MP 7.0.

Scrub Lands

Dominant vegetation in scrub lands of the Project area include: multiflora rose, Allegheny blackberry, black raspberry, eastern red cedar, winged sumac, smooth sumac, goldenrod, Japanese honeysuckle, black locust, and poison ivy. Saplings of canopy species such as red maple and box elder are also present within these areas.

Open Land

Vegetation in pastures and hayfields used for grazing by livestock includes Bahia grass and Bermuda grass. Agricultural fields are rotated between corn and soybeans. Vegetation on residential lands consists primarily of lawns and other landscaped vegetation.

Sensitive Vegetation Communities

The Project would not cross any sensitive vegetation communities.

Invasive Plants

Invasive species can out-compete and displace native plant species, thereby negatively altering the appearance, composition, and habitat value of affected areas. Table B-6 lists invasive species that have been identified in the Project area. During surveys, East Tennessee identified Chinese privet as an occasional component of the sub-story in forested areas at MP 2.3 and MP 2.5, which would be within the uncleared area of the first HDD that is between MP 2.18-MP 2.84.

Table B-6: Invasive Species In the Project Area		
Type	**Name**	**Threat Level** [a/]
Tree	mimosa (*Albizia julibrissin*)	Significant Threat (Rank 2)
Shrub	common St. Johnswort (*Hypericum perforatum*)	Severe Threat (Rank 1)
Shrub	Chinese privet (*Ligustrum sinense*)	Severe Threat (Rank 1)
Forb/Herb	spotted knapweed (*Centaurea stoebe*)	Significant Threat (Rank 2)
Forb/Herb	curly dock (*Rumex crispus*)	Highly aggressive [b/]
Forb/Herb	gray chickweed (*Cerastium brachypetalum*)	Invasive [c/]

Notes:
a/ TNEPPA 1996:
Severe Threat (Rank 1) – Exotic plant species which possess characteristics of invasive species, spread easily into native plant communities, and displace native vegetation. Includes species which are or could become widespread in Tennessee.
Significant Threat (Rank 2) – exotic plant species which possess some invasive characteristics, but have less impact on native plant communities. These plants may have the capacity to invade natural communities along disturbance corridors, or to spread from stands in disturbed sites into undisturbed areas, but have fewer characteristics of invasive species than Rank 1 above.
b/ Natural Biodiversity 2015; Invasive Plant Atlas of the United States 2015
c/ USDA 2015b

Impacts and Mitigation

The Project would temporarily impact 100.5 acres of vegetation during construction and permanently impact 36.5 acres during operation. Table B-7 summarizes the temporary construction and permanent operational impacts of the Project on each vegetation community type.

Table B-7: Summary of Project Vegetation/Habitat Impacts (acres)												
	Upland Forest		**Scrub Land**		**Open Land**		**Agricultural Land**		**Residential**		**Project Subtotal**	
Pipeline Facilities	**C**	**O**	**C**	**O**	**C**	**O**	**C**	**O**	**C**	**O**	**C**	**O**
PE	11.97	11.97	0.49	0.49	0.95	0.95	22.58	22.58	0.36	0.36	36.35	36.35
TWS	16.43	0	0.62	0	3.05	0	20.64	0	0.29	0	41.03	0.00
ATWS	7.99	0	0.03	0	0.66	0	4.46	0	0.83	0	13.97	0.00
TAR	0.52	0	0	0	0.22	0	1.07	0	0.1	0	1.91	0.00
PAR	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Pipeline Facilities Subtotal	**36.91**	**11.97**	**1.14**	**0.49**	**4.88**	**0.95**	**48.75**	**22.58**	**1.58**	**0.36**	**93.26**	**36.35**
Hwy 322 Wareyard	0	0	0	0	0	0	7.15	0	0	0	7.15	0.00
Aboveground Facilities	0.01	0.01	0	0	0	0	0.13	0.13	0	0	0.14	0.14
Project Total	**36.92**	**11.98**	**1.14**	**0.49**	**4.88**	**0.95**	**56.03**	**22.71**	**1.58**	**0.36**	**100.55**	**36.49**

Notes:
PE=Permanent Easement, TWS=Temporary Workspace, ATWS=Additional Temporary Workspace, TAR=Temporary Access Road, PAR=Permanent Access Road; C=Construction; O=Operation

Construction activities would include the cutting, clearing, and removal of existing vegetation, which could result in increased soil erosion, changes to surface water flow and drainage, increased potential for the introduction and establishment of invasive and noxious weeds, and a local reduction in available wildlife habitat. The degree of impact would depend on the type and amount of vegetation affected, the rate at which the vegetation would regenerate after construction, and the frequency of vegetation maintenance conducted during operation.

A commenter expressed concern about the effects of the Project on trees and the potential for deforestation. As shown in table B-7, 36.9 acres of upland forest would be cleared for construction, with about 12 acres converting to permanent right-of-way. Forested upland areas within the construction workspace would experience long-term impacts, as regrowth of the 36.9-acre forested area to pre-construction condition would take 20 to 30 years for many species, such as Virginia Pine. Hardwood species, such as oaks, could take more than 50 years to reach maturity. However, given the amount of upland forest in the surrounding area, the already existing patchwork of forest and open land (e.g., from existing rights-of-way, agricultural parcels, residential lots, open fields, etc.), and the fact that most forest clearing associated with the Project would be expansion of an already cleared pipeline right-of-way, we do not consider that the impacts associated with the Project constitute "deforestation" or otherwise represent a significant impact.

In open and scrub lands, vegetation would be removed from the construction area; however, these impacts are expected to be short-term. Following cleanup and reseeding of the right-of-way, herbaceous vegetation would typically regenerate quickly. Impacts on these cover types during facility operation would be minor because vegetation in the right-of-way would be left to recover and would not be substantially altered by occasional right-of-way maintenance.

Impacts of the Project on agricultural land are expected to be minor and short-term. Short-term impacts on agricultural areas include the loss of standing or row crops within the construction work area and disruption of farming operations for the growing season during construction. East Tennessee would follow the measures outlined in its E&SCP to minimize these impacts. Specific measures include testing the topsoil and subsoil for compaction at regular intervals in areas disturbed by construction and strictly controlling equipment traffic on agricultural land. East Tennessee would segregate topsoil to a maximum depth of 12 inches from either the pipeline trench and subsoil storage area, or the full construction right-of-way, as specified in landowner agreements. Topsoil would be stored separately from the subsoil for replacement after backfilling the trench and the soil decompacted as described in section A.8.1.

Approximately 65 percent of the Loudon Mainline Extension would be within and overlap with East Tennessee's existing Loudon-Lenoir City Lateral Line 3218D-100,

minimizing the amount of construction workspace needing to be cleared of vegetation. Herbaceous vegetation would be cut as close to the ground surface as feasible, leaving the root systems intact to facilitate natural revegetation. Within upland forests, mature tree stumps would either be removed or ground down to a level that would allow for safe equipment access and operation. Additionally, East Tennessee would implement measures outlined in its E&SCP to minimize or avoid impacts during construction and aid in the restoration of disturbed areas. These measures would include:

- restricting construction activities to approved work areas;
- installing temporary erosion controls (e.g., silt fence) immediately after initial disturbance and properly maintaining them until permanent erosion controls are installed and restoration is complete; and
- reseeding temporary work areas and conducting post-construction monitoring for at least 2 years in uplands to ensure successful revegetation.

In accordance with seed recommendations from the U.S. Fish and Wildlife Service (FWS), NRCS, and TDEC, East Tennessee has developed a *Seeding and Soil Amendment Requirements Plan* (Appendix I) requiring soil testing to determine fertilization and lime application rates as well as warm-season native grasses to ensure revegetation last beyond the first two growing seasons.

In accordance with its *Noxious Weed Management Plan*, East Tennessee would also implement measures to reduce the spread of exotic, invasive, and noxious plant species pre-construction and post-operation.

Pre-Construction:

- mechanical removal of the invasive species during clearing and grubbing;
- burning of woody vegetation; and
- reseeding with native and other vegetation, according to the seed mix developed in consultation with the FWS, NRCS, and TDEC (see Appendix I).

Post-Operation:

- monitor the pipeline right-of-way and proposed facilities for noxious weed infestations in accordance with our Plan and Procedures; and
- treat as needed with a foliar-based herbicide.

East Tennessee would monitor disturbed areas for at least 3 years following construction to determine if invasive species or noxious weeds are becoming established. If species or colonies of species are more abundant than in nearby undisturbed areas, East Tennessee would spot-eradicate invasive species by hand-pulling or using an approved herbicide. East Tennessee would consult with the appropriate agency before using the

herbicide. Additional measures to prevent the spread of invasive species may be included in right-of-way agreements between landowners and East Tennessee.

Therefore, we conclude that vegetation impacts associated with the construction and operation of the Project would be minimized by implementing the construction, restoration, and mitigation measures as outlined in East Tennessee's E&SCP and *Noxious Weed Management Plan*.

4.2 Fisheries

All of the waterbodies in the project area are warmwater fisheries. As discussed in section B.3, most of the waterbodies crossed by the Project are ephemeral (snowmelt or rain-related water flow), and dry for much of the year. Thus, even though TDEC classifies these waterbodies as warmwater fisheries, they do not actively support fish populations year-round. Three waterbodies are perennial or open water that provide year-round fishery habitat.

Warmwater habitat is generally characterized as slower-moving bodies of water, and the streams are less oxygenated compared to coldwater waterbodies. Recreational fishing is prevalent in the Project area. Game fish in the Project area include: longnose gar, channel catfish, smallmouth bass, black crappie, river carpsucker, bluegill, redear sunfish, and bigmouth buffalo. The Tennessee Wildlife Resource Agency (TWRA) stocks Tellico Lake and the Watts Bar Reservoir upstream of the Tennessee River for recreational fishing (table B-8).

Table B-8: Fish Stocking on Waterbodies Crossed by the Project

Waterbody	Species	Individuals Released	Release Date
Tellico Lake	Walleye	63,200	5/15/2015
Watts Bar Reservoir (Tennessee River)	Walleye	95,405	5/18/2015
	Walleye	137,104	5/20/2015
	Florida Largemouth Bass	66,180	5/26/2015
	Florida Largemouth Bass	49,749	5/31/2015
	Florida Largemouth Bass	71,116	6/2/2015
	Striped Bass	6,620	7/10/2015
	Striped Bass	32,798	7/13/2015
	Striped Bass	14,987	7/14/2015
	Striped Bass	37,358	7/16/2015
	Striped Bass	22,550	7/17/2015
	Blacknose Black Crappie	26,283	11/19/2015

Source: TWRA 2015a

The TVA maintains a program to examine contaminants in fish from TVA reservoirs and their major tributary streams. The data collected from this program are

distributed to the TWRA, which is responsible for placing or removing fish tissue consumption advisories on those bodies of water. The current TWRA Fish Consumption Advisory for the full extent of Tellico Lake in Loudon and Monroe Counties is to avoid consuming catfish due to PCBs and mercury. For the Loudon County Tennessee River portion of the Watt Bar Reservoir, the TWRA Advisory recommends that catfish, striped bass, and hybrid striped bass not be eaten. Additionally, TWRA has listed a precautionary advisory[11] for white bass, sauger, carp, smallmouth buffalo, and largemouth bass.

Fisheries of Special Concern

According to the TWRA, three state and federally threatened and endangered species have been documented near East Tennessee's proposed crossing location of the Tennessee River: pink mucket, orangefoot pimpleback, and the snail darter (TWRA 2015b). These species are further discussed in section B.6.1.

Impacts and Mitigation

The Project would potentially affect 19 freshwater waterbodies, 18 of which would be crossed by the pipeline (see table B-4). Waterbody crossing methods are described in detail in section A.8.1. To reduce potential impacts on fisheries, all waterbody crossings (i.e., channels with discernable flow at the time of crossing)[12] would adhere to construction timing windows and mitigation measures in East Tennessee's E&SCP, such as restoration, bank stabilization, and revegetation. In-stream construction for warmwater fisheries would occur between June 1 and November 30.

Streams that are dry at the time of crossing would be crossed using the upland construction methods in accordance with the FERC Procedures and applicable federal and state permit conditions. East Tennessee proposes to cross all minor waterbodies with discernible flow at the time of crossing using either the flume or dam-and-pump method. While the dam-and-pump crossing method would reduce turbidity and downstream sedimentation during construction, minor aquatic habitat alteration could still occur, primarily because species cannot travel through the working area. Temporary impediments, changes to behavior, loss of habitat, and/or the alteration of water quality could increase the stress rates, injury, and/or mortality experienced by fish. Generally, the flume crossing method minimizes the potential for sedimentation downstream, reducing the risk for the mortality of fish species during construction, and allows species to travel through the flume, if able.

[11] Precautionary Advisory - Children, pregnant women, and nursing mothers should not consume the fish species named. All other persons should limit consumption of the named species to one meal per month.

[12] We note that most of these channels are expected to be dry at the time of crossing and thus not subject to waterbody-related restrictions or special measures.

East Tennessee has proposed to use the HDD method to cross the two perennial waterbodies (Tellico Lake and the Tennessee River) and one ephemeral unnamed tributary to Bat Creek, which if successful, should avoid impacts on fisheries. In the event of an inadvertent release of drilling fluid into the waterbodies, suspended sediment and turbidity caused by the clay mixture could affect oxygen exchange over gills, resulting in weakened individuals or mortality. To prevent and control inadvertent releases of drilling fluids, East Tennessee would implement its *HDD Inadvertent Returns Plan*. This plan includes measures to monitor the drilling operation and drill path to identify and minimize the potential for inadvertent returns, minimize the duration of any releases that occur, and contain and clean up any spills.

However, we note that given the prevalence of mature karst geological in the Project area, there is a higher than average probability of an inadvertent release of drilling fluids during HDD construction that could affect fish. Given that the TWRA fish stocking of Tellico Lake and Watts Bar Reservoir, which is upstream of the proposed Tennessee River crossing, generally occurs in the spring as does most natural spawning, if the HDD crossing started in the early summer, an inadvertent release of drilling fluids could have a deleterious effect on both the stocked and natural fisheries. Additionally, an increase in the amount of water within the reservoir would increase the chances of a successful HDD crossing, and based on our discussion with TVA staff, the reservoirs would be full at the height of the summer. Therefore, **we recommend that:**

- **East Tennessee should conduct HDD construction across Tellico Lake and the Tennessee River between July 1-November 30.**

Based on the expected presence of shallow bedrock, East Tennessee anticipates that blasting may be required at the following five tributary locations: MPs 0.5, 2.9, 4.0/4.1, 4.9 and 4.9 that East Tennessee anticipates would be dry at the time of construction (see table B-4). However, it is possible that blasting could occur when there would be flow within a waterbody. In that event, potential adverse effects of in-water blasting include direct mortality of organisms in the immediate vicinity of the blast, reduced macroinvertebrate prey base, alteration of substrate characteristics, and loss of large woody debris and other stream structures. To mitigate for the potential effects of blasting, East Tennessee would implement the measures in its *Blasting Plan* such as using delays and stemming to dampen the shock wave. Prior to any blasting, preparation of the trench and test drilling prior to blasting would likely displace most aquatic organisms in the vicinity of the blast site. In accordance with its *Blasting Plan*, East Tennessee would remove debris so as to not interfere with downstream flow.

One access road associated with the Project would cross an intermittent stream that may support fish. However, this road is pre-existing and has a culvert that is passable by fish; therefore, East Tennessee's proposed use of the access road would not

affect fish. No aquatic habitats would be affected by construction or operation of the aboveground facilities.

Water withdrawals from waterbodies for hydrostatic testing could affect fisheries by entraining small fish and larvae during withdrawal. However, East Tennessee, in accordance with its E&SCP, would withdraw water through a screened intake to prevent fish entrainment. East Tennessee has stated that the final volumes, sources, and withdrawal and discharge locations for hydrostatic testing would be included in a Hydrostatic Testing Plan, which we will review prior to construction. Following hydrostatic testing and in accordance with its E&SCP, East Tennessee would discharge the used water into well-vegetated upland areas through an energy dissipation device and away from waterbodies and wetlands to prevent erosion, sedimentation, or excessive flow into a waterbody.

To minimize impacts on fisheries and aquatic resources from spills of hazardous materials, East Tennessee would implement its SPCC Plan that includes preventative measures to avoid spills and leaks, as well as the mitigation measures to minimize potential impacts should a spill or leak occur.

Based on the minimization measures proposed by East Tennessee, the temporary nature of impacts on aquatic resources, and our recommendation to conduct HDD construction across Tellico Lake and the Tennessee River between July 1-November 30 and to case the first 60 feet of the drill (see section B.1.1), we conclude that impacts on aquatic resources from the Project would be minor.

4.3 Wildlife Resources

The Project would cross various habitat types including forested areas, shrub and open lands, wetlands/open water, industrial/commercial land, and residential land. Residential and commercial landscaped areas generally provide low habitat value, but may still provide habitat for common wildlife species that are adapted to human disturbance such as house finch, mourning dove, rabbit, and raccoons. Table B-9 lists typical wildlife species in the Project area by habitat.

Forested upland habitat is primarily comprised of hardwood species such as oaks, softwood species such as red maple and eastern red cedar, and coniferous species such as Virginia pine. These forest types provide food, cover, and nesting habitat for various bird species and larger mammals such as white-tailed deer and opossum. Organic material on the forest floor provide food and shelter for various invertebrates, reptiles, amphibians, and rodents such as gray squirrel and other small species.

Open and shrub lands, which include agricultural lands and previously disturbed areas such as maintained rights-of-way, are comprised of grasses, herbs, and shrubs.

Open and shrub lands provide food, cover, and nesting habitat for a variety of wildlife species including eastern cottontail, gray squirrel, and Virginia opossum. Edges, where natural habitat lay adjacent to developed or maintained areas, also create habitat for certain species for food and nesting and allow for travel between other habitats. Species that use edge habitat include white tailed deer, coyote, and American robin.

Table B-9: Typical Wildlife Species in the Project Area and Their Associated Habitats

Species	Scientific Name	Upland Forest	Shrub/ Open Lands	Open Water Areas
Amphibians				
American toad	*Anaxyrus americanus*	X	X	
Bullfrog	*Lithobates catesbeianus*			X
Northern cricket frog	*Acris crepitans*		X	X
Pickerel frog	*Rana palustris*			X
Upland chorus frog	*Pseudacris feriarum*			X
Reptiles				
Black racer	*Coluber constrictor*	X	X	
Common garter snake	*Thamnopsis sirtalis*	X	X	
Copperhead	*Agkistrodon contortrix*	X	X	
Eastern fence lizard	*Sceloporus undulates*	X		
Common snapping turtle	*Chelydra serpentine*			X
Eastern box turtle	*Terrapene carolina*	X	X	
Timber rattlesnake	*Crotalus horridus*	X		
Birds				
American Robin	*Turdus migratorius*	X	X	
Blue jay	*Cyanocitta cristata*	X		
Northern cardinal	*Cardinalis cardinals*	X		
Killdeer	*Charadrius vociferous*	X	X	
Mammals				
American beaver	*Castor canadensis*	X		X
Coyote	*Canis latrans*	X	X	
Eastern chipmunk	*Tamias striatus*	X	X	
Eastern cottontail	*Sylvilagus floridanus*	X	X	
Gray squirrel	*Sciurus carolinensis*	X		
Muskrat	*Ondatra zibethicus*			X
Raccoon	*Procyon lotor*	X		
Virginia opossum	*Didelphis virginiana*	X	X	
White-tailed deer	*Odocoileus virginiaus*	X	X	

Open water areas in the Project area include adjacent ponds and waterbodies that provide aquatic and riparian wildlife habitat for amphibian, reptile, and mammal species.

Managed and Sensitive Wildlife Areas

The Project would not cross any managed or sensitive wildlife areas. The closest such area is the Tellico Lake Wildlife Management Area – Tellico West Industrial Park Unit, which is managed by the TWRA, and is within 1 mile of Project construction workspace.

Impacts and Mitigation

Construction and operation of the Project would result in short- and long-term impacts on wildlife. Impacts would vary depending on the specific habitat requirements of the species in the area and the vegetation cover crossed by the right-of-way. Potential short-term impacts on wildlife include the displacement of individuals from construction areas, which could cause wildlife to expend energy to find alternative habitats and potentially reduce foraging or breeding success. Small, less mobile mammals, reptiles, and amphibians could experience direct mortality as they may be unable to leave the construction area or leave quickly enough. Long-term impacts would include conversion of forested habitats to cleared areas and maintained right-of-way, and periodic disturbance of wildlife during operational maintenance. Altered habitat and periodic disturbance could also increase wildlife mortality, injury, and stress.

Fragmentation of forested areas is defined as the breaking up of contiguous areas of vegetation or habitat into smaller patches. These smaller patches create edges within a forest that result in changes to the microclimate (e.g., wind, humidity, and light) that in turn result in changes to vegetation, including changing the species composition with the adjacent forest or increasing invasion by invasive species. Such changes may curtail movement of species between adjacent forest blocks, increase predation, and decrease reproductive success for some species. We note that 65 percent of the Project would be collocated with East Tennessee's existing Loudon-Lenoir City Lateral, which was originally sited through areas of contiguous forest uplands and for which East Tennessee currently maintains a 50-foot-wide operational right-of-way. For the proposed Project, 36.9 acres of upland forest would be affected during construction and 11.9 acres during operation, with the operational right-of-way maintained as early successional habitat[13]. The operational right-of-way for the two collocated pipelines would be 50 feet wide. Therefore, while the Project would widen existing fragmented forest areas during construction, over time 25 acres would revert to upland forest, with the Project only impacting 11.9 acres during operation.

[13] Early successional habitat consists of vigorously growing grasses, forbs, shrubs, and trees which provide excellent food and cover for wildlife. Examples of early successional habitats include weedy areas, grasslands, old fields or pastures, shrub thickets (e.g. dogwood or alder), and young forest (NRCS 2012).

Construction of the Project would also affect 4.8 acres of open land and 1.4 acres of shrub land, which would revert to its original vegetation cover during operation. To minimize overall impacts on vegetation, East Tennessee would implement measures in its E&SCP, including:

- restricting maintenance clearing to August 2 through April 14 to avoid impacts on nesting birds; and
- stabilizing and revegetating affected lands with seed mixes containing native species, as approved by federal agencies and landowners.

During the scoping period, one landowner expressed concern that the Project would cause the area's abundant bird and wildlife populations to leave if the construction right-of-way is cleared of trees. Although individuals of some wildlife species would be affected and temporarily displaced by the Project, most of the impacts on wildlife would be short term and limited mostly to the construction period. Areas adjacent to the Project site provide similar and ample habitats for displaced wildlife during construction and operation of the Project facilities.

Based on the extent of collocation with existing right-of-way, the presence of similar habitats adjacent to and in the vicinity of construction activities, and the implementation of minimization measures, we conclude that construction and operation of the Project would not have population-level or significant negative impacts on wildlife.

4.4 Migratory Birds

Migratory birds are species that nest in the United States and Canada during the summer and then migrate to and from tropical regions of Mexico, Central and South America, and the Caribbean for the nonbreeding season. Migratory birds are protected under the Migratory Bird Treaty Act (16 U.S. Code 703-711); bald and golden eagles are additionally protected under the Bald and Golden Eagle Protection Act (16 U.S. Code 668-668d). Executive Order 13186 (66 Federal Register 3853) directs federal agencies to identify where unintentional take is likely to have a measurable negative effect on migratory bird populations and to avoid or minimize adverse impacts on migratory birds through enhanced collaboration with the FWS.

Executive Order 13186 was issued, in part, to ensure that environmental analyses of federal actions assess the impacts of these actions/plans on migratory birds. It also states that emphasis should be placed on species of concern, priority habitats, and key risk factors. On March 30, 2011, the FWS and the Commission entered into a Memorandum of Understanding (MOU) that focuses on avoiding or minimizing adverse impacts on migratory birds and strengthening migratory bird conservation through enhanced collaboration between the Commission and the FWS. This voluntary MOU

does not waive legal requirements under the Migratory Bird Treaty Act, the Endangered Species Act (ESA), the NGA, or any other statues, and does not authorize the take of migratory birds.

As shown in table B-10, the Project would be within Region 28 (Appalachian Mountains) of the FWS Birds of Conservation Concern 2008 List and potentially affect 25 species, including the bald eagle and golden eagle, which are also protected under the Bald and Golden Eagle Protection Act. One landowner commented that a bald eagle was seen along Bat Creek and Tellico Lake in the 2014-2015 timeframe. East Tennessee conducted field surveys in the same area for bald eagle nests in September-October 2014 and did not identify any bald eagles or their nests.

Table B-10: Birds of Conservation Concern Potentially Occurring in the Vicinity of the Project

Common Name	Scientific Name	State Listed Species	Nesting Habitat
Bald eagle	(*Haliaeetus leucocephalus*)	D	tree
bewick's wren	(*Thryomanes bewickii*)		tree
black-capped chickadee	(*Poecile atricapillus*)		tree
blue-winged warbler	(*Vermivora cyanoptera*)		ground nesting
Canada warbler	(*Cardellina canadensis*)		ground nesting
cerulean warbler	(*Setophaga cerulea*)	D	tree
Golden eagle	(*Aquila chrysaetos*)	T	tree
golden-winged warbler	(*Vermivora chrysoptera*)	D	ground nesting
Henslow's sparrow	(*Ammodramus henslowii*)		ground nesting
Kentucky warbler	(*Geothlypis formosa*)		ground nesting
Louisiana waterthrush	(*Parkesia motacilla*)		ground nesting
loggerhead shrike	(*Lanius ludovicianus*)	D	ground nesting
northern saw-whet owl	(*Aegolius acadicus*)	T	tree
olive sided flycatcher	(*Contopus cooperi*)		tree
peregrine falcon	(*Falco peregrinus*)		cliff
prairie warbler	(*Setophaga discolor*)		shrub
red-headed woodpecker	(*Melanerpes erythrocephalus*)		tree
rusty blackbird (nb)	(*Euphagus carolinus*)		tree
sedge wren (nb)	(*Cistothorus platensis*)		shrub
Swainson's warbler	(*Limnothlypis swainsonii*)	D	shrub
red crossbill	(*Loxia curvirostra*)		tree
upland sandpiper	(*Bartramia longicauda*)		ground nesting
whip-poor-will	(*Antrostomus vociferus*)		ground nesting
wood thrush	(*Hylocichla mustelina*)		tree
worm-eating warbler	(*Setophaga cerulea*)		ground nesting
yellow-bellied sapsucker	(*Sphyrapicus varius*)	D	tree

Notes:
nb: nonbreeding in this Bird Conservation Region
D: Tennessee State Deemed in Need of Management; T: Tennessee State Threatened

The primary concern for migratory birds is mortality of eggs and/or young, as mature birds generally avoid active construction. Tree clearing and ground disturbing activities could cause disturbance during critical breeding and nesting period, potentially resulting in the loss of nests, eggs or young birds. In addition, forest fragmentation could increase predation, competition, and reduce nesting and mating habitat for migratory and ground nesting birds. To minimize disturbance during migratory bird critical nesting periods (generally April 1-August 31), East Tennessee has proposed to conduct all tree clearing activities prior to March 31, which would avoid direct impacts on tree nesting birds. Tree clearing would affect 36.9 acres. The proposed construction schedule (March through August) would directly affect ground and shrub nesting species on 6.0 acres of open and shrub lands. The FWS stated in its October 13, 2015 letter that East Tennessee has agreed "to notify the Service should it later be determined [that] any aspect of construction of the pipeline could threaten to kill or injure migratory birds, or kill, injure, or harass bald and golden eagles."

To minimize impacts on shrub and ground-nesting birds during the operational life of the Project, East Tennessee would not perform route vegetation maintenance clearing during the general nesting season of April 15-August 1, in accordance with our Plan and FWS guidance.

Based on the extent of collocation with existing right-of-way, the presence of similar habitats adjacent to and in the vicinity of construction activities, adherence to FWS guidelines, and the implementation of impact minimization measures, we conclude that construction and operation of the Project would not have population-level or significant negative impacts on migratory birds.

5. Threatened, Endangered, and Other Special Status Species

5.1 Federally Listed Species

Special status species are those species for which state or federal agencies afford an additional level of protection by law, regulation, or policy. Included in this category are federally listed species that are protected under the ESA or are proposed or candidate for such listing by the FWS, and those species that are state-listed as threatened, endangered, or otherwise considered sensitive.

Section 7 of the ESA ensures that any actions authorized, funded, or carried out by a federal agency would not jeopardize the continued existence of a federally listed threatened or endangered species or any of its designated critical habitat. The FERC, as the lead federal agency, is required to consult with the FWS to determine if designated critical habitat or federally listed species could be affected by the Project.

Typically, the FERC must prepare a biological assessment for any federally listed species or designated critical habitat areas that could be affected. If the FERC determines that the proposed action would likely adversely affect a listed species, FERC must then submit a request to enter into formal consultation with the FWS in order to comply with Section 7 of the ESA. In response to FERC's request for formal consultation, the FWS would issue a biological opinion describing its determination of whether or not the federal action would likely jeopardize the continued existence of a listed species or would result in the destruction or adverse modification of designated critical habitat. However, specific to the Loudon Expansion Project, the FWS has provided East Tennessee the option of developing a conservation MOU for federally listed bat species in lieu of formal Section 7 consultation. This is further described below.

East Tennessee contacted the FWS Tennessee Ecological Services Office to obtain species information and conservation reports. Twenty-one federally listed endangered, threatened, and candidate species were identified as potentially occurring in the vicinity of the Project (see Appendix J). Eight of the 21 identified species also include essential and nonessential experimental populations in the Project area. Under section 10(j) of the ESA, the Secretary of the Department of the Interior can designate reintroduced populations established outside the species' current range, but within its historical range, as "experimental." These populations are designated as either "essential" or "nonessential" to the continued existence of the species. Essential experimental populations are treated like a normal endangered species. Under section 10(j) of the ESA, a nonessential experimental population is one that, on the basis of the best available information, is not essential for the continued existence of the species, but is treated as a threatened species if the population is located within public lands (e.g., National Wildlife Refuges and National Parks), making Section 7(a)(1) and the consultation requirements of Section 7(a)(2) of the ESA applicable. When nonessential experimental populations are located outside of public lands, the FWS treats the population as proposed for listing and only two provisions of Section 7 would apply: section 7(a)(1) and section 7(a)(4), which requires Federal agencies to confer with the FWS on actions that are likely to jeopardize the continued existence of a proposed species.

The FWS has not designated critical habitat for any of the listed species within the counties that would be crossed by the Project. Eleven of the 21 listed and candidate species, including 4 mussels (Cumberland monkeyface, Dromedary pearlymussel, Finerayed pigtoe, and Ring pink), 5 fish (Citico darter, duskytail darter, smoky madtom, spotfin chub, yellowfin madtom), 1 mammal (Carolina northern flying squirrel); and 1 plant (white fringeless orchid) are not known to occur in the specific Project area, and habitat for the species was not identified during East Tennessee's field surveys. Therefore, we have determined that the Project would have *no effect* on these 11 species.

Below, we evaluate the remaining 10 federally listed species (6 aquatic invertebrates, 2 fish, and 2 mammals) that have the potential to occur or have suitable

habitat within the Project area based on initial surveys and agency correspondence. Because five of the six aquatic invertebrates are potentially in the Tennessee River, they are discussed collectively.

Aquatic Invertebrates Potentially Occurring in the Tennessee River

Anthony's Riversnail

The endangered Anthony's riversnail is a freshwater snail found in large rivers on cobble and boulder substrate in riffle habitat. Only two extant populations are known, one in the upper basin of the Tennessee River, and one in Limestone Creek in Alabama. This snail was once widespread throughout the Tennessee River system, but impoundments and siltation have eliminated most of its suitable habitat. According to TDEC Division of Natural Areas records, this species was recorded within 4 miles of the Project area; however, it has not been recorded within 1 mile of the Project area.

Fanshell mussel

The endangered fanshell is a medium-sized freshwater mussel with light green or yellow with green mottling or rays approximately 80 mm in length. The fanshell inhabits medium to large rivers with moderate current primarily in relatively deep water in a gravelly substrate. Historically, it was distributed in the Ohio, Wabash, Cumberland, and Tennessee Rivers and their larger tributaries. The fanshell was designated as endangered throughout its entire range in Alabama, Illinois, Indiana, Kentucky, Ohio, Tennessee, Virginia, and West Virginia and a recovery plan was approved in July 1991. According to TDEC records, this species has not been recorded within 4 miles of the Project area.

Orangefoot pimpleback

The endangered orangefoot pimpleback is a medium sized freshwater mussel with a rayless, light brown shell which becomes more chestnut or dark brown as the animal matures reaching up to 100 mm. Historic records show that the orangefoot pimpleback was found in the Ohio, Wabash, Cumberland, Clinch, Tennessee, Holston, and French Broad rivers in Tennessee as well as the Green and Rough Rivers in Kentucky. Currently, the orangefoot pimpleback only exists in the lower Ohio River in Illinois, middle reaches of the Cumberland River, and lower reaches of the Tennessee River. It typically is found in medium to large rivers with sand and gravel substrates and can occur in both shallow riffles and deep pools with steady currents. According to TDEC records, this species was recorded within 4 miles of the Project area; however it has not been recorded within 1 mile of the Project area.

Pink mucket

The endangered pink mucket is a rounded, slightly elongate mussel with a thick, inflated, and smooth shell, which is usually yellow-brown in color. The pink mucket is found in the silt-free mud and sand shallow riffles of major rivers and tributaries buried in the substrate with only its feeding siphons exposed. Historically it was widespread and found in 25 rivers associated with the Ohio, Cumberland, Mississippi, and Tennessee River systems; however, it only currently exists in about 16 rivers and tributaries. Reasons for habitat loss include impoundments and siltation from mining and erosion. According to TDEC records, this species has been recorded within 1 mile of the Project area.

Sheepnose

The endangered sheepnose is a medium-sized mussel with a thick, solid shell that is smooth and shiny. Shell coloration varies from light yellow to a dull yellowish brown, without lines or rays but with dark concentric ridges, which are a result of periods when growth stops or slows. It lives in larger rivers and streams where it is usually found in shallow areas with moderate to swift currents flowing over coarse sand and gravel. However, they have also been found in areas of mud, cobble, and boulders, and in large rivers they may be found in deep runs. The sheepnose is found across the Midwest and Southeast, but it has been eliminated from two-thirds of the streams from which it was known. According to TDEC records, this species has not been recorded within 4 miles of the Project area.

Effects Determination for Tennessee River Species: East Tennessee has proposed to employ an HDD to cross the Tennessee River, which should avoid impacts on any populations of the five aforementioned aquatic invertebrates. (See section A.8.1 for a discussion of the HDD crossing method). However, should there be an inadvertent release of drilling fluid – either as a result of a direct discharge into the waterbody or an indirect discharge resulting in the runoff of drilling fluid from an onshore inadvertent release – then the species, if present, could be affected. Any HDD drilling fluid that reaches a waterbody could increase the turbidity of the waterbody due to the high clay content of the water-based drilling fluid. Because the clay would remain in suspension for some time, the turbidity plume could persist for several minutes or hours and, depending on the flow of the waterbody, this turbidity plume could extend downstream for a considerable distance. Suspended sediment and turbidity caused by the clay mixture could affect the mussels' siphons, which are used for feeding and oxygen uptake, resulting in weakened individuals or mortality.

To prevent and control inadvertent releases of drilling fluids, East Tennessee would implement its *HDD Inadvertent Returns Plan*. This plan includes measures to monitor the drilling operation and drill path to identify and minimize the potential for

inadvertent returns, minimize the duration of any releases that occur, and contain and clean up any spills. Additionally, we note that at the crossing location, the Tennessee River is 500 feet wide, approximately 65 feet deep, and has a median flow rate of 163 cubic feet per second. Therefore, we expect that any inadvertent release of drilling fluids not immediately contained and/or removed as per the *HDD Inadvertent Returns Plan* would be disbursed fairly quickly and would not likely be problematic for aquatic populations in the river. Therefore, we conclude that the Project *may effect, but is not likely to adversely affect* the Anthony's Riversnail, fanshell mussel, orange pimpleback, pink mucket, or sheepnose.

Appalachian monkeyface

The endangered Appalachian monkeyface is a freshwater mussel endemic to small reaches of the upper Clinch and Powell Rivers in Tennessee and Virginia. The Appalachian monkeyface is medium sized (70-90 mm) with a yellow-green shell. This mussel was listed as endangered in 1976, and populations that occurred in the Tennessee and Cumberland River systems are extirpated. Much of its historic range was lost due to dam construction and impoundments in river systems. It is usually found in fast flowing water on gravel and sandy bottoms that are low in silt content. According to TDEC records, this species has not been recorded within 4 miles of the specific Project area. The populations potentially occurring in the general Project area are listed as experimental and non-essential. None of the aquatic habitat encountered in the Project area was found to be fast flowing water on gravel and sandy bottoms that are low in silt content. Therefore, we conclude that the Project is *may effect, but is not likely to adversely affect* the Appalachian monkeyface.

Laurel dace and Snail Darter

The endangered laurel dace is a small minnow averaging 45.7 mm long with olive green to tan coloration, a silvery white underside, and two black stripes on each side. During the breeding season both the males and females develop bright red coloration on the lower parts, black on the head and breast, yellow on the fins, and gold on the cheeks. The laurel dace is found in only seven Tennessee streams: Soddy Creek, three streams of the Sale Creek system, and three streams of the Piney River system in Bledsoe and Rhea Counties. The laurel dace is usually found beneath undercut banks or under boulders in large stream reaches with cobble/rubble substrate. According to TDEC records, this species has not been recorded within 4 miles of the Project area.

The threatened snail darter, averaging 8 cm long, is found in gravel shoals free of silt and aquatic plants, with moderate to strong currents, and moderate depths. The substrate generally consists of dark micaceous sand, with little to no silt, and 25-50 percent of the area scattered with gravel. The snail darter is currently found in six Tennessee River tributaries, although the historic range probably included the main stem

of the Tennessee River, which is now impounded and contains silt. Current populations of the species are fragmented and small. According to TDEC records, this species was recorded within 4 miles of the Project area; however it has not been recorded within 1 mile of the Project area.

The Project would cross 3 perennial waterbodies: Tellico Lake, the Tennessee River, and an unnamed tributary to Clear Prong Creek. Any potential populations of laurel dace or snail darter in Tellico Lake or the Tennessee River should be avoided with a successful HDD. In the event of an inadvertent release of drilling fluid into the waterbodies, suspended sediment and turbidity caused by the clay mixture could affect oxygen exchange over gills, resulting in weakened individuals or mortality. To prevent and control inadvertent releases of drilling fluids, East Tennessee would implement its *HDD Inadvertent Returns Plan*. This plan includes measures to monitor the drilling operation and drill path to identify and minimize the potential for inadvertent returns, minimize the duration of any releases that occur, and contain and clean up any spills.

East Tennessee would employ a dry ditch crossing method, utilizing either a dam and pump or a flume to construct across the unnamed tributary to Clear Prong Creek. (See section A.7.1 for a full description of waterbody crossing methods.) In accordance with East Tennessee's E&SCP, construction and restoration across the minor waterbody would be conducted within 48 hours. Therefore, with the implementation of these plans, we conclude that the Project *may effect, but is not likely to adversely affect* any potential populations of laurel dace or snail darter within the perennial waters crossed by the Project.

Indiana bat

The endangered Indiana bat uses caves and abandoned mines as hibernacula during the winter months. In the summer months (May to August), Indiana bats inhabit and utilize hardwood forests for foraging and roosting. Roost sites typically consist of dead and living trees containing exfoliating bark and a diameter at breast height of 3 inches or greater. Trees utilized as primary maternity colony roots sites typically contain over 30 females at a single time while alternate roost sites contain fewer numbers of females from the same colony. Primary roosts are typically found at forest edges or in canopy gaps, while alternate roosts are generally located in a shaded portion of an interior forest. Male Indiana bats occupy the same summertime habitat as females but tend to occur in smaller numbers that may or may not be in close proximity to a primary roost site. Indiana bats typically forage in semi-open forested habitats, forest edges, and riparian areas on terrestrial and aquatic flying insects.

Northern long-eared bat

Much like the Indiana bat, the threatened northern long-eared bat occupies hardwood forested areas for roosting and foraging during the summer months and similar hibernacula as Indiana bats during the winter. The bats roost singly or in colonies underneath exfoliating trees, in cavities, or in crevices of both living and dead trees. Northern long-eared bats also have been found utilizing structures as roost sites (for example, barns and sheds), although these sites are much less commonly utilized than trees. Foraging for insects occurs within the understories of forested hillsides and ridges.

Based on the loss of 42.7 acres of potential bat summer roost and foraging habitat, we have determined that the Project *is likely to adversely affect* the Indiana bat and northern long-eared bat. The FWS considers the development of a Project-specific MOU for listed bat species to be acceptable in lieu of formal Section 7 consultation. Therefore, on August 18, 2015, East Tennessee entered into a MOU with the FWS to address the Project's effects on potential bat summer roost and foraging habitat. The MOU calculates that 42.7 acres of forested habitat suitable for roosting Indiana and northern long-eared bats would be permanently converted to grassland or early successional habitat within the pipeline right-of-way. The MOU requires that all suitable roosting trees and snags associated with the Project be removed during the unoccupied or non-maternity occupied timeframe (August 1-March 31). If timeframe or other aspects of the Project are revised, consultation with FWS must be reopened to modify the MOU, if necessary. Additionally, the MOU also provides for incidental take of the two bats species.

In its letter dated October 18, 2015, the FWS agreed with the determinations for all federally listed species and concluded:

> Based on the applicant's [East Tennessee's] efforts to avoid, minimize, and mitigate the impacts of this action to listed species to such an extent it will result in no effects to some and become a net benefit to others, we believe that the requirements of section 7 of the Endangered Species Act of 1973, as amended, are fulfilled.

We note that the MOU requires that all suitable roosting trees and snags associated with the Project be removed by March 31. If it becomes necessary to do that work after March 31, consultation with the FWS would need to be re-initiated.

5.2 State-Listed Species

One hundred and five state-listed species were identified as potentially occurring within the Project area. Eighteen of the state-listed species are also federally listed and are discussed above in section B.5.1. An additional eight state listed species are also

migratory birds, which are discussed in section B.4.4. Of the remaining 79 species, there was no suitable habitat for 29 in the areas crossed by the Project. For 42 of the state-listed species, suitable habitat was observed in the Project area, but the TDEC database did not have records of the species within 4 miles of the Project. Two state-listed amphibians, the Junaluska and Seepage salamanders, were not found during surveys nor are there any TDEC records of them within 4 miles of the Project area.

Of the remaining six species, three are submerged obligate aquatic plants (Hiwassee quillwort, large-leaf pondweed, Nuttall's pondweed), the first two of which have not been recorded by TDEC within 4 miles of the Project area, and the last of which has been recorded within 4 miles. No individuals any these species were found during surveys. Additionally, the fish blue sucker has been recorded by TDEC within 4 miles of the Project area.

Any potential populations of these four species in Tellico Lake or the Tennessee River should be avoided with a successful HDD. In the event of an inadvertent release of drilling fluid into the waterbodies, suspended sediment and turbidity caused by the clay mixture would limit light exposure for the plant species and could affect oxygen exchange over gills, resulting in weakened individuals or mortality. To prevent and control inadvertent releases of drilling fluids, East Tennessee would implement its *HDD Inadvertent Returns Plan*. This plan includes measures to monitor the drilling operation and drill path to identify and minimize the potential for inadvertent returns, minimize the duration of any releases that occur, and contain and clean up any spills.

Surveys found limited available habitat for two state listed plant species – the mountain honeysuckle, which inhabits woodland edges, and the American barberry, which inhabits open canopy forest. No individuals were documented although TDEC records indicate the species is found within 1 mile of the Project area. The complete table of all state-listed species is in Appendix K.

Given that surveys found no individuals of any state-listed species and the mitigation measures East Tennessee would implement in its E&SCP and *HDD Inadvertent Returns Plan*, we determine that the Project would not result in a significant impact on state-listed or state-sensitive species.

6. Land Use, Recreation, and Visual Resources

Construction of the Project would impact land use along the pipeline route and aboveground facilities as described below. Land use types affected by the Project include open land, agricultural, industrial/commercial lands, upland forest, shrub land, residential land, open water, road, and right-of-way lands.

The Project would affect approximately 132.3 acres of land during construction, including the pipeline construction right-of-way, ATWS areas, wareyard, access roads, and new aboveground facilities. Following construction, approximately 70.7 acres would be restored to pre-construction uses. The remaining 61.6 acres would be maintained for operation of the Project. Table B-11 summarizes the acreage of each land use that would be affected during construction and operation of the Project.

6.1 Land Uses Affected by the Project

Open Land

Open land is comprised of grasses, herbs, and shrubs. The Project would utilize 4.8 acres (or 3.6 percent of land use impacts) of open land for construction, including 0.95 acre of permanent impacts associated with operation of the Loudon Mainline Extension. The operational right-of-way would be maintained in an herbaceous state and would not change existing open land use designations.

East Tennessee would follow its *Seeding and Soil Amendment Requirements Plan* (see Appendix I), which incorporates FWS, NRCS and TDEC recommendations specific to Tennessee for seed mixtures and soil amendments for restoration of disturbed areas following construction activities.

Agricultural Land

The Project would cross agricultural land used for crop production (corn and soybeans) and pasture land. A total of 56 acres (or 42.3 percent of land use impacts) would be affected by construction, of which 22.5 acres would be designated operational right-of-way and 0.13 acre would be permanently impacted by the installation of aboveground facilities. With the exception of the aboveground facilities, all agricultural land disturbed by Project construction, including the operational pipeline right-of-way, would be restored to original use.

East Tennessee would minimize adverse impacts on agricultural land by implementing its Stormwater Pollution Prevention Plan and its E&SCP. East Tennessee would utilize topsoil segregation techniques in agricultural areas to preserve soil productivity up to 12 inches in depth. Additionally, East Tennessee would work with landowners to identify and locate areas known to have existing drainage tiles or irrigation systems. If drain tiles or irrigation systems are damaged by construction of the pipeline, East Tennessee would work with the landowner to repair or replace those damaged sections to their original condition or better. In locations without drain tiles, the agricultural land would be returned to its original contour to maintain pre-construction hydrology. Should construction result in any new drainage or ponding issues, East Tennessee would work with the landowner to remedy the problem.

Table B-11: Acreage Affected by the Loudon Expansion Project																				
	Open Land		Agricultural Land		Industrial/ Commercial		Upland Forest		Scrub Land		Residential		Open Water		Road		Right-of-way		Total	
	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O
PIPELINE FACILITIES																				
PE	0.95	0.95	22.58	22.58	0.07	0.07	11.97	11.97	0.49	0.49	0.36	0.36	1.32	1.32	0.83	0.83	20.96	20.96	**59.53**	**59.53**
TWS	3.05	0	20.64	0	0.39	0	16.43	0	0.62	0	0.29	0	0	0	0.94	0	0.94	0	**43.3**	**0**
ATWS	0.66	0	4.46	0	0.03	0	7.99	0	0.03	0	0.83	0	0.01	0	0.4	0	1.19	0	**15.59**	**0**
TAR	0.22	0	1.07	0	0.43	0	0.52	0	0	0	0.1	0	0	0	2.05	0	0.26	0	**4.65**	**0**
PAR	0	0	0	0	0.89	0.89	0	0	0	0	0	0	0	0	0.47	0.47	0	0	**1.36**	**1.36**
Pipeline Facilities	**4.88**	**0.95**	**48.75**	**22.58**	**1.81**	**0.96**	**36.91**	**11.97**	**1.14**	**0.49**	**1.58**	**0.36**	**1.33**	**1.32**	**4.69**	**1.3**	**23.35**	**20.96**	**124.44**	**60.89**
WAREYARD																				
Wareyard	**0.00**	**0.00**	**7.15**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**7.15**	**0.00**
ABOVEGROUND FACILITIES																				
Aboveground Facilities	**0**	**0**	**0.13**	**0.13**	**0.59**	**0.59**	**0.01**	**0.01**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.73**	**0.73**
Project Total	**4.88**	**0.95**	**56.03**	**22.71**	**2.4**	**1.55**	**36.92**	**11.98**	**1.14**	**0.49**	**1.58**	**0.36**	**1.33**	**1.32**	**4.69**	**1.3**	**23.35**	**20.96**	**132.32**	**61.62**

Notes:
C = Construction Right-of-Way; O = Operational Right-of-Way (ROW consisting of “greenfield” or new easement areas that are not within the existing maintained ROW); TWS = Temporary workspace; ATWS = Additional Temporary Workspace; PE=Permanent Easement; TAR=Temporary Access Road; PAR=Permanent Access Road.

The USDA defines prime farmland as "land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops" (USDA, 2015a). With the exception of the new meter facility at the Tate & Lyle Plant in Loudon County, affecting 0.3 acre at MP 10.2, and a portion the new mainline valve area connecting the Loudon Mainline Extension to East Tennessee's existing 3200 mainline, affecting less than 0.7 acre at MP 0.0, all remaining prime farmland soils affected by the Project would be restored according to East Tennessee's E&SCP and would return to previous use following construction. We note, however, that the new meter station at the Tate & Lyle Plant would be within the Plant's fence line, which is already designated as an industrial/commercial land use area.

Industrial/Commercial Land

Industrial/commercial land primarily consists of developed land that is not otherwise classified as residential, mainly consisting of existing aboveground facilities that are either sparsely vegetated or lack vegetation (e.g., cement foundations, gravel pads, or bare, compacted land with a hard clay surface). Industrial land accounts for approximately 1.8 percent of the Project area, with 2.4 acres used for construction and 1.5 acres required for operation.

Upland Forest

Consisting of hardwoods and Virginia Pine, approximately 36.9 acres (27.9 percent of land use impacts) of upland forest would be affected by construction, of which about 24.9 acres would be cleared for temporary use during construction. The remaining 11.9 acres would be converted to open and developed land, including 11.9 acres that would be maintained as operational right-of-way and 0.01 acre that would be permanently converted to developed land for aboveground facilities.

For approximately 65 of the pipeline route, East Tennessee would site the pipeline within the existing cleared right-of-way for the Loudon-Lenoir City Later Line 3218D-100 to minimize impacts on upland forest. Construction in upland forest areas would require the removal of trees to prepare the construction corridor and workspace. After construction, trees and shrubs would be allowed to grow within the temporary construction right-of-way and ATWS. East Tennessee would work with individual landowners to develop replanting plans as part of easement negotiations. Although temporary, impacts on upland forest lands would be long term, taking between 20 to 30 years for species such as Virginia Pine to reach maturity and up to 50 years for hardwood species. Visual impacts from forest clearing are discussed in section B.6.4.

Shrub Land

Shrub land contains thickets of shrubs and young trees mixed with scattered grasses and wildflowers. The Project would affect 1.4 acres (or 0.8 percent of land use impacts) of shrub land for construction, including 0.49 acre of permanent impacts associated with the operation of the Loudon Mainline Extension. In accordance with its E&SCP, East Tennessee would conduct routine vegetation mowing or clearing over the full width of the permanent right-of-way once every 3 years. Any trees within 15 feet of the pipeline that have roots that could compromise the integrity of the pipeline coating may be cut and removed from the permanent right-of-way, converting the 0.49 acre from shrub land to open land.

Open Water

Open water that would be affected Project includes minor streams, one major river (the Tennessee River), and one large lake (Tellico Lake). Open water accounts for 1.3 acres, or 1 percent of land use impacts. The Tennessee River, Tellico Lake, and an unnamed tributary to Bat Creek would be crossed via the HDD method; one minor perennial minor waterbody would be crossed via either the flume or dam and pump dry ditch method. East Tennessee anticipates that the remaining ephemeral, minor waterbodies would be dry at the time of crossing and upland construction methods would be utilized. Sections A.8.1, B.1.1, and B.3 discuss waterbody crossing methods in general, the HDD crossings in particular, and overall waterbody impacts, respectively.

Right-of-Way and Roads

Approximately 23.3 acres (17 percent of land use impacts) of the Project would affect East Tennessee's right-of-way on its Loudon-Lenoir City Later Line 3218D-100 as the Project would be collocated within the existing pipeline, maintaining continuity of land use.

Approximately 4.7 acres (3.5 percent of land use impacts) of the Project would affect existing area roads during construction, including 1.3 acres of permanent impacts.

Residential Land

About 1.6 acres (1.2 percent) of residential land would be affected by the Project, of which about 0.4 acre would be maintained as permanent right-of-way. As shown in table B-12, a total 19 structures are within 50 feet of the proposed construction work space. Most of these out buildings such as barns or sheds; however, one residence would be within 41 feet and three residences would be less than 25 from the construction work space.

East Tennessee would remove one barn within the proposed trench line of the Project. Additionally, a boat dock on Tellico Lake is directly over the trench line at MP 2.3; however, because East Tennessee has proposed to cross Tellico Lake via the HDD method, the boat dock would not be affected.

Table B-12: **Residences and Buildings Within 50 feet of the Project Construction Work Area**

Feature	Approximate Milepost	Distance from Construction Work Area (feet)	Distance from Pipeline Centerline (feet)
Loudon Mainline Extension			
Barn	0.35	0	0 (to be removed)
Utilities Building	1.16	26	89
Barn	1.73	0	202
Structure	1.81	32	179
Garage	3.81	27	63
Shed	3.82	8	43
Shed	3.82	28	63
Barn	4.45	0	10
House	4.47	9	45
Utility Structure	4.91	3	39
Utility	7.56	36	71
House	7.83	22	57
Shed	7.88	30	65
Barn	8.04	16	52
House	8.10	41	66
Garage	8.11	20	45
House	8.12	20	57
Loudon-Lenoir City Lateral Line			
Guard Tower	MP 10.73 on Line 3218D-100	31	N/A
Stormwater Equipment Shed	MP 10.73 on Line 3218D-100	3	46

To minimize potential disruptions on residential areas near construction work areas, East Tennessee would coordinate construction work schedules with affected landowners prior to construction. In addition, East Tennessee would work to ensure construction activities progress in a timely manner to minimize the residence exposure to noise, dust, and the general presence of construction activities. East Tennessee would maintain emergency vehicles access to residences by using temporary travel lanes or steel

plate bridges over open trenches. To further minimize impacts on residential areas within the vicinity of construction work areas, East Tennessee would:

- fence the edge of the construction work area 100 feet either side of the residence;
- avoid removal of mature trees and landscaping within the construction work area unless necessary of safe operation of equipment or as specified in landowner agreements;
- ensure piping is welded and installed as quickly as reasonably possible, consistent with prudent pipeline construction practices to minimize construction time affecting a neighborhood;
- backfill the trench (except for tie-in locations) at the end of the workday, or cover the trench temporarily with steel plates or timber mats, and/or employ a night watchman at the area;
- complete final cleanup (including final grading) and install of permanent erosion control measures within 10 days after the trench is backfilled, weather conditions permitting; and
- restore all lawn areas and landscaping according to our Plan and Procedures and terms of individual easement agreements.

East Tennessee developed site-specific construction plans for the seven affected structures within 25 feet of the proposed construction work areas; these plans are provided in Appendix E. We have reviewed the plans and find them acceptable; however, we encourage the owners of each of these residences/structures to review the plans and provide us with comments on the plan for their individual property.

In general, as the distance from the construction work area increases, the impacts on residences decrease. In residential areas, the greatest impacts associated with construction and operation of a pipeline are temporary disturbances during construction and restrictions preventing construction of permanent structures within the permanent right-of-way. Temporary construction impacts on residential areas could also include inconvenience caused by noise and dust generated by construction equipment, personnel, and trenching of roads or driveways; traffic congestion; ground disturbance of lawns, removal of trees, landscaped shrubs, or other vegetation screening between residences and/or adjacent rights-of-way; potential damage to existing septic systems or wells and other utilities; and removal of aboveground structures such as fences, sheds, or trailers from within the right-of-way. East Tennessee has identified a septic system near MP 7.9 and has stated that because the system's drain field is west of the construction work space, no adverse impacts on the field are anticipated.

In accordance with our Plan, East Tennessee would begin cleanup operations immediately following backfill, and would complete final grading, topsoil replacement, and installation of permanent erosion control structures within 10 days after backfilling

the trench. East Tennessee would be responsible for ensuring successful revegetation of soils disturbed by Project-related activities and restoring turf, ornamental shrubs, and specialized landscaping in accordance with the landowner's request, or, in some cases, compensating the landowner.

In order to address any potential landowner issues during construction, prior to construction, East Tennessee would mail a letter to each affected landowner and municipal office notifying them of the Project-specific contacts and processes for resolving complaints. A designated Loudon Expansion Project local contact person would be listed as the first contact and the call would be returned as soon as practicable, but no later than 48 hours after a landowner's concern is received. The letter would also instruct landowners to contact the Loudon Expansion Project Hotline if not satisfied with the results provided by the local contact. Finally, the FERC Enforcement Hotline telephone number would also be provided in the event the landowner is dissatisfied with the result of the Loudon Expansion Project Hotline Procedure. Issues raised would remain active until the complaint has been resolved with the landowner or complainant, or otherwise considered closed. The contact number would remain available through the completion of all construction activities, as well as through the completion of final restoration. For any issues that may come up during operation, landowners would be referred to the local East Tennessee operations right-of-way representative.

Given the measures outlined above, in conjunction with the site-specific plans and complaint procedures that would be implemented by East Tennessee, overall impacts on residences from construction of the Project would generally be short term. Depending on the specific vegetation impacted and its ability to be restored to pre-construction conditions, some residences would experience long-term impacts associated with visual changes in the landscape. Compensation would be negotiated between individual landowners and East Tennessee during the easement process.

Roadways and Railroads

The proposed Project would require 20 road crossings and 5 active rail crossings. East Tennessee would obtain the necessary railroad and road crossing permits. Generally, East Tennessee would cross lightly traveled, unimproved roads via open-cut methods. Primary roads crossings (where required by operations, construction, or permitting) would be conducted via conventional bore or HDD methods. Five adjacent railroad rights-of-way would be crossed by pipeline facilities via the HDD crossing method. Table B-13 lists the road and railroad crossings, county jurisdiction, type, and construction crossing methods, which are discussed in greater detail in section A.8.1 of this EA.

Table B-13: Road and Railroad Crossings for the Project			
Road Name	**Approximate Milepost**	**Crossing Method**	**Type of Road**
Monroe County			
Summit Road	0.4	Open Cut	Asphalt
Sweetwater Vonore Road/Highway 322	1.2	Conventional Bore	Asphalt
Highway 72	1.7	Conventional Bore	Asphalt
Bat Creek Road East	2.7	HDD	Asphalt
Loudon County			
Sunshine Private Lane	3.8	Open Cut	Asphalt
Driveway/Farm Road	3.8	Open Cut	Dirt
Mayo Road	4.2	Open Cut	Asphalt
West Fork Road	4.6	HDD	Asphalt
Mialaquo Road	4.7	HDD	Asphalt
Kanutsu Lane	4.9	Open Cut	Asphalt
Tellico Pkwy/Highway 444	5	Conventional Bore	Asphalt
Cheeyo Way	5	Open Cut	Asphalt
Doya Lane	5.2	Open Cut	Asphalt
Farm Road	5.7	Open Cut	Dirt
Wade Road East	5.9	Open Cut	Asphalt
Watkins Road	6.5	Open Cut	Asphalt
Simpson Road	7.5	Conventional Bore	Asphalt
Steekee School Road	8.3	Conventional Bore	Asphalt
Vonore Road	9.3	Conventional Bore	Asphalt
CR 2559/Popular Springs Road	9.9	HDD	Dirt
Norfolk Southern	10.1	HDD	NA
Norfolk Southern	10.1	HDD	NA
Norfolk Southern	10.1	HDD	NA
Tate & Lyle Railroad Spur	10.1	HDD	NA
Tate & Lyle Railroad Spur	10.1	HDD	NA
Note: NA = not applicable			

Planned Developments

We identified no planned residential, industrial, or commercial developments within 0.25 mile of the Project. Further, the Project would not cross any areas identified as growth areas and/or planned road or bridge projects.

6.2 Public Land, Recreation, and Special Interest Areas

The Project would not cross and is not within 0.25 mile of any National Park System Units, which includes national parks, monuments, preserves, historic sites, historic parks, memorials, battlefields, military parks, cemeteries, recreation areas, parkways, trails, or other designations. Additionally, the Project does not cross and is not within 0.25 mile of any Indian reservations, National Wildlife Refuges, National Wilderness Areas, or registered landmarks. Nor would the Project cross or be within 0.25 mile of any state parks, forests, or registered state landmarks.

Between MPs 2.2-2.8 and MPs 4.5-4.7, the Loudon Mainline Extension would pass underneath Tellico Lake, which is owned and managed by the TVA. Potential impacts on Tellico Lake are discussed in sections B.1.1 and B.3. Additionally, the Project would be within 1 mile of two recreation areas: 1) the TWRA managed Tellico West Unit – Industrial Park, a 724.6 acre area reserved for deer and turkey hunting; and 2) the Clear Creek boat ramp and fishing access area on Tellico Lake, which is the jointly managed by the TWRA and the Tellico Reservoir Development Agency.

The USDA Farm Service Agency manages the Conservation Reserve Program, which is a voluntary program for agricultural landowners to assist in the prevention of topsoil erosion and conservation of natural resources. The USDA NRCS manages the Wetland Reserve Program, which is a voluntary program to assist landowners with the protection, restoration, and enhancement of wetlands on their property. No lands enrolled in either of these programs were identified.

6.3 Contaminated Sites

We reviewed federal and state databases to identify hazardous waste sites, landfills, or other sites with the potential for soil or groundwater contamination that are located within 0.25 mile of the Loudon Expansion Project's boundaries.

The nearest EPA Superfund site listed on the National Priorities List or Brownfield site listed on the Assessment, Cleanup & Redevelopment Exchange System is more than 4 miles northeast of MP 10.0, near Lenoir City, Tennessee (USEPA 2015). This site, Lenoir Car Works, is a brownfield site with soil contamination. Because of its distance from the Project, there would be no impacts on the Project or the site.

If a contaminated or hazardous waste site is encountered during construction of the Project, East Tennessee would stop work activities in the immediate vicinity of the site, notify the appropriate state and federal agencies, and proceed in accordance with those agencies' regulations and East Tennessee's *Waste Management Plan*.

6.4 Visual Resources

Pipeline Facilities

Visual resources along the proposed pipeline route are a function of geology and climate, and include topographic relief, vegetation, water features, wildlife, land use, and human uses and development. There are no visually sensitive areas, including scenic roads or rivers identified within the Project area. Approximately 65 percent of the Loudon Mainline Extension would be installed within East Tennessee's existing, maintained right-of-way for the Loudon-Lenoir City Lateral Line 3218-D-100. Consequently, most visual resources along the majority of the Project have been previously affected.

Visual impacts associated with the construction right-of-way would include the removal of existing vegetation and exposure of bare soils, earthwork and grading scars associated with heavy equipment tracks, trenching, blasting (if necessary), rock formation alteration or removal, and equipment storage. Other visual effects could result from the removal of large individual trees with intrinsic aesthetic value, the removal or alteration of vegetation providing a visual screen, or landform alterations that introduce contrasts in visual scale, spatial characteristics, form, line, color, or texture. No impacts on visually sensitive areas are expected as a result of the proposed pipeline facilities.

Visual impacts are typically greatest where a pipeline route parallels or crosses roads where the pipeline right-of-way may be seen by passing motorists, and near residences where vegetation used for visual screening of existing utility right-of-way would be removed. The duration of visual impacts from the Project would depend upon the type of vegetation that is cleared or altered. The impact of vegetation clearing would be most brief in areas consisting of short grasses and scrub-shrub vegetation and in agricultural crop and pasture lands, where the re-establishment of vegetation following construction would be relatively fast (less than 5 years). The impact would be greater in forest land, where it would take 20-50 years to regenerate mature trees. Trees would be prevented from reestablishing within the permanent right-of-way.

During easement negotiations, East Tennessee would discuss screening issues with individual landowners in locations where trees that serve as a visual buffer would be removed. Installing pipelines within existing rights-of-way reduces impacts by reducing fragmentation impacts and minimizing vegetation clearing for the construction work areas and permanent right-of-way. Following construction, East Tennessee would restore disturbed areas in accordance with federal, state, and local permits, landowner agreements, and East Tennessee's easement requirements.

Aboveground Facilities

The aboveground facilities associated with the Project would be the most visible features. The magnitude of these impacts depends upon factors such as the existing landscape, remoteness of the location, and the number of viewpoints from which the facility can be seen. The installation of the new meter facility and appurtenant equipment at the Tate & Lyle Plant at MP 10.2 and installation of the new pressure regulator at East Tennessee's existing Meter Station 59039 on its Loudon-Lenoir City Lateral Line 3218D-100 both would be located within an existing industrial facilities. Therefore, we do not anticipate a change in visual impacts from construction of these facilities.

Installation of the new 12-inch mainline valve and appurtenant equipment within a 0.07-acre fenced area to connect the Loudon Mainline Extension to East Tennessee's existing 3200 mainline would be within agricultural lands, near a roadway, and across from industrial facilities, providing a minor change in the visual landscape.

Overall, visual resources would minimally affected by the Project.

7. Cultural Resources

Section 106 of the National Historic Preservation Act, as amended, requires the FERC to take into account the effect of its undertakings on properties listed or eligible for listing on the National Register of Historic Places (NRHP), and to afford the Advisory Council on Historic Preservation an opportunity to comment. East Tennessee, as a non-federal party, is assisting the FERC in meeting our obligations under Section 106 and FERC's implementing regulations at 36 CFR 800.

East Tennessee completed cultural resources surveys for the Project, and provided a Phase I report and two addendum reports to the FERC, the Tennessee State Historic Preservation Office (SHPO), and the TVA. The Phase I survey included a generally 300-foot-wide corridor for the pipeline, as well as access roads and a contractor yard, and covered 354.65 acres. The survey included visual inspection and subsurface shovel testing. The addendum 1 survey covered 29.2 acres of previously denied-access pipeline route, reroutes, and an access road. The addendum 2 survey covered 62.2 acres including the Highway 72 re-route, two access roads, and extra workspace. Both archaeological and architectural resources were included in the surveys.

As a result of the surveys, the Phase I report documented one newly recorded historic archaeological site (40LD375); one previously recorded prehistoric archaeological site (40LD58); two newly recorded prehistoric isolated finds (KFS-1 and TPG-3); six newly recorded architectural resources consisting of three cemeteries (TRC-1, TRC-2, and TRC-5), a farm complex (TRC-3), a residence (TRC-4), and a recreational facility (TRC-6); and three previously recorded architectural resources (LD-0644, LD-

0669, and LD-0670), all residences. None of the newly recorded archaeological and architectural resources were recommended as eligible for the NRHP. The previously recorded archaeological site was found to be severely disturbed within the survey corridor and no further work was recommended. Two of the previously recorded architectural resources were recommended as not eligible for the NRHP, and one (LD-0669) was inaccessible and was therefore unassessed. This resource is outside the survey corridor and would be avoided. East Tennessee has also indicated it would avoid the three cemeteries and the recreational facility. No cultural resources were identified by the addendum 1 survey. The addendum 2 survey documented one previously recorded site (40MR669) in the project area. This area would be avoided by HDD.

In a letter dated March 2, 2015, the SHPO commented on the Phase I report and indicated that the Project area contained no historic properties eligible for the NRHP. In letters dated June 15 and July 8, 2015, the SHPO commented on the addendum 1 and 2 reports, respectively, and indicated that the Project area contained no historic properties eligible for the NRHP. We concur with the SHPO and find that no historic properties would be affected by the Project. TVA Cultural Compliance has reviewed the Loudon Expansion Project and associated survey reports. For TVA to fulfill its Section 106 responsibilities under NHPA, the TVA will consult with the SHPO and federally recognized Indian Tribes regarding TVA's involvement with the Project. Therefore, **we recommend that:**

- **<u>Prior to construction</u>, East Tennessee should file with the Secretary the appropriate TVA approval documentation for the Project segment on TVA jurisdictional land.**

For the remainder of the Project, we concur with the SHPO and find that no historic properties would be affected.

East Tennessee contacted the Cherokee Nation of Oklahoma, Eastern Band of Cherokee Indians, and United Keetoowah Band of Cherokee Indians regarding the Project, and also sent follow-up letters to the tribes regarding the Highway 72 re-route. No responses have been received to date. We sent our NOI and follow-up letters to these same tribes. No responses to our NOI or follow-up letters have been received from the Tribes.

In response to our NOI, we received a comment regarding the Robinson Mill, which is listed on the NRHP. The Robinson Mill lies approximately 2,700 feet from the pipeline route and is separated from the route by a forested hill/ridge. Therefore, there would be no direct or indirect impacts on the mill.

East Tennessee provided a plan to address the unanticipated discovery of historic properties and human remains during construction. We reviewed the plan and find it acceptable.

8. Air Quality

Construction and operation of the pipeline, new and modified M&R stations, and mainline valves would have impacts on air quality and noise.

The only operational emission sources associated with the Project would be fugitive releases of natural gas from the new M&R Station on the existing Tate & Lyle Plant property and along the pipeline, further described in the Operational Emissions section below.

The Clean Air Act of 1970, 42 U.S. Code 7401 et seq., amended in 1977 and 1990 (CAA), is the basic federal statute governing air quality. The provisions of the CAA that are potentially relevant to construction and operational emission sources include the following:

- National Ambient Air Quality Standards (NAAQS);
- New Source Review Standards including non-attainment New Source Review and the Prevention of the Significant Deterioration of Air Quality;
- Federal Class I Area Protection;
- New Source Performance Standards;
- National Emission Standards for Hazardous Air Pollutants including Maximum Achievable Control Technology;
- Title V (Part 70) Operating Permits (Title V);
- Chemical Accident Prevention Provisions;
- General Conformity;
- Prevention of the Significant Deterioration of Air Quality and Title V Greenhouse Gas Tailoring Rule; and
- The Greenhouse Gas Reporting Program.

The CAA designates six criteria pollutants for which standards are promulgated to protect public health and welfare. They include nitrogen oxides (NO_x, including nitrogen dioxide), carbon monoxide (CO), particulate matter less than 10 micrometers in aerodynamic diameter (PM_{10}), particulate matter less than 2.5 micrometers in aerodynamic diameter ($PM_{2.5}$), sulfur dioxide (SO_2), ozone, and lead. The NAAQS are codified in 40 CFR 50. Areas of the country in violation of the NAAQS are designated as nonattainment areas, and new sources to be located in or near these areas may be subject to more stringent air permitting requirements. Tennessee has adopted all of the NAAQS.

Air quality control regions (AQCRs) are areas established for air quality planning purposes in which implementation plans describe how ambient air quality standards would be achieved and maintained. AQCRs were established by the EPA and local agencies in accordance with Section 107 of the CAA as a means to implement the CAA and comply with the NAAQS through State Implementation Plans. The AQCRs are intra- and interstate regions such as large metropolitan areas where improvement of the air quality in one portion of the AQCR requires emission reductions throughout the AQCR. Each AQCR, or portion thereof, is designated based on compliance with the NAAQS. AQCR designations fall under three main categories as follows: "attainment" (areas in compliance with the NAAQS); "nonattainment" (areas not in compliance with the NAAQS); or "unclassifiable." Unclassifiable areas are treated as attainment areas for the purpose of permitting a stationary source of pollution. Areas that have been designated nonattainment but have since demonstrated compliance with the ambient air quality standard(s) are designated maintenance for that pollutant. Maintenance areas may be subject to more stringent regulatory requirements to ensure continued attainment of the NAAQS pollutant.

The Project would be in Loudon County, Tennessee, which is within the Eastern Tennessee-Southwestern Virginia Interstate AQCR. Loudon County is currently designated by the EPA as nonattainment for $PM_{2.5}$ (1997 and 2006 standards) and maintenance for 8-hour ozone (1997 standard).

Greenhouse gases (GHGs) occur in the atmosphere both naturally and as a result of human activities, such as the burning of fossil fuels. These gases are the integral components of the atmosphere's greenhouse effect that warms the earth's surface and moderates day/night temperature variation. In general, the most abundant GHGs are water vapor, carbon dioxide (CO_2), methane, nitrous oxide (N_2O), and ozone. The EPA has expanded its definition of air pollution to include six GHGs, finding that the presence of the following GHGs in at the atmosphere endangers public health and public welfare currently and in the future: CO_2, methane, N_2O, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.

The Project would contribute GHG emissions. The principal GHGs that would be emitted by the Project construction and operation are CO_2 and methane. Emissions of GHGs are quantified and regulated in units of carbon dioxide equivalents (CO_{2e}). The CO_{2e} unit of measure takes into account the global warming potential (GWP) of each GHG. The GWP is a ratio relative to CO_2 that is based on the properties of the GHG's ability to absorb solar radiation as well as the residence time within the atmosphere. Thus, CO_2 has a GWP of 1, methane has a GWP of 25, and N_2O has a GWP of 298. Consistent with EPA's definition of air pollution to include GHGs, emissions of GHG pollutants associated with the construction and operation of the Project are shown in tables B-14 and B-15, respectively (presented as CO_{2e} emissions). Impacts from GHG emissions (climate change) are discussed in more detail within section B.11 of this EA.

Regulatory and Permitting Requirements

As indicated in table A-6, the Tennessee Department of Agriculture, Division of Forestry requires a permit for open burning operations. East Tennessee would comply with all applicable requirements of this permit for open burning conducted during Project construction.

General Conformity

The General Conformity Rule is codified in 40 CFR 51, Subpart W and Part 93, Subpart B, Determining Conformity of General Federal Actions to State and Federal Implementation Plans. A conformity determination must be conducted by the lead federal agency if a federal action's construction and operation activities are estimated to (1) result in generating direct and indirect emissions that would exceed the conformity threshold levels (de minimis) of the pollutant(s) for which an air basin is in nonattainment or maintenance; or (2) result in generating direct and indirect emissions that would exceed 10 percent of the total emissions budget for the entire nonattainment or maintenance area.

Loudon County is currently classified by the EPA as nonattainment for $PM_{2.5}$ (1997 and 2006 standards) and maintenance for 8-hour ozone (1997 standard). Project construction emissions, summarized in table B-14, in combination with minor releases of fugitive emissions from M&R station and pipeline operation further described in the Operational Emissions section below, would fall below any applicable threshold for which general conformity would potentially apply. Therefore, the Project is not subject to a conformity determination.

Construction Emissions Impacts and Mitigation

Construction of the pipeline, M&R station, and other appurtenant Project facilities would result in combustion and fugitive dust emissions from the operation of fossil fuel-fired construction equipment and commuter and delivery vehicles. Such air quality impacts would be temporary and localized. Emissions would be generated as construction proceeds along the right-of-way, and therefore would not result in sustained impacts at any location. The construction would utilize large earth-moving equipment, cranes, trucks, and other mobile sources. Such sources would be powered by diesel or gasoline and would be sources of combustion emissions, including NO_x, CO, volatile organic compounds (VOCs, a precursor of ground-level ozone formation), SO_2, PM_{10}, $PM_{2.5}$, and hazardous air pollutants (HAPs). Combustion emissions would also include CO_2 and other GHG measured according to their global warming potential in terms of CO_{2e} emissions. The construction of the pipeline and associated facilities would likely begin in March 2016 and end in time to place the facilities in service by September 2016.

Estimated construction emissions of criteria pollutants and GHGs associated with the proposed Project are summarized in table B-14.

Table B-14: Summary of Estimated Construction Emissions (tons) a/

Construction Emission Type	VOCs	NO_x	CO	SO_2	PM_{10}	$PM_{2.5}$	HAPs	CO_{2e}
Construction vehicles and equipment	4.45	21.95	108.1	0.05	1.50	1.50	1.77	5,843.5
Fugitive dust	-	-	-	-	42.6	4.3	-	-
Open burning	3.6	0.6	20.8		2.5	2.5	b/	473.1
Commuter vehicles	0.54	1.64	13.21	0.02	0.02	0.02	0.18	1,025.9
Pipeline purging, blowdown, and loading	2.3	-	-	-	-	-	-	2,086.5
Total	**10.9**	**24.2**	**142.1**	**0.07**	**46.6**	**8.3**	**1.95**	**9,429**

a/ Construction vehicles and equipment emissions and commuter vehicle emissions were estimated using EPA MOVES emission factors. Fugitive dust emissions were estimated using factors from the Western Regional Air Partnership Fugitive Dust Handbook. Open burning emissions were estimated using EPA AP-42 emission factors (section 13, southern region). Pipeline purging, blowdown, and loading emissions were based on EPA AP-42 Appendix A (density data) and natural gas compositional data in the EPA memo "Composition of Natural Gas for use in the Oil and Natural Gas Sector," July 28, 2011.

b/ Not estimated, but some VOCs would also be classified as HAPs.

To mitigate for the Project's production of emissions during construction, East Tennessee would control fugitive dust by applying water or commercially available dust control agents on unpaved areas subject to frequent vehicle traffic.

Because East Tennessee would implement its best management practices for construction equipment maintenance and operation including proper tuning of equipment, operating equipment only on an as-needed basis, and the fugitive dust suppression methods described above, we conclude that the Project's construction would have temporary and minor impacts on air quality in the immediate vicinity of the construction sites.

Operational Emissions

Based on the number and types of valves, fittings, and connections in the Project design, potential fugitive emission releases of methane (the principal constituent of natural gas) from the M&R station and pipeline expressed in terms of CO_{2e} are estimated to be approximately 0.4 ton per year. Lesser amounts of other gas constituents, including VOCs and trace quantities of HAPs, would also be emitted in these fugitive releases. Periodic maintenance activities of the Project right-of-way in accordance with East

Tennessee E&SCP would result in highly localized emissions from operation of maintenance vehicles and other fossil fuel-fired equipment (brush cutters, mowers, etc.). We conclude that the Project's operation and maintenance would have a negligible impact on the regional airshed.

Non-Jurisdictional Facilities

Table B-15 summarizes the approximate net change in emissions of criteria pollutants, HAPs, and CO_{2e} from operation of the Tate & Lyle Plant after it converts from coal to natural gas.

Table B-15: Potential Net Change in Emissions from the Tate & Lyle Plant after the Anticipated Modifications (tons per year) a/, c/

	VOCs	NO_x	CO	SO_2	PM_{10}	HAPs	CO_{2e}
Combustion emissions – existing facility (existing potential)	407.8	997.3	457.2	1682.1	334.5	b/	**304,324** c/
Combustion emissions – (future potential)	413.3	640.0	531.6	246.9	283.7	b/	**514,554** c/
Potential net change in emissions	**+5.5**	**-357.3**	**+74.4**	**-1,435.1**	**-50.8**	b/	**+210,230** c/

a/ Based on information reported by East Tennessee through its communications with Tate & Lyle. Estimates include both combustion and non-combustion emission sources more fully described in the Title V air permit number 561515 issued by the Tennessee Air Pollution Control Board (TAPCB) for the Tate & Lyle Plant as amended May 1, 2014. These emission estimates are for informational purposes only and do not contradict any determination made by the TAPCB.

b/ Not determined from the information provided in East Tennessee's application and responses; a fraction of combustion-generated VOC emissions are also likely classified as HAPs. Based on information on the Tate & Lyle Plant operations found in its current Title V facility permit, most VOC emissions from the facility likely consist of alcohols (including biomass-derived ethanol and propanediol) and other non-HAPs VOCs.

c/ CO_{2e} emission rates and net CO_{2e} emission increase are based on existing boilers 1 and 2 (proposed for permanent shutdown) and the proposed CoGen plant, and are obtained from the Title V permit application and associated major NSR applicability analysis submitted by Tate & Lyle to the TAPCB for the proposed CoGen plant.

9. Noise

Two measurements used by some federal agencies to relate the time-varying quality of environmental noise to its known effects on people are the equivalent sound level (L_{eq}) and the day-night sound level (L_{dn}). The L_{eq} is an A-weighted sound level in decibels (dB) containing the same sound energy as the instantaneous sound levels measured over a specific time period. Noise levels are perceived differently, depending on length of exposure and time of day. The L_{dn} takes into account the duration and time the noise is encountered. Late night and early morning (10:00 pm to 7:00 am) noise exposures are penalized +10 dB to account for people's greater sensitivity to sound during the nighttime hours.

In 1974, the EPA published its *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*. This

document provides information for state and local governments to use in developing their own ambient noise standards. The EPA has indicated that an L_{dn} of 55 decibels on the A-weighted scale (dBA) protects the public from indoor and outdoor activity interference. We have adopted this criterion and use it to evaluate the potential noise impact from the operation of facilities.

9.1 Construction Noise Impacts and Mitigation

Construction of the Project would require operation of various kinds of construction equipment (e.g., large earth-moving equipment, cranes, trucks, and sidebooms). Operation of this equipment would generate intermittent and varying levels of noise throughout the anticipated March through September 2016 construction timeframe. Typical (non-HDD) construction activities would take place primarily during daytime hours. Therefore, we expect that noise from these typical construction activities would result in minor and insignificant impacts on nearby noise-sensitive areas (NSAs).

HDD-related construction activities have the potential to operate and produce sustained noise levels for up to 24 hours per day for potentially several days. Table B-16 summarizes the predicted noise level contributions and estimated durations that would result from the proposed HDDs at nearby NSAs. Predicted noise levels incorporate East Tennessee's proposed mitigation measures.

Table B-16: Proposed HDD Noise Impacts at Nearby NSAs Within 0.5 Mile

HDD Crossing	Entry or Exit Point	Estimated Duration of HDD Activities (days)	Distance (feet) and Direction to nearest NSA	Existing Ambient Sound Level (L_{dn}, dBA) a/	Est. HDD Contrib-ution (L_{dn}, dBA)	Total Average Noise Level (L_{dn}, dBA)	Increase Above Ambient (dB)
Tellico Lake (HDD 1)	Entry	83	680 SE	53.1	52.0	55.6	+2.5
	Exit		560 NNE	53.1	51.4	55.3	+2.2
Tellico Lake (HDD 2)	Entry	28	480 SE	43.5	51.6	52.2	+8.7
	Exit		150 S	44.5	53.5	54.0	+9.5
Tennessee River (HDD 3)	Entry	42	2,380 SSW	56.1	47.9	56.7	+0.6
	Exit		950 SW	56.1	46.3	56.5	+0.4

a/ Based on ambient noise surveys performed in 2015.

As shown in table B-16, all HDD noise contributions at nearby NSAs would fall below an L_{dn} of 55 dBA. The human ear's threshold of perception for noise change is considered to be 3 dBA; 6 dBA is clearly noticeable to the human ear; and 9 dBA is perceived to be a doubling of noise. Therefore, the NSAs nearest the HDD 2 entry and exit points may experience at least a perceived doubling of noise. Noise increases at the other nearby NSAs would not be perceptible.

East Tennessee's noise analysis proposes several means by which to mitigate for noise at nearby NSAs attributable to the HDD 1 and HDD 2 entry points and the HDD 2 exit point. To meet the predicted noise levels shown in table B-16, East Tennessee would need to employ the following mitigation measures:

HDD 1 entry point:

- a 16-foot-high partial enclosure constructed of sound-absorptive/barrier material with a minimum sound transmission class 20-31 rating around three sides of the hydraulic power unit associated with the drilling rig;
- a partial enclosure for unenclosed engines; and
- an exhaust silencer having a 20 to 25 dBA attenuation on all engines.

HDD 2 entry point:

- a 16-foot-high partial enclosure constructed of sound-absorptive/barrier material with a minimum sound transmission class 20-31 rating around three sides of the hydraulic power unit associated with the drilling rig;
- a temporary 16-foot-high, 150 to 200-foot-long noise barrier with blanket material having a minimum sound transmission class 20-31 rating between the south and east sides of the HDD exit site workspace and the closest NSA;
- a diesel generator designed with a factory-installed acoustical enclosure for the mud/cleaning system; and
- an exhaust silencer having a 20 to 25 dBA attenuation on all engines.

HDD 2 exit point:

- a diesel generator designed with a factory-installed acoustical enclosure for the mud/cleaning system; and
- an exhaust silencer having a 20 to 25 dBA attenuation on all engines.

To ensure that the noise from HDD operations does not exceed the predicted levels in table B-16, **we recommend that:**

- **East Tennessee should employ the noise mitigation measures identified in its noise survey analysis, or others as necessary, at the HDD 1 entry point and the HDD 2 entry and exit points to limit noise to the predicted levels.**

East Tennessee identified three residences within 25 feet of construction workspaces. To mitigate for potential construction-related noise and vibration impacts on these residences and associated structures, East Tennessee would notify homeowners in advance of planned construction activities. If the construction noise and vibration levels are determined to be unacceptable by the homeowner, East Tennessee would implement specific additional mitigation measures such as placing a noise barrier between the

workspace and affected home(s). If necessary, vibration levels and potential vibration-related activities would be monitored to ensure that the vibration levels do not cause damage to structures. If the construction noise/vibration levels are still unacceptable to the residents after any additional mitigation measures are employed, East Tennessee would discuss additional temporary mitigation options with the homeowners including temporary relocation.

We conclude that Project construction would result in short term and minor impacts on nearby NSAs, and noise levels would revert to previous levels following active Project construction activities.

9.2 Operational Noise Impacts

The only source of noise during normal Project operation is the proposed M&R station. The full-load noise contribution of the M&R station at the nearest NSA, about 2,230 feet south-southwest of the meter station site, is predicted not to exceed 37.0 dBA, well below existing ambient noise levels. We conclude that operation of the proposed M&R station would result in little to no noise contributions at the nearest and other nearby NSAs.

The proposed mainline valves at the Tate & Lyle Plant and at MP 0.0 would not result in noise during normal operation but could contribute noise at any nearby NSAs during an emergency blowdown event. Such blowdown events would be extremely infrequent and possibly nonexistent. No NSAs are within 0.25 mile of the valve at the Tate & Lyle Plant. NSAs are approximately 450 feet south-southeast and 530 feet northeast of the valve at MP 0.0. During a blowdown event for the valve at MP 0.0, noise is predicted not to exceed an L_{dn} of 55 dBA. Due to the distance between the Tate & Lyle Plant and the nearest NSA (at least 0.25 mile away), we expect that a blowdown event would result in a minimal noise impact at any nearby NSAs. Therefore, we conclude that noise impacts from operation of the Project mainline valves would be minimal.

We expect modifications to existing meter station 59039 on the Loudon-Lenoir City Lateral Line 3218-D-100 including installation of a new pressure regulator to add minimally (if at all) to existing noise levels generated by the station.

Other operational noise impacts would include occasional vehicular travel on permanent access roads for operation of mowing equipment related to right-of-way maintenance conducted in accordance with our Plan and Procedures as well as other inspection activities.

We conclude that normal operation and maintenance activities of the Project would result in minimal, and for most time periods indiscernible, noise impacts at nearby NSAs.

10. Reliability and Safety

The transportation of natural gas by pipeline involves some incremental risk to the public due to the potential for accidental release of natural gas. The greatest hazard is a fire or explosion following a major pipeline rupture.

Methane, the primary component of natural gas, is colorless, odorless, and tasteless. It is not toxic, but is classified as a simple asphyxiate, possessing a slight inhalation hazard. If breathed in high concentration, oxygen deficiency can result in serious injury or death.

Methane has an auto-ignition temperature of 1,000 ºF and is flammable at concentrations between 5.0 percent and 15.0 percent in air. An unconfined mixture of methane and air is not explosive; however, it may ignite and burn if there is an ignition source. A flammable concentration within an enclosed space in the presence of an ignition source can explode. It is buoyant at atmospheric temperatures and disperses rapidly in air.

A landowner expressed concerns that odorants that may be added to the natural gas transported in the pipeline could pose a health risk to sensitive individuals. The odorant most commonly used for natural gas detection is a mercaptan liquid, and is added to natural gas in very minute (parts per billion) quantities before the gas reaches the consumer. Typically, odorants are added by local natural gas distributors rather than natural gas transmission operators. The natural gas transmitted by the Project would not contain any odorants.

10.1 Safety Standards

The DOT is mandated to prescribe minimum safety standards to protect against risks posed by pipeline facilities under Title 49, U.S. Code Chapter 601. The DOT pipeline standards are published in 49 CFR Parts 190-199. Part 192 specifically addresses natural gas pipeline safety issues. The DOT's Pipeline and Hazardous Materials Safety Administration (PHMSA) administers the national regulatory program to ensure the safe transportation of natural gas and other hazardous materials by pipeline. It develops safety regulations and other approaches to risk management that ensure safety in the design, construction, testing, operation, maintenance, and emergency response of pipeline facilities. Many of the regulations are written as performance standards which set the level of safety to be attained and allow the pipeline operator to use various technologies to achieve safety. PHMSA's safety mission is to ensure that people and the

environment are protected from the risk of pipeline incidents. This work is shared with state agency partners and others at the federal, state, and local level.

Title 49, U.S. Code Chapter 601 provides for a state agency to assume all aspects of the safety program for intrastate facilities by adopting and enforcing the federal standards. A state may also act as DOT's agent to inspect interstate facilities within its boundaries; however, East Tennessee does not have delegated authority to inspect interstate pipeline facilities. The DOT is responsible for enforcement actions.

Under a Memorandum of Understanding on Natural Gas Transportation Facilities dated January 15, 1993, between the DOT and the FERC, the DOT has the exclusive authority to promulgate federal safety standards used in the transportation of natural gas. Section 157.14(a)(9)(vi) of the FERC's regulations require that an applicant certify that it will design, install, inspect, test, construct, operate, replace, and maintain the facility for which a Certificate is requested in accordance with federal safety standards and plans for maintenance and inspection. Alternatively, an applicant must certify that it has been granted a waiver of the requirements of the safety standards by the DOT in accordance with section 3(e) of the Natural Gas Pipeline Safety Act. The FERC accepts this certification and does not impose additional safety standards. If the Commission becomes aware of an existing or potential safety problem, there is a provision in the Memorandum to promptly alert DOT. The Memorandum also provides for referring complaints and inquiries made by state and local governments and the general public involving safety matters related to pipelines under the Commission's jurisdiction.

The FERC also participates as a member of the DOT's Technical Pipeline Safety Standards Committee which determines if proposed safety regulations are reasonable, feasible, and practicable.

The pipeline and aboveground facilities associated with the Project must be designed, constructed, operated, and maintained in accordance with the DOT Minimum Federal Safety Standards in 49 CFR 192. The regulations are intended to ensure adequate protection for the public and to prevent natural gas facility accidents and failures. The DOT specifies material selection and qualification; minimum design requirements; and protection from internal, external, and atmospheric corrosion.

The DOT also defines area classifications, based on population density in the vicinity of the pipeline, and specifies more rigorous safety requirements for populated areas. The class location unit is an area that extends 220 yards on either side of the centerline of any continuous 1-mile length of pipeline. The four area classifications are defined below:

Class 1	Location with 10 or fewer buildings intended for human occupancy.
Class 2	Location with more than 10 but less than 46 buildings intended for human occupancy.
Class 3	Location with 46 or more buildings intended for human occupancy or where the pipeline lies within 100 yards of any building, or small well-defined outside area occupied by 20 or more people on at least 5 days a week for 10 weeks in any 12-month period.
Class 4	Location where buildings with four or more stories aboveground are prevalent.

Class locations representing more populated areas require higher safety factors in pipeline design, testing, and operation. For instance, pipelines constructed on land in Class 1 locations must be installed with a minimum depth of cover of 30 inches in normal soil and 18 inches in consolidated rock. Class 2, 3, and 4 locations, as well as drainage ditches of public roads and railroad crossings, require a minimum cover of 36 inches in normal soil and 24 inches in consolidated rock.

Class locations also specify the maximum distance to a sectionalizing block valve (e.g., 10.0 miles in Class 1, 7.5 miles in Class 2, 4.0 miles in Class 3, and 2.5 miles in Class 4). Pipe wall thickness and pipeline design pressures; hydrostatic test pressures; maximum allowable operating pressure (MAOP); inspection and testing of welds; and frequency of pipeline patrols and leak surveys must also conform to higher standards in more populated areas. Preliminary class locations for the Loudon Expansion Project have been developed based on the relationship of the pipeline centerline to other nearby structures and manmade features. Accordingly, the Project would consist of approximately 7.6 miles of Class 1, 2.6 miles of Class 2, and 0.03 mile of Class 3 pipe.

If a subsequent increase in population density adjacent to the right-of-way results in a change in class location for the pipeline, East Tennessee would reduce the MAOP or replace the segment with pipe of sufficient grade and wall thickness, if required to comply with the DOT requirements for the new class location.

The DOT Pipeline Safety Regulations require operators to develop and follow a written integrity management program that contain all the elements described in 49 CFR 192.911 and address the risks on each transmission pipeline segment. The rule establishes an integrity management program which applies to all high consequence areas (HCAs).

The DOT has published rules that define HCAs where a gas pipeline accident could do considerable harm to people and their property and requires an integrity

management program to minimize the potential for an accident. This definition satisfies, in part, the Congressional mandate for DOT to prescribe standards that establish criteria for identifying each gas pipeline facility in a high-density population area.

The HCAs may be defined in one of two ways. In the first method an HCA includes:

- current class 3 and 4 locations;
- any area in Class 1 or 2 where the potential impact radius[15] is greater than 660 feet and there are 20 or more buildings intended for human occupancy within the potential impact circle[16]; or
- any area in Class 1 or 2 where the potential impact circle includes an identified site.

An identified site is an outside area or open structure that is occupied by 20 or more persons on at least 50 days in any 12-month period; a building that is occupied by 20 or more persons on at least 5 days a week for any 10 weeks in any 12-month period; or a facility that is occupied by persons who are confined, are of impaired mobility, or would be difficult to evacuate.

In the second method, an HCA includes any area within a potential impact circle which contains:

- 20 or more buildings intended for human occupancy; or
- an identified site.

Once a pipeline operator has determined the HCAs along its pipeline, it must apply the elements of its integrity management program to those segments of the pipeline within HCAs. The DOT regulations specify the requirements for the integrity management plan at section 192.911. Of the approximately 10.2 miles of proposed pipeline, East Tennessee identified one HCA along the pipeline route. The pipeline integrity management rule for HCAs requires inspection of the pipeline HCAs every 7 years.

The DOT prescribes the minimum standards for operating and maintaining pipeline facilities, including the requirement to establish a written plan governing these activities. Each pipeline operator is required to establish an emergency plan that includes procedures to minimize the hazards of a natural gas pipeline emergency. Key elements of the plan include procedures for:

[15] The potential impact radius is calculated as the product of 0.69 and the square root of: the MAOP of the pipeline in pounds per square inch gauge multiplied by the square of the pipeline diameter in inches.
[16] The potential impact circle is a circle of radius equal to the potential impact radius.

- receiving, identifying, and classifying emergency events, gas leakage, fires, explosions, and natural disasters;
- establishing and maintaining communications with local fire, police, and public officials, and coordinating emergency response;
- emergency system shutdown and safe restoration of service;
- making personnel, equipment, tools, and materials available at the scene of an emergency; and
- protecting people first and then property, and making them safe from actual or potential hazards.

The DOT requires that each operator establish and maintain liaison with appropriate fire, police, and public officials to learn the resources and responsibilities of each organization that may respond to a natural gas pipeline emergency, and to coordinate mutual assistance. The operator must also establish a continuing education program to enable customers, the public, government officials, and those engaged in excavation activities to recognize a gas pipeline emergency and report it to appropriate public officials. East Tennessee would provide the appropriate training to local emergency service personnel before the pipeline is placed in service.

10.2 Pipeline Accident Data

The DOT requires all operators of natural gas transmission pipelines to notify the DOT of any significant incident and to submit a report within 30 days. Significant incidents are defined as any leaks that:

- caused a death or personal injury requiring hospitalization; or
- involve property damage of more than $50,000 (1984 dollars)[17].

During the 20 year period from 1994 through 2013, a total of 1,237 significant incidents were reported on the more than 300,000 total miles of natural gas transmission pipelines nationwide.

Additional insight into the nature of service incidents may be found by examining the primary factors that caused the failures. Table B-17 provides a distribution of the causal factors as well as the number of each incident by cause.

The dominant causes of pipeline incidents are corrosion and pipeline material, weld or equipment failure constituting 48.2 percent of all significant incidents. The pipelines included in the data set in table B-17 vary widely in terms of age, diameter, and

[17] $50,000 in 1984 dollars is approximately $115,000 as of March, 2014 (CPI, Bureau of Labor Statistics, February, 2014).

level of corrosion control. Each variable influences the incident frequency that may be expected for a specific segment of pipeline.

Table B-17: Natural Gas Transmission Pipeline Significant Incidents by Cause - a/ 1994-2013		
Cause	**No. of Incidents**	**Percentage**
Corrosion	292	23.6
Excavation b/	211	17.0
Pipeline material, weld or equipment failure	304	24.6
Natural force damage	142	11.5
Outside force c/	74	6.0
Incorrect operation	33	2.7
All other causes d/	181	14.6
TOTAL	1,237	-

a/ All data gathered from PHMSA significant incident files, March 25, 2014. http://primis.phmsa.dot.gov/comm/reports/safety/

b/ Includes third party damage

c/ Fire, explosion, vehicle damage, previous damage, intentional damage

d/ Miscellaneous causes or unknown causes

The frequency of significant incidents is strongly dependent on pipeline age. Older pipelines have a higher frequency of corrosion incidents and material failure, since corrosion and pipeline stress/strain is a time-dependent process.

The use of both an external protective coating and a cathodic protection system[18], required on all pipelines installed after July 1971, significantly reduces the corrosion rate compared to unprotected or partially protected pipe.

Outside force, excavation, and natural forces are the cause in 34.5 percent of significant pipeline incidents. These result from the encroachment of mechanical equipment such as bulldozers and backhoes; earth movements due to soil settlement, washouts, or geologic hazards; weather effects such as winds, storms, and thermal strains; and willful damage. Table B-18 provides a breakdown of outside force incidents by cause.

Older pipelines have a higher frequency of outside forces incidents partly because their location may be less well known and less well marked than newer lines. In addition, the older pipelines contain a disproportionate number of smaller-diameter pipelines; which have a greater rate of outside forces incidents. Small diameter pipelines are more easily crushed or broken by mechanical equipment or earth movement.

[18] Cathodic protection is a technique to reduce corrosion (rust) of the natural gas pipeline through the use of an induced current or a sacrificial anode (like zinc) that corrodes at faster rate to reduce corrosion.

Since 1982, operators have been required to participate in "One Call" public utility programs in populated areas to minimize unauthorized excavation activities in the vicinity of pipelines. The "One Call" program is a service used by public utilities and some private sector companies (e.g., oil pipelines and cable television) to provide preconstruction information to contractors or other maintenance workers on the underground location of pipes, cables, and culverts.

Table B-18: Outside Forces Incidents by Cause – 1994-2013		
Cause	**No. of Incidents**	**Percent of all Incidents**
Third party excavation damage	176	14.2
Operator excavation damage	25	2.0
Unspecified excavation damage/previous damage	10	0.8
Heavy rain/floods	72	5.8
Earth movement	35	2.8
Lightning/temperature/high winds	21	1.7
Natural force (other)	14	1.1
Vehicle (not engaged with excavation)	45	3.6
Fire/explosion	8	0.6
Previous mechanical damage	5	0.4
Fishing or maritime activity	7	0.6
Intentional damage	1	0.1
Electrical arcing from other equipment/facility	1	0.1
Unspecified/other outside force	7	0.6
TOTAL	**427**	**-**

10.3 Impact on Public Safety

The service incidents data summarized in table B-18 include pipeline failures of all magnitudes with widely varying consequences.

Table B-19 presents the average annual injuries and fatalities that occurred on natural gas transmission lines for the 5 year period between 2009 and 2013. The majority of fatalities from pipelines are due to local distribution pipelines not regulated by FERC. These are natural gas pipelines that distribute natural gas to homes and businesses after transportation through interstate natural gas transmission pipelines. In general, these distribution lines are smaller diameter pipes and/or plastic pipes which are more susceptible to damage. Local distribution systems typically do not have large rights-of-way and pipeline markers common to the FERC regulated natural gas transmission pipelines.

Table B-19: Injuries and Fatalities – Natural Gas Transmission Pipelines		
Year	Injuries	Fatalities
2009	11	0
2010 [a/]	61	10
2011	1	0
2012	7	0
2013	2	0
a/ All of the fatalities in 2010 were due to the Pacific Gas and Electric pipeline rupture and fire in San Bruno, California on September 9, 2010.		

The nationwide totals of accidental fatalities from various anthropogenic and natural hazards are listed in table B-20 in order to provide a relative measure of the industry-wide safety of natural gas transmission pipelines. Direct comparisons between accident categories should be made cautiously, however, because individual exposures to hazards are not uniform among all categories. The data nonetheless indicate a low risk of death due to incidents involving natural gas transmission pipelines compared to the other categories. Furthermore, the fatality rate is much lower than the fatalities from natural hazards such as lightning, tornados, or floods.

The available data show that natural gas transmission pipelines continue to be a safe, reliable means of energy transportation. From 1994 to 2013, there were an average of 62 significant incidents, 10 injuries, and 2 fatalities per year. The number of significant incidents over the more than 303,000 miles of natural gas transmission lines indicates the risk is low for an incident at any given location. The operation of the Project would represent a slight increase in risk to the nearby public.

Table B-20: Nationwide Accidental Deaths [a/]	
Type of Accident	**Annual No. of Deaths**
All accidents	117,809
Motor Vehicle	45,343
Poisoning	23,618
Falls	19,656
Injury at work	5,113
Drowning	3,582
Fire, smoke inhalation, burns	3,197
Floods [b/]	89
Tractor Turnover [c/]	62
Lightning [b/]	54
Natural gas distribution lines [d/]	14
Natural gas transmission pipelines [d/]	2
a/ All data, unless otherwise noted, reflect 2005 statistics from U.S. Census Bureau, Statistical Abstract of the United States: 2010 (129th Edition) Washington, DC, 2009; http://www.census.gov/statab.	
b/ NOAA National Weather Service, Office of Climate, Water and Weather Services, 30 year average (1983-2012) http://www.weather.gov/om/hazstats.shtml.	
c/ Bureau of Labor Statistics, 2007 Census of Occupational Injuries.	
d/ PHMSA significant incident files, March 25, 2014. http://primis.phmsa.dot.gov/comm/reports/safety/, 20 year average.	

11. Cumulative Impacts

In accordance with NEPA and FERC policy, we evaluated the cumulative impacts of the Project and other projects in the area. Cumulative impacts are the environmental effects that result from the incremental effects of two or more projects occurring in the same general area within a concerted timeframe. Cumulative impacts may result from individually minor, but collectively significant, actions that occur in the same location over a given period of time. Even though certain projects may not occur at the same time or even years apart, their impacts may be of such duration that overlaying the incremental effects of each could result in a greater cumulative impact.

We based our cumulative impacts analysis on the guidance set forth by CEQ (1997) and the EPA (USEPA 1999). When evaluating potential cumulative impacts, we considered environmental effects associated with the proposed action added to impacts associated with projects in the past, present, or reasonably foreseeable future in the same region of influence (ROI). The cumulative impacts analysis includes actions meeting the following three criteria:

- impact a resource area also potentially impacted by the Loudon Expansion Project;
- cause this impact within all or part of the Loudon Expansion Project area; and
- cause this impact within all, or part of the time span for the potential impacts from the Loudon Expansion Project.

The actions considered in the cumulative impact analysis may vary from the Loudon Expansion Project in nature, magnitude, and duration. Only projects with either ongoing impacts or "reasonably foreseeable" future actions were evaluated. We further considered existing or reasonably foreseeable actions expected to affect similar resources during similar time periods with the Loudon Expansion Project. For this analysis, the ROI ranges from 0.25-0.5 mile from the Loudon Expansion Project to the county or watershed in which the Project is located, up to a 31-mile radius around the Project depending on the resource affected.

East Tennessee contacted the Loudon County Planning and Codes Enforcement Office, Monroe County Planning Department, Monroe County Economic Development Office, and Tellico Reservoir Development Authority to identify recently completed, present, and future major construction projects that either have occurred or may occur within the Loudon Expansion Project area during the Project's anticipated construction timeframe.

Three projects were identified as being within the ROI for the Loudon Expansion Project or otherwise potentially contributing to cumulative impacts (table B-21). The new natural gas fueled combined cycle electric power plant at the Tate & Lyle Plant is within the 0.25 mile ROI for construction impacts. Tate & Lyle began construction of the new power plant September 2015. The plant is being constructed on a 3-acre parcel within the 194-acre Tate & Lyle facility. Commissioning activities for the new plant are expected to begin in August 2016 and continue through September 2016. Full operation is expected by late September 2016.

Table B-21: Projects with Potential Cumulative Impacts on Resources Within the Loudon Expansion Project Area

County	Project Sponsor/ Project	Description	Project Status
Loudon	Tate & Lyle Ingredients Americas, LLC New Natural Gas Power Plant	Located at MP 10.2 of the Loudon Expansion Project, Tate & Lyle Ingredients Americas, LLC is installing a new natural gas fueled combined cycle electric power plant that consists of two new cogeneration units, each with a natural gas fired combustion turbine and natural gas fired heat recovery steam generator. Tate & Lyle will also convert the Plant's existing coal fired boilers to natural gas and maintain them in a backup status.	Ongoing (since September 2015) with an estimated completion date of September 2016
	Tennessee Department of Transportation Widening of State Route 73	State Road 73 road widening project located approximately 5 miles northeast of the Loudon Expansion Project. Widening project includes the construction of three bridges: 1) concrete I- beam over Norfolk Southern railroad, 2) welded steel girder across the Tennessee River; and 3) welded steel girder parallel to the existing bridge over Tellico Canal. The project also includes dismantling of the existing J. Carmichael Greer Bridge over the dam.	Ongoing (since June 2012) with an estimated completion date of June 2016.
Monroe	Havco Wood Products, LLC Plant Expansion	Located approximately 2.5 miles south of the Project, Havco Wood Products is expanding a plant at the Nile Ferry Industrial Park. The planned expansion is occurring on previously cleared area within the industrial park.	Ongoing (since September 2015) with an estimated completion date of March 2016.

The Tennessee Department of Transportation (TDOT) widening of State Road 73 and Havco Wood Products, LLC Plant Expansion are within the county ROI for construction impacts for traffic. Beginning in June 2012, the multi-year TDOT project includes construction of new, wider bridges and destruction of older bridges, with an estimated completion date of June 2016. The Havco Wood Products, LLC Plant Expansion would also be within the 31-mile radius ROI for operational impacts. Beginning in September 2015, the wood floor manufacturer is expanding its existing plant within a previously cleared area of an industrial park and expects project completion by March 2016.

Because construction of the new Tate & Lyle Power Plant would be limited to a 3-acre site within the manufacturer's existing 194-acre industrial site, there would be no changes to groundwater, land use, visual resources, or vegetation; and no impacts on wetlands, fisheries, wildlife, or federal- and state-listed threatened and endangered species. Therefore, there would be no cumulative impacts on those resources. The evaluation of cultural resources for East Tennessee's Project included pedestrian surveys within the Tate & Lyle facility boundary where conditions did not warrant additional investigation. As stated in section B.7, the FERC, in consultation with the Tennessee SHPO, has determined that no historic properties would be affected by the Loudon Expansion Project. Therefore, there would not be cumulative impacts on historic properties[19].

Cumulative impacts on geology, soils, water resources, traffic, and air quality and noise are discussed below, as applicable.

Geology and Soils

The region of influence considered for cumulative impacts on geology and soils is 0.25 mile from the Loudon Expansion Project. Grading and other temporary ground disturbance activities associated with construction have the potential to affect near-surface geologic resources and soils through wind and water erosion, blasting, and poor post-construction soil stabilization and restoration. Permanent impacts would occur if land were converted to impervious surfaces. Cumulative impacts on soils could occur if two or more projects are constructed concurrently or if one project re-disturbs an area that had been previously stabilized and restored by another project. The East Tennessee and Tate & Lyle projects would occur concurrently.

Construction associated with the Loudon Expansion Project would result in temporary and minor impacts on near-surface geology and soils, as discussed in section B.1. The overlap between this Project and the new Tate & Lyle Power Plant would occur where the pipeline would connect to the power plant at MP 10.2. Cumulative impacts are expected to be minor because the construction workspaces would overlap within an existing industrial area. As discussed in section A.8.1, East Tennessee would implement our recommendations, its E&SCP, and SPCC Plan to minimize effects of erosion and sedimentation during construction. Construction on Tate & Lyle facility requires permits that include erosion and sediment control measures; therefore, we conclude that cumulative impacts on geological resources and soils would not be significant.

[19] We note that the TVA section 106 consultation is pending.

Water Resources

The region of influence considered for cumulative impacts on water resources is the Watts Bar Lake Watershed, which contains both the Loudon Expansion and Tate & Lyle projects, as impacts within waters could migrate downstream within the watershed. The health of a water system and cumulative impacts are both traditionally assessed on a watershed level.

The Tate & Lyle project and interconnecting piping involves grading and other ground disturbing activities that have the potential to affect surface water within the watershed crossed by the proposed Loudon Expansion Project. However, we note that the location of the 3-acre site for the Tate & Lyle Power Plant is approximately 400 feet from the Tennessee River, making direct impacts on this waterbody highly unlikely. There are no surface waterbodies on the Tate & Lyle industrial site. The construction of both projects do have the potential to affect surface water through indirect impacts associated with improper erosion control devices and increased pollutants due to the potential for leaks and spills.

The Tate & Lyle Project would be required would be required by various federal, state, and local agencies to use mitigation measures to minimize erosion and sedimentation into surface water resources and to implement measures, such as a project-specific Integrated Pollution Prevention Plan and an Integrated Contingency Plan, to contain and remediate any spills that could potentially affect groundwater resources; therefore, we conclude that cumulative impacts on surface resources would not be significant.

Traffic

The region of influence considered for cumulative impacts on roadway traffic includes Loudon and Monroe Counties as truck deliveries to and construction worker commuter traffic to and from all four projects - the Loudon Expansion Project, the Tate & Lyle new power plant, the Havco Wood Products, LLC Plant Expansion, and the TDOT widening of State Route 73 – as they would occur concurrently. While roadways in the area could experience a noticeable increase in daily vehicle trips as the result of material and equipment deliveries and commuting workers during construction, the traffic increase is expected to be intermittent, short term, and localized. Any road closures or lane restrictions would be coordinated with county officials to ensure adequate flow of traffic, and access for emergency vehicles would be maintained. During operation, traffic would return to pre-construction volumes as additional workers are not expected to be hired for the projects.

Air Quality and Noise

Noise from operation of aboveground facilities (e.g., the proposed M&R station) typically has an ROI of 1 mile, although the greatest potential for cumulative construction-related noise impacts occurs within an ROI of 0.25 mile from the Project construction sites. Air emissions from operational sources have the greatest potential to be cumulative within an ROI of 50 kilometers (approximately 31 miles).

The Tate & Lyle Project is the only other project we identified within the 0.25-mile construction ROI that could be constructed concurrently with the Loudon Expansion Project. Project construction air emissions and noise could cumulatively add to air emissions and noise associated with the Tate & Lyle construction activities.[20]

The Loudon Expansion Project's construction air quality and noise impacts would be temporary, intermittent, short-term, and localized. Project pipeline construction would proceed along the construction right-of-way and not take place at a single location for extended periods. HDD-related construction activities, however, have the potential to operate and produce sustained noise levels for up to 24 hours per day for potentially several days. Although construction activities associated with the proposed M&R station and the Power Plant could occur concurrently on the Tate & Lyle property over a period of weeks to months, no nearby residences would be affected.

Although the new power plant at Tate & Lyle is a non-jurisdictional facility in respect to the proposed Project, the Loudon Expansion Project would nevertheless affect emission rates, which in turn result in cumulative air impacts when combined with other air emissions sources. A facility operated by Havco Wood Products, LLC (Havco facility), approximately 2.5 miles south of the Tate & Lyle Plant, is currently undergoing an expansion. As illustrated in table B-15, the operational emissions of CO from the Tate & Lyle Plant could potentially increase by approximately 74 tons per year after the Power Plant facility addition (the potential increase in VOC emissions would be minor). The CO emissions increase could cumulatively add to any operational CO emissions generated by the modified Havco facility; however, considering the distance between these two facilities, the cumulative impact would be negligible and far below any applicable air quality standard. Further, as summarized in table B-15, the modifications to the Tate & Lyle Plant would decrease the Plant's potential to emit the criteria pollutants NO_x, SO_2, and PM_{10}, thereby offsetting potential emission increases of those respective pollutants that may result from the Havco facility's expansion and improving regional air quality.

[20] Project construction and non-jurisdictional power plant facility construction could also result in increased traffic emissions on shared roadways in and around the respective construction sites during these overlapping periods.

Noise from the proposed operation of the M&R station and Power Plant facility would cumulatively add to existing operational noise sources at the Tate & Lyle Plant; however, due to the distance between the nearest NSA and the M&R station, Power Plant facility, and greater Tate & Lyle Plant (approximately 2,300 feet), we expect noise from these new facilities to produce only a minor (and most likely indiscernible) increase in ambient noise levels at this NSA.

We conclude that cumulative air quality and noise impacts attributable to the Project's construction and operation would be minimal.

Climate Change

The GHG emissions associated with the Project were previously discussed in section B.8 of this EA. Currently there is no standard methodology to determine how the incremental contribution of GHGs from any project or other activity would translate into physical effects on the global environment. The emissions from the East Tennessee and Tate & Lyle's projects' construction and operation would collectively increase the atmospheric concentration of GHGs, in combination with past and future emissions from all other sources, and contribute incrementally to climate change.[21]

[21] In May 2014, the U.S. Global Change Research Program issued its Third National Climate Assessment Report, Climate Change Impacts in the United States, summarizing the impacts that climate change has already had on the United States and what projected impacts by source may have in the future. This report can be accessed at http://nca2014.globalchange.gov/downloads

C. ALTERNATIVES

In accordance with NEPA and Commission policy, we considered alternatives to the proposed action, including the no-action alternative, system alternatives, and major route alternatives for the pipeline. Because two of the three aboveground facilities – the new meter facility within the Tate & Lyle Plant at MP 10.2 and the pressure regulator at Meter Station 59039 on East Tennessee's existing Loudon-Lenoir City Lateral Line 3218D-100 – would be constructed within previously disturbed and cleared land on industrial sites, and their construction and operation would result in minimal impacts on all environmental resource areas, we did not evaluate any alternative sites for these aboveground facilities. The location of the third aboveground facility – the mainline valve at MP 0.0 connecting the proposed Loudon Mainline Extension to East Tennessee's existing 3200 mainline – represents the take-off point of the proposed pipeline. Therefore, any alteration of this interconnect would result in an entirely different pipeline route and thus would be included as part of a major route alternative discussion.

We evaluated each alternative to determine whether it would be reasonable and environmentally preferable to the proposed action. The evaluation criteria for selecting alternatives are:

- technical and economic feasibility and practicality;
- significant environmental advantages over the Project; and
- meeting the objectives of the Project (i.e., providing Tate & Lyle with approximately 40,000 Dth/d of new firm transportation service).

1. No-Action Alternative

Under the no-action alternative, East Tennessee would not implement the proposed action, thus avoiding the potential environmental impacts associated with the Project; however, the Project objectives would not be met.

Although a Commission decision to deny the proposed action would avoid the environmental impacts addressed in this EA, other natural gas companies could construct projects in substitute for the natural gas supplies offered by East Tennessee. Such alternative projects could require the construction of additional and/or new pipeline facilities in the same or other locations to transport the gas volumes proposed by the Project. These projects would result in their own set of specific environmental impacts that could be equal to or greater than those described for the current proposal.

Although it is speculative and beyond the scope of this analysis to predict what action might be taken by policymakers or end users in response to the no-action alternative, it is possible that Tate & Lyle could suspend construction of its new natural

gas fueled combined cycle electric power plant and continue to operate the coal-fired boilers it had shut down. Tate & Lyle could also be forced to find alternate means to power its new natural gas fueled power plant, the current design of which relies entirely on natural gas supplied by the Project. Relative to coal, natural gas is a cleaner burning fuel and emits lesser amounts of particulate matter, SO_2, CO, hydrocarbons, and non-criterial pollutants. Thus, maintaining the status quo (i.e., adopting the non-action alternative) could result in the continuation of the burning of coal in the Project area.

For the above reasons, we do not recommend the no-action alternative.

2. System Alternatives

System alternatives would utilize other existing, modified, or proposed facilities to meet the objectives of the proposed action. A system alternative would make it unnecessary to construct all or part of the Project, although modifications or expansion of existing or proposed pipeline systems may be required.

We evaluated a system alternative that would utilize East Tennessee's existing 3100 mainline in Roane County, Tennessee. Currently, the Loudon-Lenoir City Lateral Line 3218D-100 connects East Tennessee's existing 3200 mainline and its 3100 mainline through Monroe, Loudon, and Roane Counties. Because the Loudon-Lenoir City Lateral Line 3218D-100 is fully subscribed, East Tennessee would need to construct pipeline looping adjacent to the Loudon-Lenoir City Lateral to the Tate & Lyle Plant, which would require approximately 16 miles of new pipeline. Based on the additional length of this loop as compared to the proposed 10.2-mile-long Loudon Mainline Extension, we conclude that this system alternative could result in greater ground disturbance (and environmental impact) than the Project, and we do not recommend it.

We have not identified any other system alternative that would have a significant environmental advantage over the proposed route and achieve East Tennessee's stated Project objective; therefore, we eliminated system alternatives from further consideration.

3. Route Alternatives

Route alternatives deviate from a proposed project pipeline alignment for portions of the route or follow routes substantially different from the proposed alignment. The delivery point generally remains the same, although in certain cases, the take-off point (i.e., interconnect with an existing pipeline or system) could change. Route alternatives are generally considered to determine if specific environmental impacts can be avoided or reduced.

Our NOI seeking comments on East Tennessee's originally proposed route generated multiple landowner comments regarding the detrimental effects of constructing

the pipeline on the west side of Highway 72. (See section A.3 for details). In response, on July 10, 2015, East Tennessee filed a revised route that moved the pipeline route to the east side of Highway 72, which is the current proposed route analyzed in this EA and the basis against which we evaluated alternative routes (including the originally proposed alignment). As summarized in table C-1 and depicted in figure 4[22], our alternatives analysis includes the following five routes, which we included in our July 28, 2015 supplemental NOI:

- Alternative A, a route that would be collocated with East Tennessee's existing Loudon-Lenoir City Lateral Line 3218D-100[23] for its entire length;
- Alternative B, a route that avoids Tellico Lake;
- Alternative F, the route East Tennessee proposed in its original filing; and
- Alternative G and the East Side Alternative, two routes proposed by landowners.

Alternative A

The 9.3-mile-long Alternative A route would be directly adjacent to the existing Loudon-Lenoir City Lateral Line 3218D-100 for its entire length to the new meter facility at the Tate & Lyle Plant. While shorter than the proposed route by 0.9 mile, the Alternate A route would cross several residential areas and a golf course that were not present when the Loudon-Lenoir City Lateral was constructed over 45 years ago. As table C-1 shows, Alternative A would be within 50 feet of 14 residences, compared to 4 residences for the proposed route. Therefore, we conclude that Alternative A is not preferable to the proposed route, and we are not recommending it.

Alternative B

From the MP 0.0 tie-in with East Tennessee's existing 3200 mainline, the 9.9-mile-long Alternative B route veers northwest of Highway 72 by approximately 1.25 miles through largely undeveloped land to rejoin the existing Loudon-Lenoir City Lateral at approximate MP 5.4. Although the Alternative B route would avoid the two Tellico Lake crossings, it would impact more acres of upland forest in comparison with the proposed route (51.0 acres vs. 36.9 acres, respectively). Given that the upland forest in Project area provides habitat for the federally listed endangered Indiana bat and threatened northern long-eared bat, we conclude that Alternative B is not environmentally preferable to the proposed route, and we are not recommending it.

[22] Note that in table C-1 and figure 4, "Alternative G1" is the proposed route evaluated in this EA and provides the basis of comparison for the identified alternate routes.

[23] The Loudon-Lenoir City Lateral Line 3218D-100 is a combination of nominal 4- and 6-inch-diameter pipeline segments that has a capacity of 3.5 million cubic feet per day and is fully subscribed.

Table C-1: Comparison of the Loudon Expansion Project Route Alternatives							
Alternative (MP) Environmental/ Engineering Factors	**Units**	**Alternative A (Collocated with Existing Loudon-Lenoir City Lateral Line)**	**Alternative B**	**Alternative F (Original Proposed Route)**	**East Side Alternative**	**Alternative G**	**Alternative G1 (Current Proposed Route)**
Length	Miles	9.3	9.9	10.0	10.1	10.2	10.2
Parallel/Adjacent to Existing Right-of-Way	Miles	9.3	4.7	9.1	7.7	7.8	6.7
Land Use [a/]:							
Open Land	Acres	1.7	2.0	3.1	4.0	3.6	4.8
Agricultural Land	Acres	37.9	54.5	41.4	42.1	41.5	56.0
Industrial/Commercial	Acres	6.5	0.9	3.1	2.1	2.1	2.4
Forest Land	Acres	44.5	51.0	51.5	54.9	55.0	36.9
Scrub Land	Acres	7.0	4.7	10.3	7.7	8.3	1.1
Residential [b/]	Acres	—	—	—	—	—	—
Open Water	Acres	5.2	1.5	2.9	3.9	4.4	1.1
Right-of-way	Acres	17.5	13.5	19.3	15.5	16.7	20.9
Total Land Disturbance	**Acres**	**120.2**	**128.1**	**131.6**	**130.2**	**131.6**	**132.3**
NWI Features Crossed [c/]	Acres	4.9	1.2	3.0	4.9	6.1	5.9
NHD Waterbodies Crossed	Number	19	18	18	20	20	20
Major Waterbodies Crossed [d/]	Number	4	1	3	5	5	5
Roads Crossed	Number	22	16	20	21	21	21
Residences within 50 feet of Construction Workspace [e/]	Number	14	3	6	5	4	4

Notes:
a/ Land use acreage based on current route, including reroutes since East Tennessee's July 10, 2015 submittal.
b/ Publicly available information (National Land Cover Database [NLCD]) did not identify land use in this category
c/ "NWI ('National Wetlands Inventory') Features" includes lakes and ponds; only Alternative B includes wetlands (<0.01 acre of PFO ['palustrine forested']).
d/ Major waterbodies are >100' or TVA owned/managed. They are also included in the number of "NHD ('National Hydrography Dataset') Waterbodies Crossed."
e/ Analysis based on constant 80' buffer from centerline; detailed workspace not developed.
Length and area based on Geographic Information System analysis and rounded; total may not equal sum of addends.

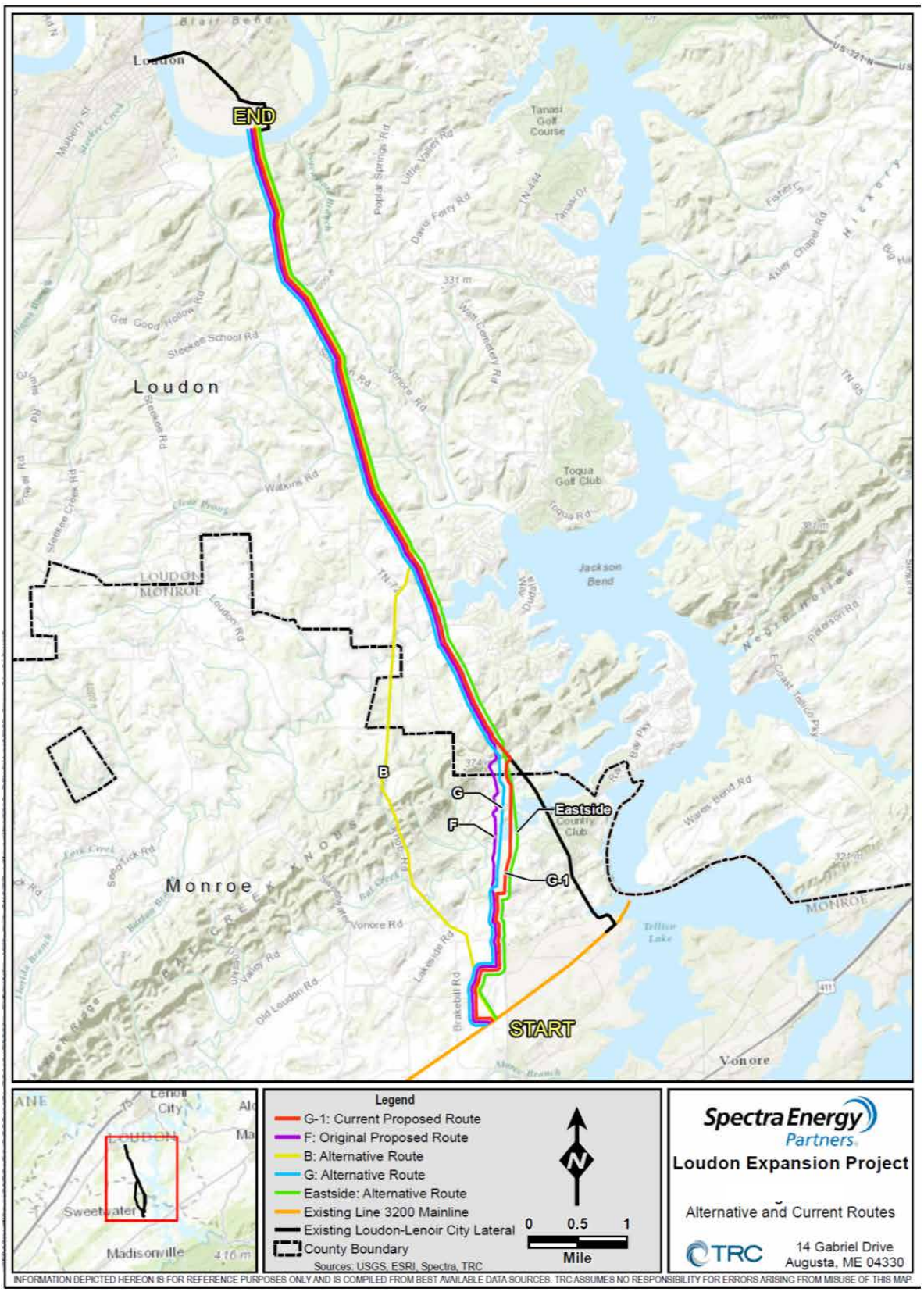


Figure 4: Route Alternatives Considered for the Loudon Expansion Project

Alternative F

The 10.0-mile-long Alternative F, East Tennessee's originally proposed route, begins at MP 0.0 and is collocated with Highway 72 on its west side, crossing under it to join and parallel the Loudon-Lenoir City Lateral at approximately MP 3.2. As discussed in section A.3, landowners west of and abutting Highway 72 commented that this route would remove mature trees that provided privacy, water retention services from stormwater runoff, and a noise and pollution barrier between themselves and the highway. The currently proposed route is longer by 0.2 mile; however, most of the environmental impacts are similar between the two routes, and the proposed route addresses the above-mentioned landowner concerns and comments. Thus, we conclude from a land use perspective that the proposed route is clearly preferable. No comments were received from landowners on the currently proposed route. As such, we are not recommending Alternative F.

Alternative G and the East Side Alternative

The 10.2-mile-long Alternate Route G and the 10.1-mile-long Eastside Alternate Route would follow similar paths to the 10.2-mile-long proposed route, crossing east under Highway 72 at MP 1.2. However, each route would be located slightly farther east than the proposed route, rejoining and paralleling the Loudon-Lenoir City Lateral pipeline at approximately MP 3.5. The Eastside Alternate Route would require crossing Tellico Lake three times. Both alternatives would require access points from currently uninterrupted segments of Highway 72 making access to the construction workspace potentially less safe for construction crews. The currently proposed route utilizes access roads along or at the terminus of low-traffic, low-speed secondary roads. Additionally, as shown in table C-1, Alternative G and the East Side Alternative would impact 55.0 acres and 54.9 acres of upland forest, respectively, in comparison with the proposed route, which would only impact 36.9 acres of upland forest. Therefore, we are not recommending either Alternative G or the East Side Alternative.

D. STAFF'S CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis contained in this EA, we have determined that if East Tennessee constructs the proposed facilities in accordance with its application, filed supplements, and staff's recommended mitigation measures listed below, approval of the Project would not constitute a major federal action significantly affecting the quality of the human environment.

The staff recommends that the Commission Order contain a finding of no significant impact. If the Commission certificates the Project, we recommend that the Commission Order include the following conditions:

1. East Tennessee shall follow the construction procedures and mitigation measures described in its application and supplements (including responses to staff data requests) and as identified in the environmental assessment, unless modified by the Order. East Tennessee must:

    a. request any modification to these procedures, measures, or conditions in a filing with the Secretary;
    b. justify each modification relative to site-specific conditions;
    c. explain how that modification provides an equal or greater level of environmental protection than the original measure; and
    d. receive approval in writing from the Director of OEP **before using that modification**.

2. The Director of OEP has delegated authority to take whatever steps are necessary to ensure the protection of all environmental resources during construction and operation of the project. This authority shall allow:

    a. the modification of conditions of the Order; and
    b. the design and implementation of any additional measures deemed necessary (including stop-work authority) to assure continued compliance with the intent of the environmental conditions as well as the avoidance or mitigation of adverse environmental impact resulting from project construction and operation.

3. **Prior to any construction**, East Tennessee shall file an affirmative statement with the Secretary, certified by a senior company official, that all company personnel, EIs, and contractor personnel will be informed of the EI's authority and have been or will be trained on the implementation of the environmental mitigation measures appropriate to their jobs **before** becoming involved with construction and restoration activities.

4. The authorized facility locations shall be as shown in the EA, as supplemented by filed alignment sheets. **As soon as they are available, and before the start of construction**, East Tennessee shall file with the Secretary any revised detailed survey alignment maps/sheets at a scale not smaller than 1:6,000 with station positions for all facilities approved by the Order. All requests for modifications of environmental conditions of the Order or site-specific clearances must be written and must reference locations designated on these alignment maps/sheets.

   East Tennessee's exercise of eminent domain authority granted under NGA section 7(h) in any condemnation proceedings related to the Order must be consistent with these authorized facilities and locations. East Tennessee's right of eminent domain granted under NGA section 7(h) does not authorize it to increase the size of its natural gas facilities to accommodate future needs or to acquire a right-of-way for a pipeline to transport a commodity other than natural gas.

5. East Tennessee shall file with the Secretary detailed alignment maps/sheets and aerial photographs at a scale not smaller than 1:6,000 identifying all route realignments or facility relocations, and staging areas, pipe storage yards, new access roads, and other areas that would be used or disturbed and have not been previously identified in filings with the Secretary. Approval for each of these areas must be explicitly requested in writing. For each area, the request must include a description of the existing land use/cover type, documentation of landowner approval, whether any cultural resources or federally listed threatened or endangered species would be affected, and whether any other environmentally sensitive areas are within or abutting the area. All areas shall be clearly identified on the maps/sheets/aerial photographs. Each area must be approved in writing by the Director of OEP **before construction in or near that area**.

   This requirement does not apply to extra workspace allowed by our Plan and/or minor field realignments per landowner needs and requirements which do not affect other landowners or sensitive environmental areas such as wetlands.

   Examples of alterations requiring approval include all route realignments and facility location changes resulting from:

   a. implementation of cultural resources mitigation measures;
   b. implementation of endangered, threatened, or special concern species mitigation measures;
   c. recommendations by state regulatory authorities; and
   d. agreements with individual landowners that affect other landowners or could affect sensitive environmental areas.

6. **Within 60 days of the acceptance of the authorization and before construction** begins, East Tennessee shall file an Implementation Plan with the Secretary for review and written approval by the Director of OEP. East Tennessee must file revisions to the plan as schedules change. The plan shall identify:

    a. how East Tennessee will implement the construction procedures and mitigation measures described in its application and supplements (including responses to staff data requests), identified in the EA, and required by the Order;
    b. how East Tennessee will incorporate these requirements into the contract bid documents, construction contracts (especially penalty clauses and specifications), and construction drawings so that the mitigation required at each site is clear to onsite construction and inspection personnel;
    c. the number of EIs assigned, and how the company will ensure that sufficient personnel are available to implement the environmental mitigation;
    d. company personnel, including EIs and contractors, who will receive copies of the appropriate material;
    e. the location and dates of the environmental compliance training and instructions East Tennessee will give to all personnel involved with construction and restoration (initial and refresher training as the project progresses and personnel change), with the opportunity for OEP staff to participate in the training session(s);
    f. the company personnel (if known) and specific portion of East Tennessee's organization having responsibility for compliance;
    g. the procedures (including use of contract penalties) East Tennessee will follow if noncompliance occurs; and
    h. for each discrete facility, a Gantt or PERT chart (or similar project scheduling diagram), and dates for:

        (1) the completion of all required surveys and reports;
        (2) the environmental compliance training of onsite personnel;
        (3) the start of construction; and
        (4) the start and completion of restoration.

7. East Tennessee shall employ at least one EI per construction spread. The EI shall be:

    a. responsible for monitoring and ensuring compliance with all mitigation measures required by the Order and other grants, permits, certificates, or other authorizing documents;

b. responsible for evaluating the construction contractor's implementation of the environmental mitigation measures required in the contract (see condition 6 above) and any other authorizing document;
c. empowered to order correction of acts that violate the environmental conditions of the Order, and any other authorizing document;
d. a full-time position, separate from all other activity inspectors;
e. responsible for documenting compliance with the environmental conditions of the Order, as well as any environmental conditions/permit requirements imposed by other federal, state, or local agencies; and
f. responsible for maintaining status reports.

8. Beginning with the filing of its Implementation Plan, East Tennessee shall file updated status reports with the Secretary on a **weekly basis** until all construction and restoration activities are complete. On request, these status reports will also be provided to other federal and state agencies with permitting responsibilities. Status reports shall include:

a. an update on East Tennessee's efforts to obtain the necessary federal authorizations;
b. the construction status of the project, work planned for the following reporting period, and any schedule changes for stream crossings or work in other environmentally sensitive areas;
c. a listing of all problems encountered and each instance of noncompliance observed by the EI during the reporting period (both for the conditions imposed by the Commission and any environmental conditions/permit requirements imposed by other federal, state, or local agencies);
d. a description of the corrective actions implemented in response to all instances of noncompliance, and their cost;
e. the effectiveness of all corrective actions implemented;
f. a description of any landowner/resident complaints which may relate to compliance with the requirements of the Order, and the measures taken to satisfy their concerns; and
g. copies of any correspondence received by East Tennessee from other federal, state, or local permitting agencies concerning instances of noncompliance, and East Tennessee's response.

9. **Prior to receiving written authorization from the Director of OEP to commence construction of any project facilities**, East Tennessee shall file with the Secretary documentation that it has received all applicable authorizations required under federal law (or evidence of waiver thereof).

10. East Tennessee must receive written authorization from the Director of OEP **before placing the project into service**. Such authorization will only be granted

following a determination that rehabilitation and restoration of the right-of-way and other areas affected by the project are proceeding satisfactorily.

11. **Within 30 days of placing the authorized facilities in service**, East Tennessee shall file an affirmative statement with the Secretary, certified by a senior company official:

    a. that the facilities have been constructed in compliance with all applicable conditions, and that continuing activities will be consistent with all applicable conditions; or
    b. identifying which of the conditions in the Order East Tennessee has complied with or will comply with. This statement shall also identify any areas affected by the project where compliance measures were not properly implemented, if not previously identified in filed status reports, and the reason for noncompliance.

12. **Prior to construction,** East Tennessee shall file with the Secretary, for review and written approval by the Director of OEP, a Karst Investigation Report. East Tennessee shall develop the Karst Investigation Report showing the results of a detailed evaluation and the remediation strategy for each of the six sinkholes (Feature IDs LE-5, LE-6, LE-14, LE-16, LE-29, and LE-33) that will be directly adjacent to or below the trench line. East Tennessee's evaluation shall define the dimensions of each feature using a combination of surface geophysical techniques, geotechnical borings, and excavation to expose the throat of the solution opening.

13. **Prior to construction**, East Tennessee shall file with the Secretary, for review and written approval by the Director of OEP, a revised *HDD Inadvertent Returns Plan.* The revised plan shall provide for the use of temporary surface casing at each of the HDD borehole entry and exit locations, installed to a sufficient depth through the karstic zones in the bedrock (per the results of the geotechnical boring logs) to prevent an inadvertent release of drilling mud into Tellico Lake and the Tennessee River. This plan must also include the following federal agency contacts to be notified in the event of an inadvertent release of drilling fluid: Mark McIntosh at the COE Nashville District, Regulatory Branch (865-986-7296) and the TVA River Forecast Center (865-632-6065).

14. **Within 30 Days of placing the facilities in service,** East Tennessee shall file a report with the Secretary identifying all water supply wells/systems damaged by construction and how they were repaired or replaced. The report shall also include a discussion of any other complaints concerning well yield or water quality and how each problem was resolved.

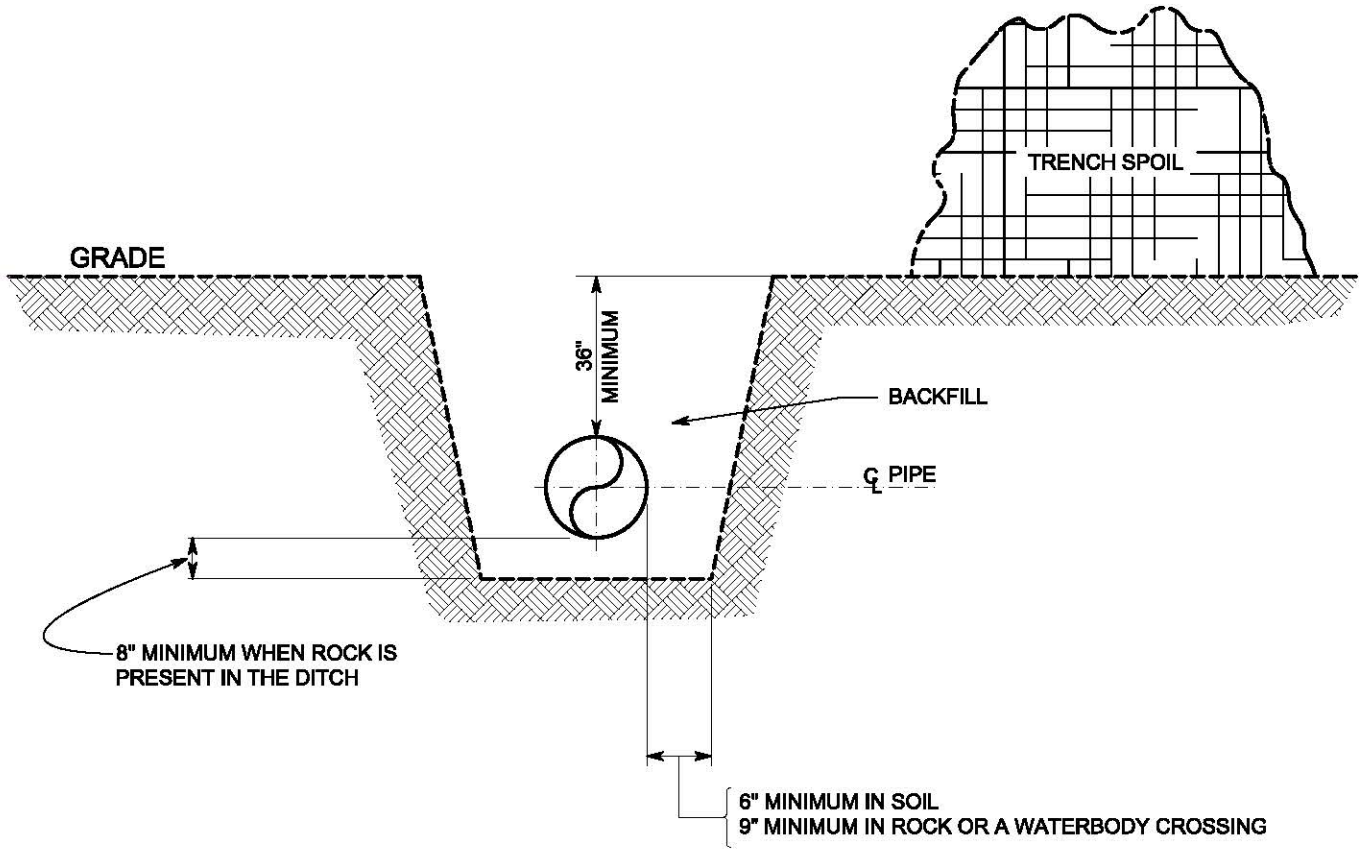
15. East Tennessee shall conduct HDD construction across Tellico Lake and the Tennessee River between July 1-November 30.

16. **Prior to construction**, East Tennessee shall file with the Secretary the appropriate TVA approval documentation for the Project segment on TVA jurisdictional land.

17. East Tennessee shall employ the noise mitigation measures in its noise survey analysis, or others as necessary, at the HDD 1 entry point and the HDD 2 entry and exit points to limit noise to the predicted levels.

Appendix A

Typical Right-of-Way Configurations and Alignment Sheets



CROSS-SECTION VIEW

NOTES:

1. ALL PRECONSTRUCTION CONTOURS WILL BE RE-ESTABLISHED UPON COMPLETION OF PIPE INSTALLATION. EXCEPT IN WETLANDS, A CROWN MAY BE LEFT TO ACCOUNT FOR DITCH SETTLING, AS DIRECTED BY THE ENVIRONMENTAL INSPECTOR.
2. IN COLD WATER FISHERY STREAMS, THE TOP 12" OF THE TRENCH WILL BE BACKFILLED WITH CLEAN GRAVEL OR NATIVE COBBLES UNLESS OTHERWISE SPECIFIED BY THE PERMITTING AGENCY.

	TYPICAL TRENCH DETAIL	FIGURE CW-1
		DWG. ES-0001 REV.

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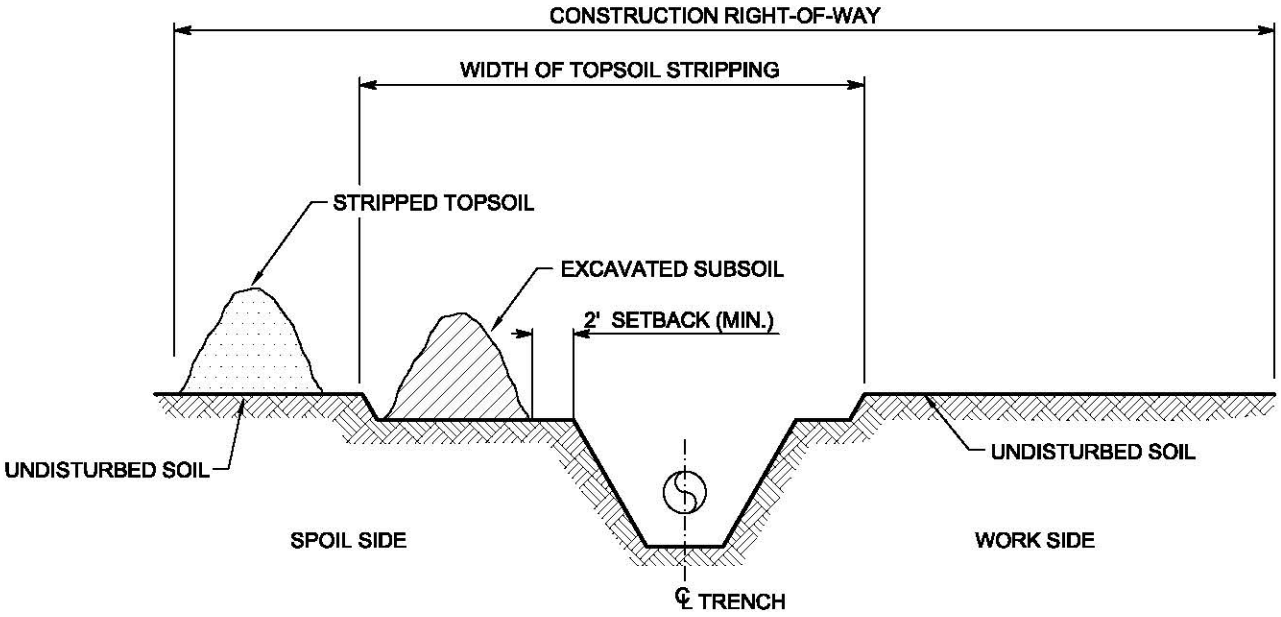
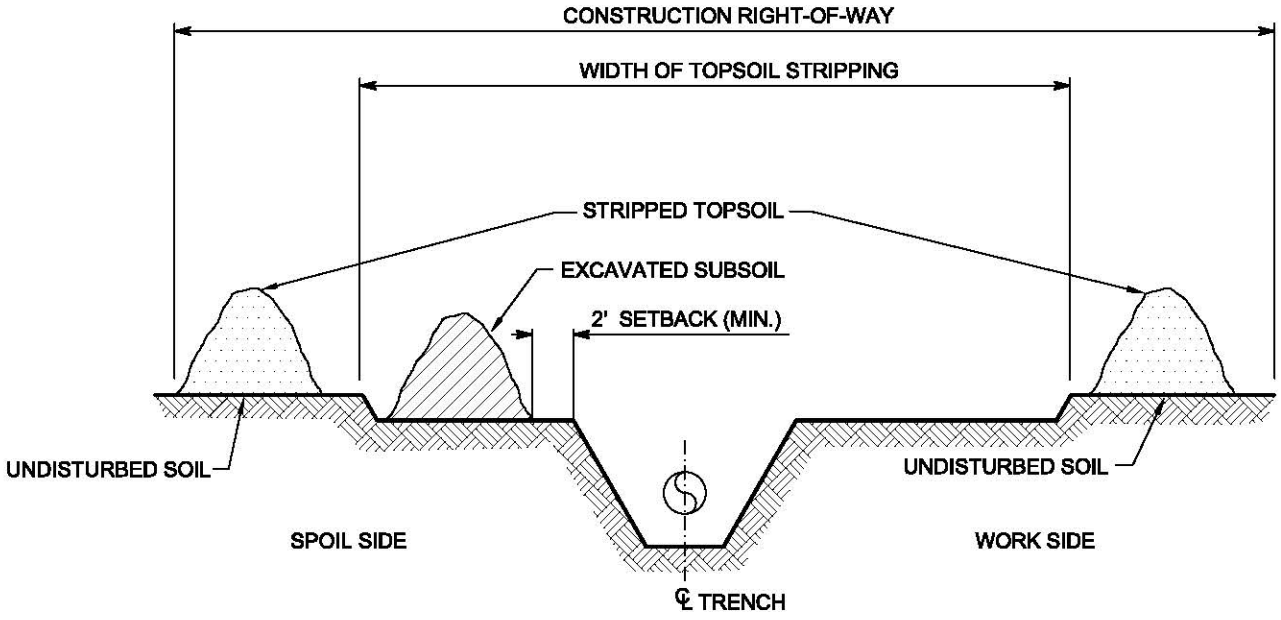


DITCH PLUS SPOILSIDE TOPSOIL SEGREGATION

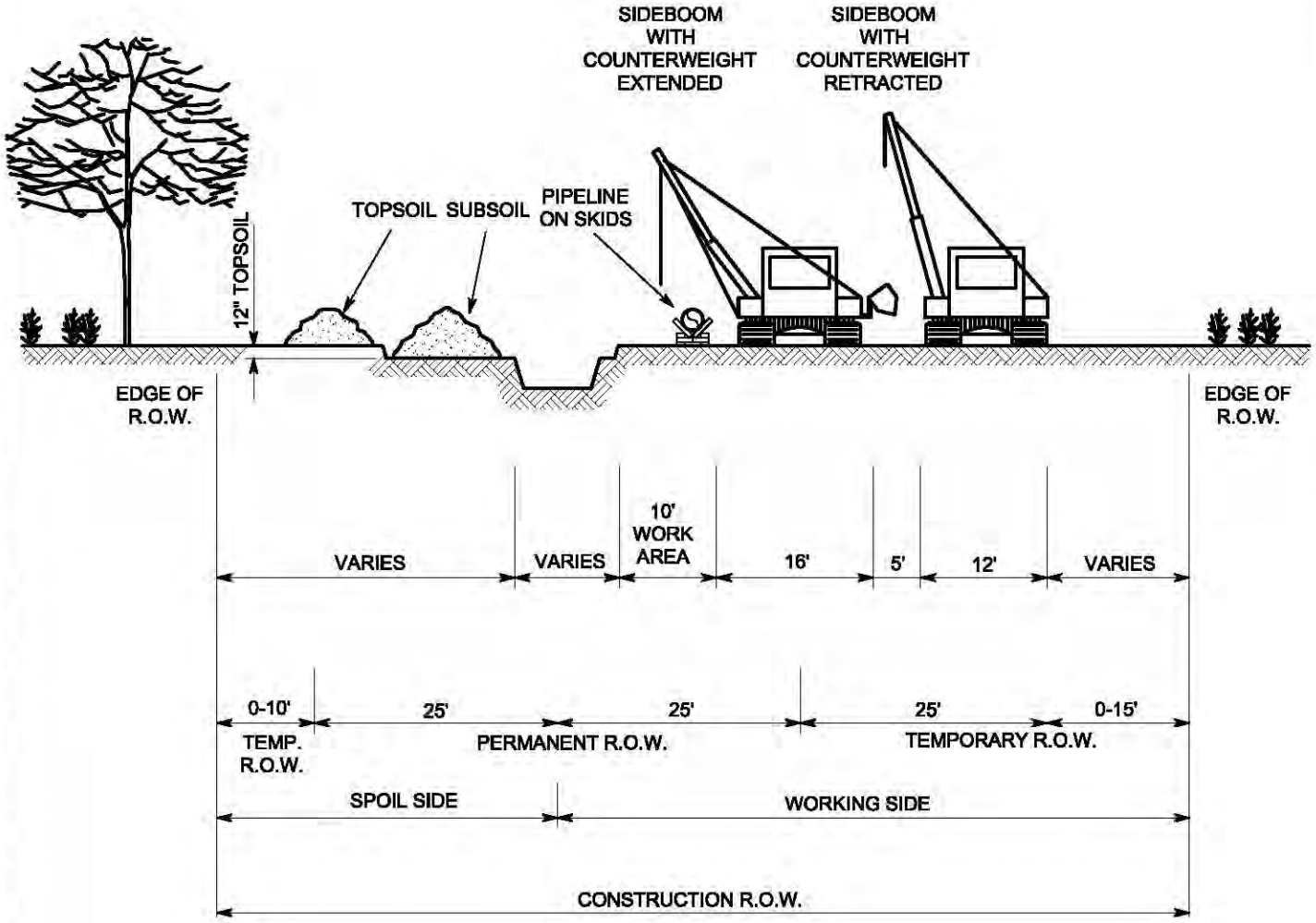


FULL RIGHT-OF-WAY TOPSOIL STRIPPING

NOTES:

1. TOPSOIL MAY BE STORED IN LOCATIONS AS SHOWN ABOVE OR AT OTHER COMPANY APPROVED LOCATIONS WITHIN THE CONSTRUCTION R.O.W.
2. LEAVE GAPS IN SPOIL PILES FOR WATER RUN-OFF.
3. MAINTAIN SEPARATION OF SALVAGED TOPSOIL AND SUBSOIL THROUGHOUT ALL CONSTRUCTION ACTIVITIES.
4. STABILIZE TOPSOIL PILES AND MINIMIZE LOSS DUE TO WATER OR WIND EROSION WITH USE OF SEDIMENT BARRIERS, MULCH, TEMPORARY SEEDING, TACKIFIERS OR FUNCTIONAL EQUIVALENTS, WHERE NECESSARY.

	RIGHT-OF-WAY TOPSOIL SEGREGATION TECHNIQUES	FIGURE CW-2
		DWG. ES-0002 REV.



PIPE DIAMETER	SPOIL SIDE (FT.)	WORKING SIDE (FT.)	CONSTRUCTION R.O.W. (FT.)
12" OR LESS	25	50	75
14" - 30"	35	50	85
36" - 42"	35	65	100
WETLANDS	25	50	75

NOTES:

1. ALTHOUGH THE DIMENSIONS SHOWN ARE TYPICAL, SOME VARIATIONS MAY EXIST DUE TO SITE SPECIFIC CONDITIONS. UNLESS OTHERWISE INDICATED ON THE ALIGNMENT SHEETS, THE MAXIMUM WIDTH OF THE CONSTRUCTION RIGHT-OF-WAY SHALL BE AS SHOWN IN THE TABLE FOR THE APPROPRIATE PIPE DIAMETER.
2. TOPSOIL SEGREGATION METHODS WILL BE USED IN ALL RESIDENTIAL AREAS AND WHEN THE CONSTRUCTION ROW IS WIDER THAN 30 FEET IN CULTIVATED OR ROTATED AGRICULTURAL LANDS, MANAGED PASTURES, HAYFIELDS, AND OTHER AREAS AT THE LANDOWNER'S OR LAND MANAGEMENT AGENCY'S REQUEST. FOR WETLANDS, SEGREGATE THE TOP 12 INCHES OF TOPSOIL WITHIN THE DITCH LINE, EXCEPT IN AREAS WHERE STANDING WATER IS PRESENT OR SOILS ARE SATURATED.

TYPICAL CONSTRUCTION WIDTHS ACQUIRING NEW PERMANENT RIGHT-OF-WAY

FIGURE CW-3

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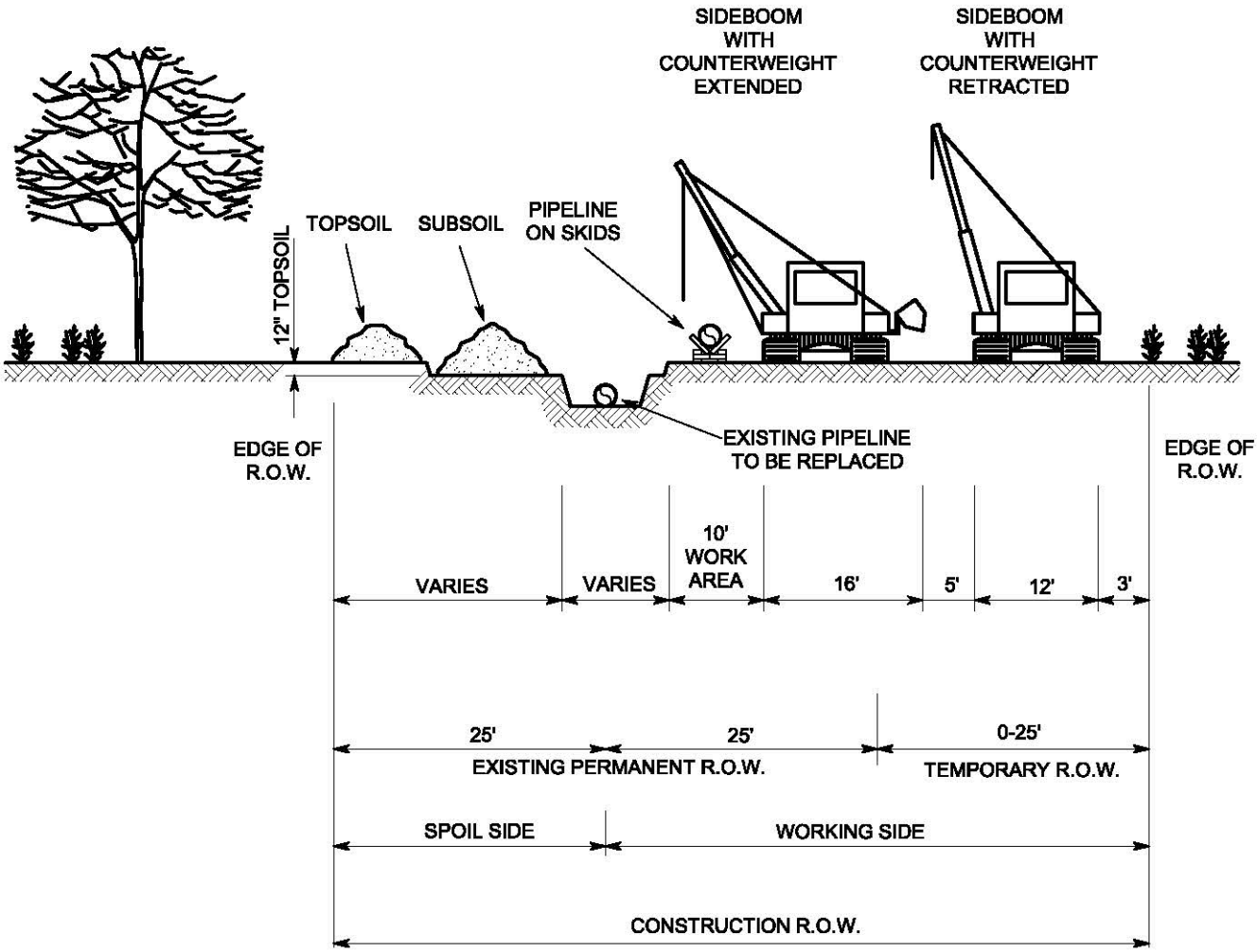
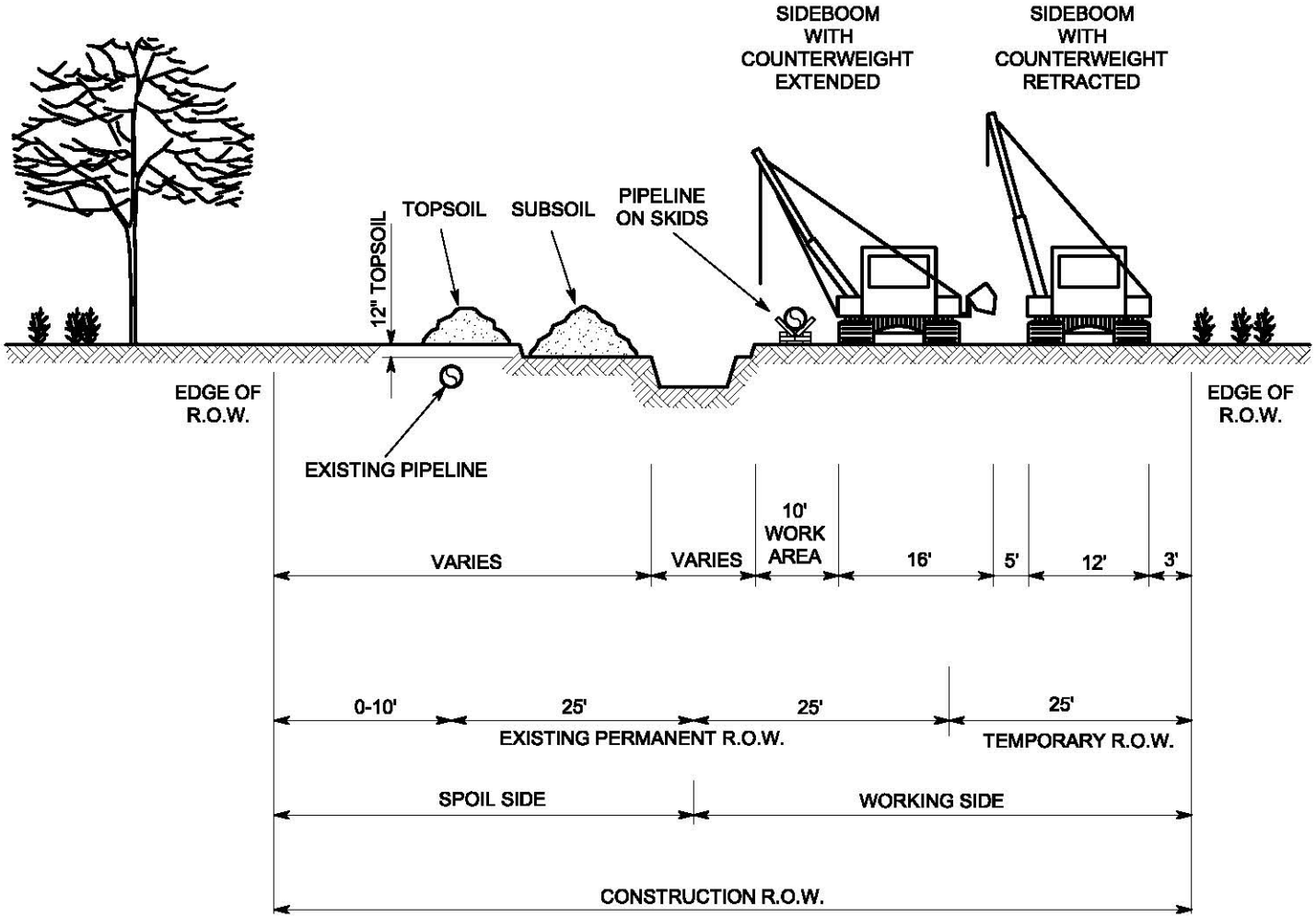


PIPE DIAMETER	SPOIL SIDE (FT.)	WORKING SIDE (FT.)	CONSTRUCTION R.O.W. (FT.)
12" OR LESS	25	25	50
14" - 30"	25	50	75
36" - 42"	25	50	75
WETLANDS	25	50	75

NOTES:

1. ALTHOUGH THE DIMENSIONS SHOWN ARE TYPICAL, SOME VARIATIONS MAY EXIST DUE TO SITE SPECIFIC CONDITIONS. UNLESS OTHERWISE INDICATED ON THE ALIGNMENT SHEETS, THE MAXIMUM WIDTH OF THE CONSTRUCTION RIGHT-OF-WAY SHALL BE AS SHOWN IN THE TABLE FOR THE APPROPRIATE PIPE DIAMETER.
2. TOPSOIL SEGREGATION METHODS WILL BE USED IN ALL RESIDENTIAL AREAS AND WHEN THE CONSTRUCTION ROW IS WIDER THAN 30 FEET IN CULTIVATED OR ROTATED AGRICULTURAL LANDS, MANAGED PASTURES, HAYFIELDS, AND OTHER AREAS AT THE LANDOWNER'S OR LAND MANAGEMENT AGENCY'S REQUEST. FOR WETLANDS, SEGREGATE THE TOP 12 INCHES OF TOPSOIL WITHIN THE DITCH LINE, EXCEPT IN AREAS WHERE STANDING WATER IS PRESENT OR SOILS ARE SATURATED.
3. IF THE WORKING SIDE MUST BE GREATER THAN THE VALUES SHOWN IN THE TABLE, COMPANY MUST REQUEST APPROVAL FROM THE F.E.R.C.

	TYPICAL CONSTRUCTION WIDTHS NOT ACQUIRING NEW PERMANENT RIGHT-OF-WAY (SINGLE LINE SYSTEM)	FIGURE CW-4
		DWG. ES-0004 REV.

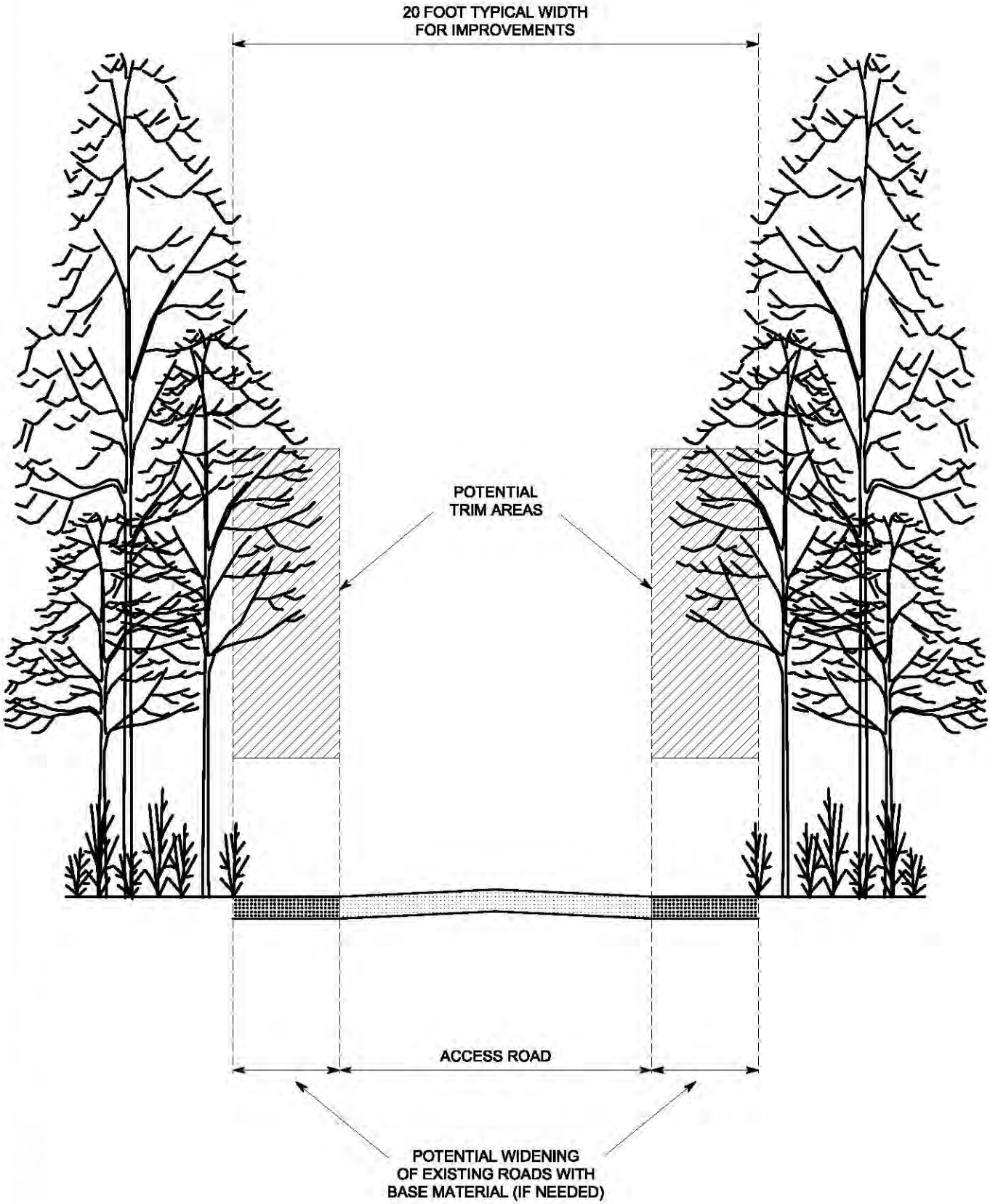


PIPE DIAMETER	SPOIL SIDE (FT.)	WORKING SIDE (FT.)	CONSTRUCTION R.O.W. (FT.)
12" OR LESS	25	50	75
14" - 30"	35	50	85
36" - 42"	35	50	85
WETLANDS	25	50	75

NOTES:

1. ALTHOUGH THE DIMENSIONS SHOWN ARE TYPICAL, SOME VARIATIONS MAY EXIST DUE TO SITE SPECIFIC CONDITIONS. UNLESS OTHERWISE INDICATED ON THE ALIGNMENT SHEETS, THE MAXIMUM WIDTH OF THE CONSTRUCTION RIGHT-OF-WAY SHALL BE AS SHOWN IN THE TABLE FOR THE APPROPRIATE PIPE DIAMETER.
2. TOPSOIL SEGREGATION METHODS WILL BE USED IN ALL RESIDENTIAL AREAS AND WHEN THE CONSTRUCTION ROW IS WIDER THAN 30 FEET IN CULTIVATED OR ROTATED AGRICULTURAL LANDS, MANAGED PASTURES, HAYFIELDS, AND OTHER AREAS AT THE LANDOWNER'S OR LAND MANAGEMENT AGENCY'S REQUEST. FOR WETLANDS, SEGREGATE THE TOP 12 INCHES OF TOPSOIL WITHIN THE DITCH LINE, EXCEPT IN AREAS WHERE STANDING WATER IS PRESENT OR SOILS ARE SATURATED.
3. IF THE WORKING SIDE MUST BE GREATER THAN 50 FEET (i.e. TEMPORARY WORKSPACE IS GREATER THAN 25 FEET), COMPANY MUST REQUEST APPROVAL FROM THE F.E.R.C.

	TYPICAL CONSTRUCTION WIDTHS NOT ACQUIRING NEW PERMANENT RIGHT-OF-WAY (MULTIPLE LINE SYSTEM)	FIGURE CW-5
		DWG. ES-0005 REV.



ACCESS ROAD CROSS SECTION

FIGURE RD-1

DWG. ES-0006 REV.

I.G. ES0006.DWG

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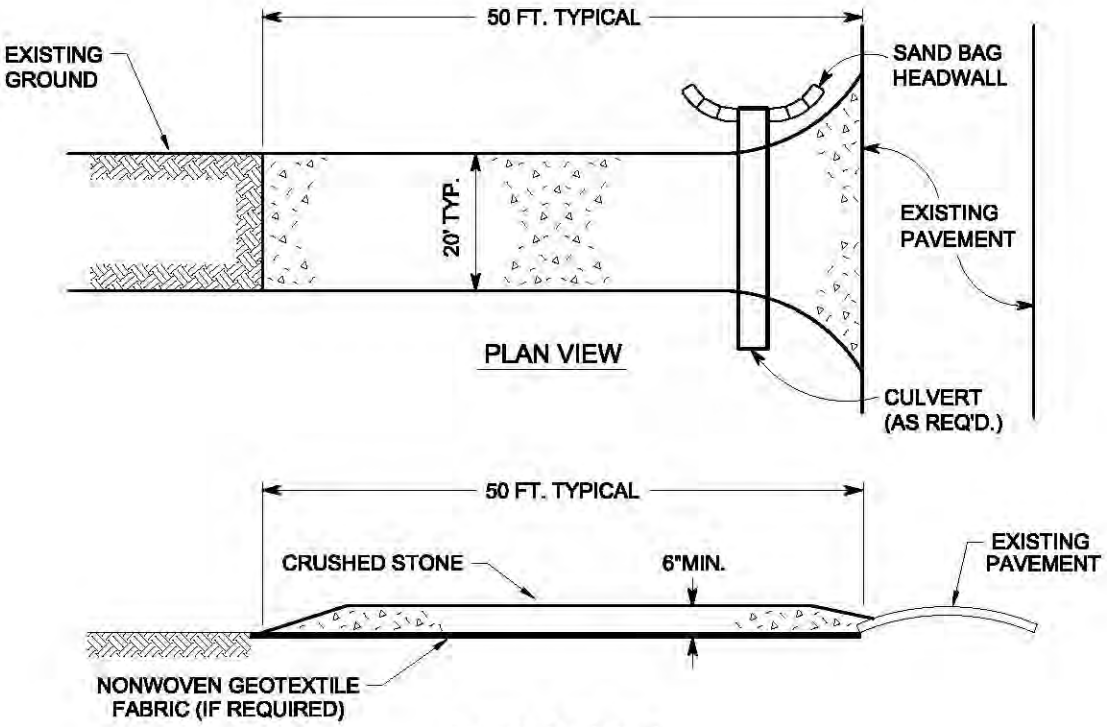
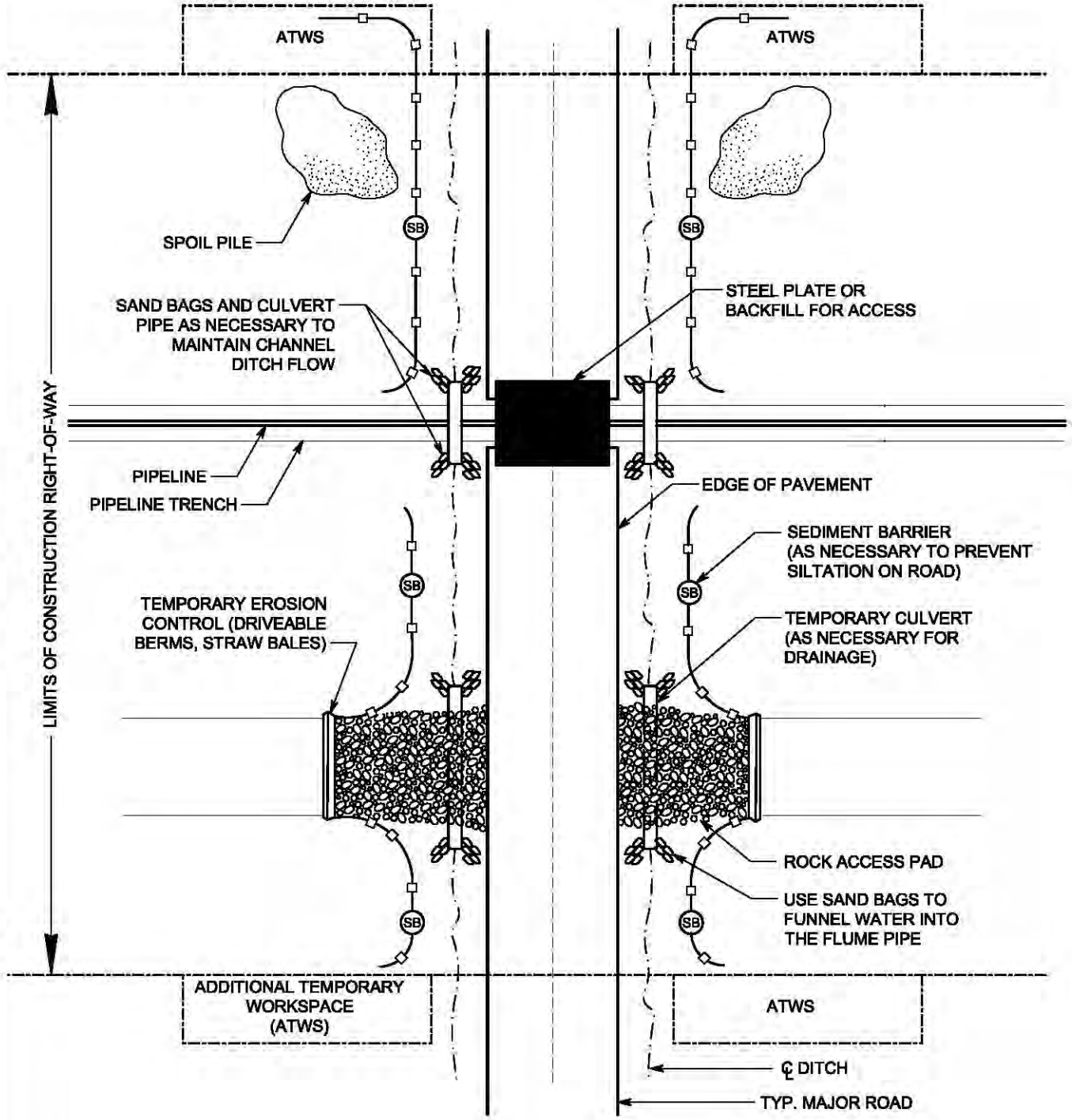


CONSTRUCTION SPECIFICATIONS:

1. STONE SIZE = 4" - 6" AVG. DIAMETER
2. ALL STONE MUST BE PLACED ON NON-WOVEN GEOTEXILE FABRIC IF USED IN RESIDENTIAL OR AGRICULTURAL AREAS.
3. LENGTH = FIFTY (50) FOOT TYPICAL (IF SITE CONDITIONS ALLOW)
4. WIDTH = TWENTY (20) FOOT TYPICAL.
5. THICKNESS = SIX (6) INCHES MINIMUM.
6. ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED ACROSS THE ENTRANCE. IF PIPING IS IMPRACTICAL, A DRIVEABLE BERM OR OTHER TEMPORARY EROSION CONTROL DEVICE CAN BE USED.
7. THE ENTRANCE SHALL BE PERIODICALLY INSPECTED AND MAINTAINED IN A CONDITION THAT MINIMIZES TRACKING OR FLOWING OF SEDIMENT ONTO ROADWAYS. MAINTENANCE MAY INCLUDE PERIODIC TOP DRESSING WITH ADDITIONAL STONE OR THE REPAIR / CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ANY SEDIMENT THAT IS SPILLED, DROPPED, WASHED OR TRACKED ONTO ROADWAYS MUST BE REMOVED AS SOON AS PRACTICAL.

	ROCK ACCESS PAD	FIGURE RD-2
		DWG. ES-0007 REV.



NOTES:

1. FIRST LAY SAND BAGS IN DITCH, THEN PLACE END OF CULVERT IN THE MIDDLE OF THE SAND BAGS BEFORE BUILDING HEAD WALLS TO CULVERT.
2. (SB) TEMPORARY SEDIMENT BARRIER OF SILT FENCE AND/OR STRAW BALES, OR OTHER APPROPRIATE MATERIALS.

TYPICAL PAVED ROAD CROSSING CONTROL MEASURES (OPEN CUT)

FIGURE RD-4

DWG. ES-0009 REV.

I.G. ES0009.DWG

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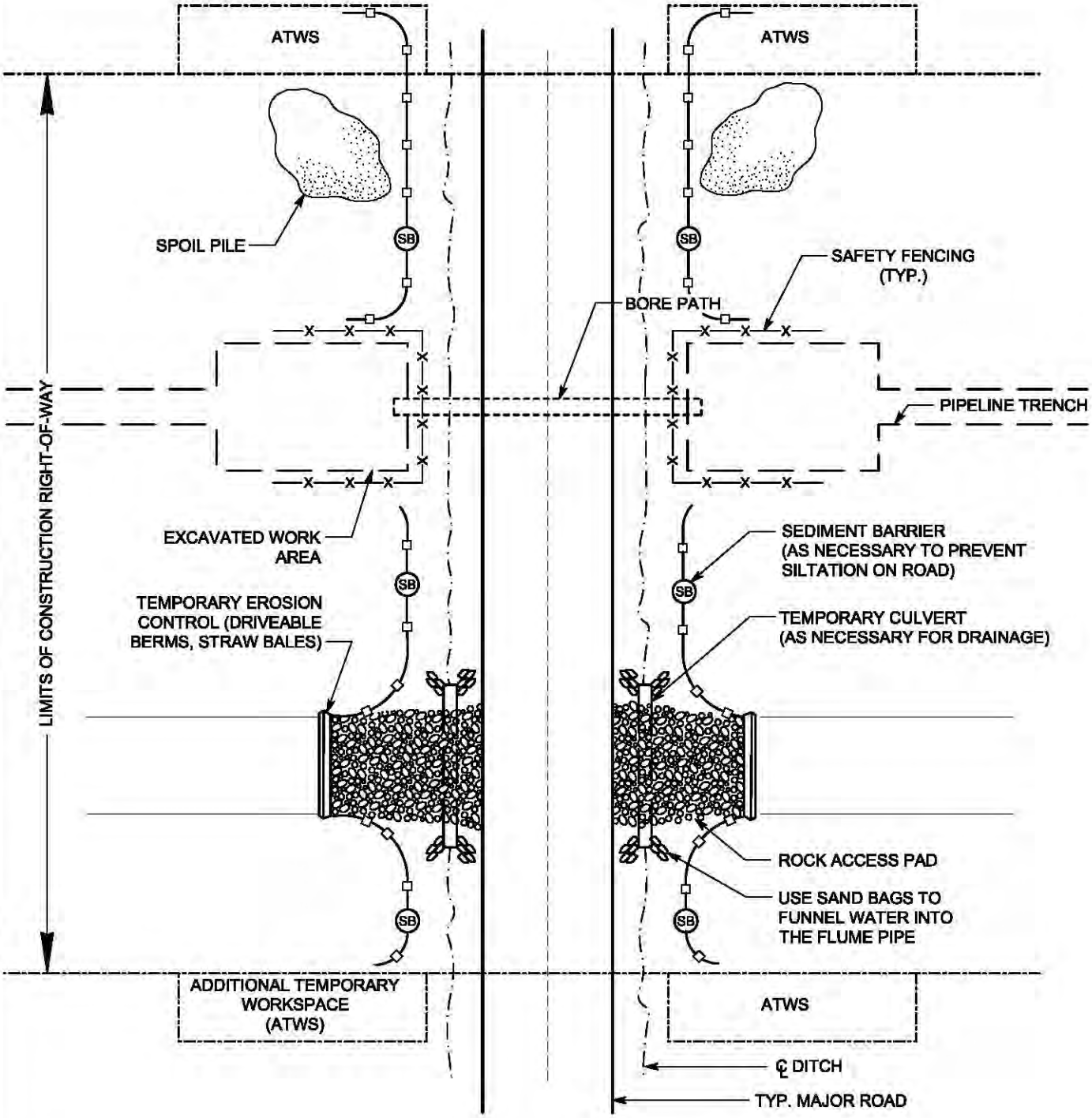

NOTES:

1. BORE PIT DIMENSIONS WILL BE DICTATED BY SITE-SPECIFIC CONDITIONS (E.G. SOIL TYPE, WIDTH OF ROAD, DEPTH OF COVER).
2. (SB) TEMPORARY SEDIMENT BARRIER OF SILT FENCE AND/OR STRAW BALES, OR OTHER APPROPRIATE MATERIALS.

TYPICAL PAVED ROAD CROSSING CONTROL MEASURES (BORED)

FIGURE RD-5

DWG. ES-0010 REV.

I.G. ES0010.DWG

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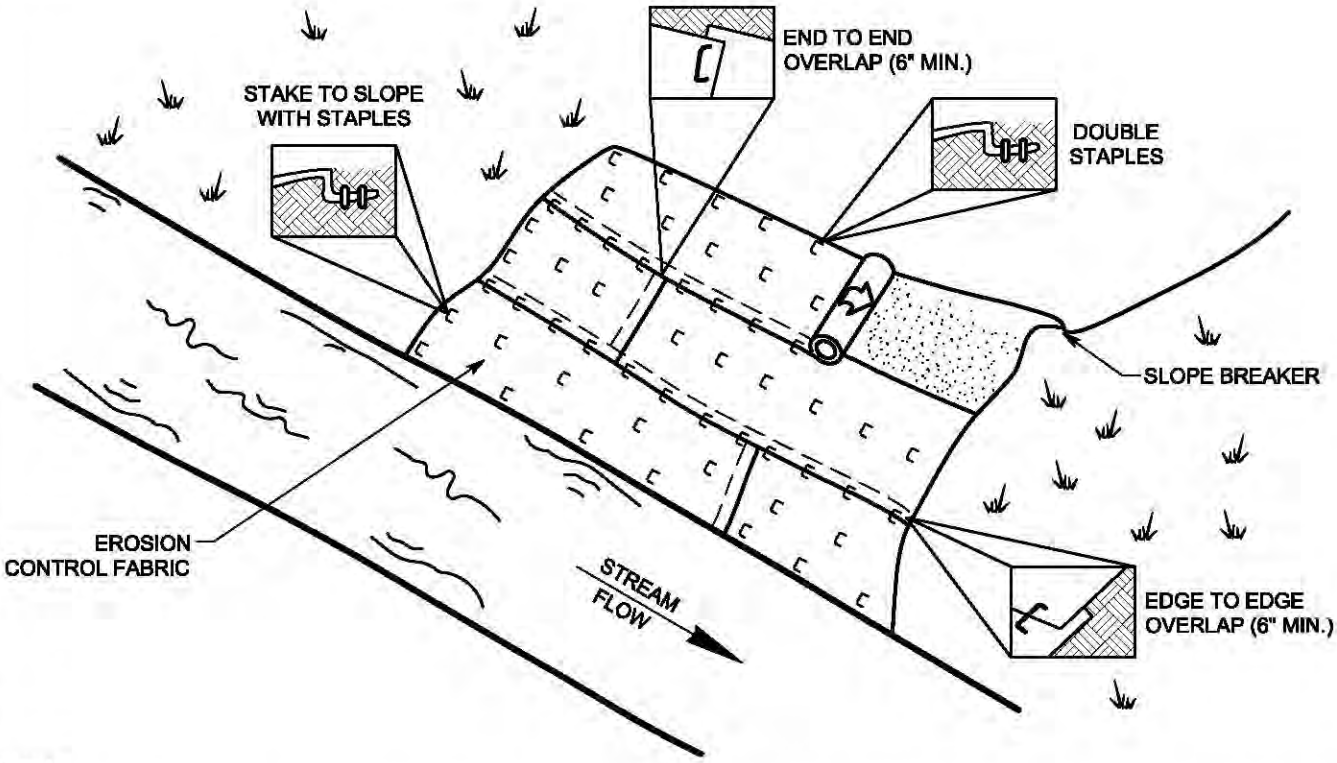


NOTES:

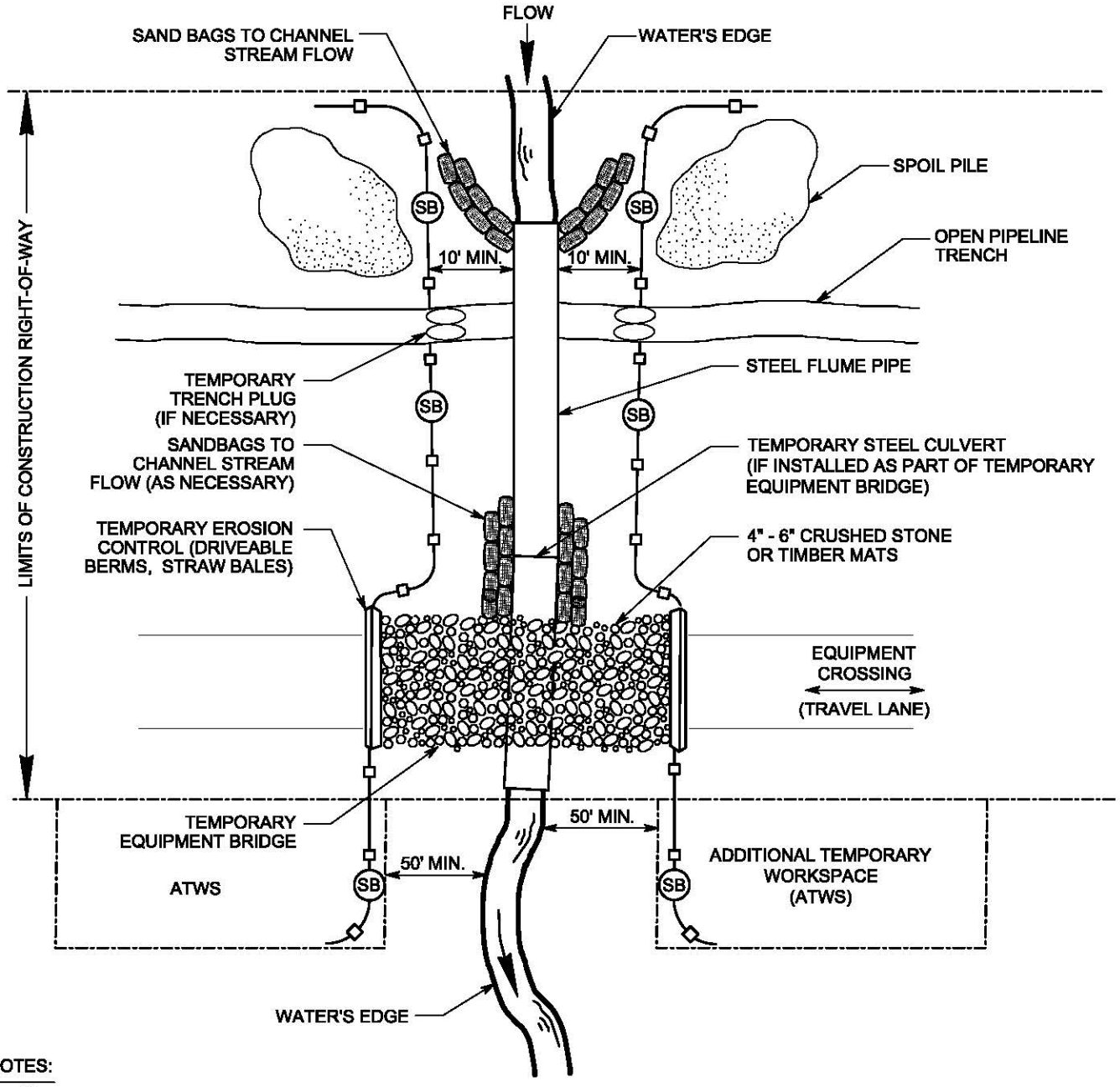
1. EROSION CONTROL BLANKETS (FABRIC) SHALL BE PLACED ON THE BANKS OF FLOWING STREAMS WHERE VEGETATION HAS BEEN REMOVED OR AS DIRECTED BY THE ENVIRONMENTAL INSPECTOR.
2. EROSION CONTROL BLANKETS SHALL MEET THE REQUIREMENTS SPECIFIED IN THE E&S PLAN AND/OR AS DIRECTED BY THE ENVIRONMENTAL INSPECTOR.
3. STAPLES SHALL BE MADE OF 11 GAUGE WIRE, U-SHAPED WITH 6" LEGS AND A 1" CROWN. STAPLES SHALL BE DRIVEN INTO THE GROUND FOR THE FULL LENGTH OF THE STAPLE LEGS. ALTERNATELY 1" WOODEN PEGS 6" LONG AND BEVELED TO SECURE MATTING.
4. BLANKETS SHALL BE INSTALLED ACCORDING TO MANUFACTURER SPECIFICATIONS OR AS STATED BELOW:
   - EXTEND TOP OF BLANKET 2 FEET PAST THE UPPER EDGE OF THE HIGH WATER MARK. IF A SLOPE BREAKER IS PRESENT ON THE APPROACH SLOPE, BEGIN THE BLANKET ON THE UPHILL SIDE OF THE SLOPE BREAKER.
   - INSTALL BLANKET(S) ACROSS THE SLOPE IN THE DIRECTION OF THE WATER FLOW.
   - ANCHOR ("KEY") THE UPSTREAM EDGE OF THE BLANKET(S) INTO THE SLOPE USING A 6" DEEP TRENCH. DOUBLE STAPLE EVERY 12" BEFORE BACKFILLING AND COMPACTING TRENCH
   - OVERLAP THE EDGES OF PARALLEL BLANKETS A MINIMUM OF 6". PLACE THE UPPER BLANKET OVER THE LOWER BLANKET (SHINGLE STYLE) AND STAPLE EVERY 12" ALONG THE LENGTH OF THE EDGE.
   - WHEN BLANKET ENDS ARE ADJOINED, PLACE THE UPSTREAM BLANKET OVER THE DOWNSTREAM BLANKET (SHINGLE STYLE) WITH APPROXIMATELY 6" OF OVERLAP AND STAPLE THROUGH THE OVERLAPPED AREA EVERY 12".
   - STAPLE DOWN THE CENTER OF THE BLANKET(S), THREE STAPLES IN EVERY SQUARE YARD.
5. IN LIVESTOCK AREAS WHERE EROSION CONTROL BLANKETS ARE APPLIED TO THE STREAMBANKS, FENCING MAY BE USED IF NECESSARY TO EXCLUDE LIVESTOCK, WITH PERMISSION OF THE LANDOWNER.
6. MONITOR WASHOUTS, STAPLE INTEGRITY OR BLANKET MOVEMENT. REPLACE OR REPAIR AS NECESSARY.
7. DO NOT USE SYNTHETIC MONOFILAMENT MESH / NETTED MATERIALS IN AREAS DESIGNATED AS SENSITIVE WILDLIFE HABITAT, UNLESS THE PRODUCT IS SPECIFICALLY DESIGNED TO MINIMIZE HARM TO WILDLIFE.

NOT TO SCALE

TYPICAL EROSION CONTROL BLANKETS ON STREAMBANKS

FIGURE WC-5

DWG. ES-0036 REV.



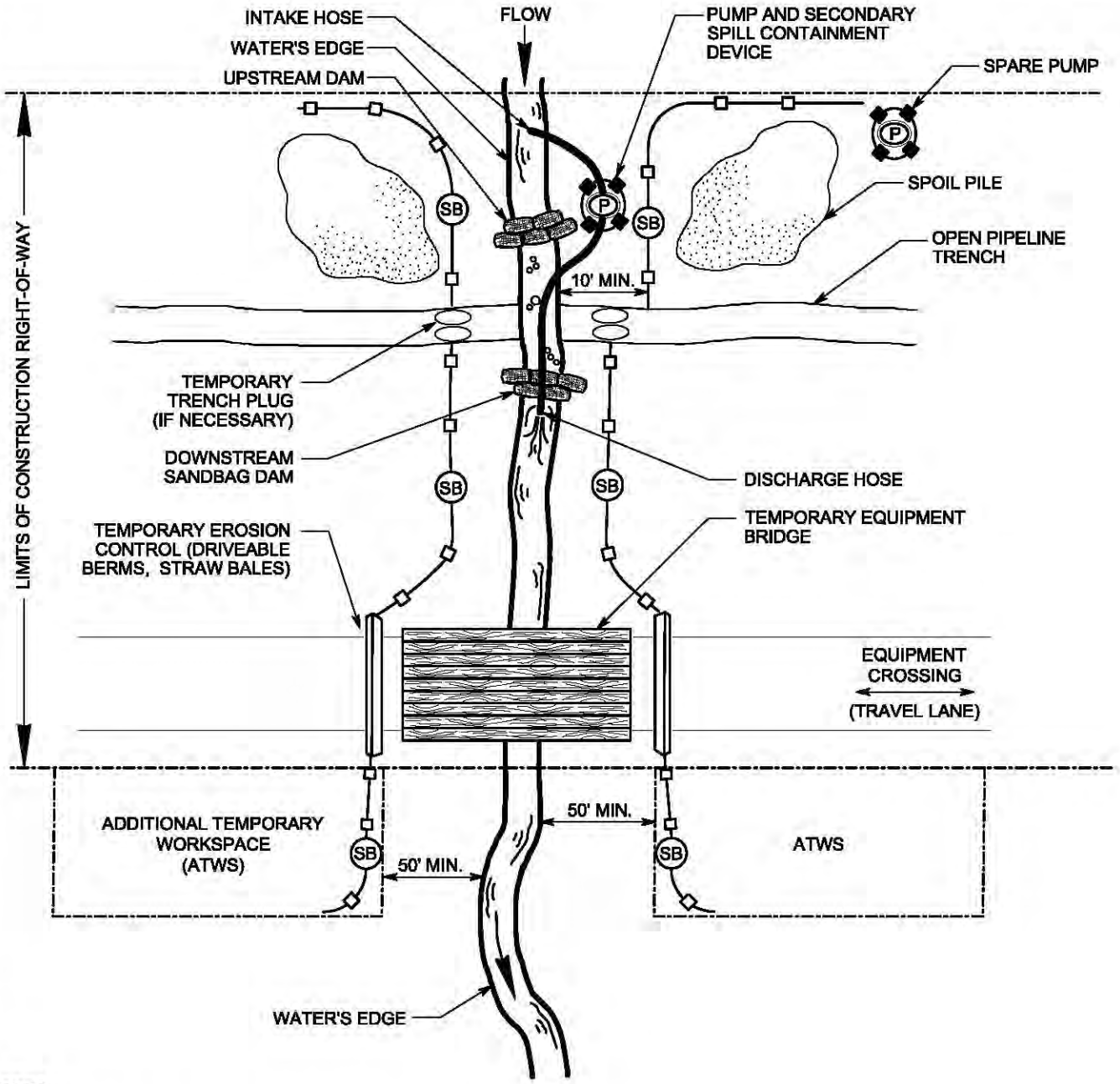
NOTES:

1. (SB) TEMPORARY SEDIMENT BARRIER OF SILT FENCE AND/ OR STRAW BALES, OR OTHER APPROPRIATE MATERIALS.
2. SAND BAGS MUST BE FILLED WITH SAND FREE OF SILT, ORGANICS, AND OTHER MATERIAL.
3. ENSURE SANDBAGS ARE INSTALLED BEFORE PLACING FLUME PIPE.
4. ALIGN FLUME(S) TO PREVENT BANK EROSION AND STREAM SCOUR.
5. CONDUCT ALL IN-STREAM ACTIVITY (EXCEPT BLASTING OR OTHER ROCK BREAKING MEASURES) WITH THE FLUME(S) IN PLACE. FLUME PIPE(S) MAY NOT BE REMOVED FOR LOWERING IN PIPE OR INITIAL STREAMBED RESTORATION EFFORTS.
6. THE ENDS OF THE FLUME AND CULVERT MUST EXTEND TO AN UNDISTURBED AREA.
7. CONTRACTOR TO DETERMINE ACTUAL NUMBER AND SIZE OF FLUMES AND CULVERTS REQUIRED BASED ON STREAM WIDTH AND STREAM FLOW RATE AT THE TIME OF CROSSING.
8. WATER ACCUMULATING WITHIN THE WORK AREA SHALL BE PUMPED TO A FILTER BAG OR DEWATERING STRUCTURE PRIOR TO DISCHARGING INTO ANY SURFACE WATER.

TYPICAL FLUME WATERBODY CROSSING

FIGURE WC-3

DWG. ES-0034 REV.



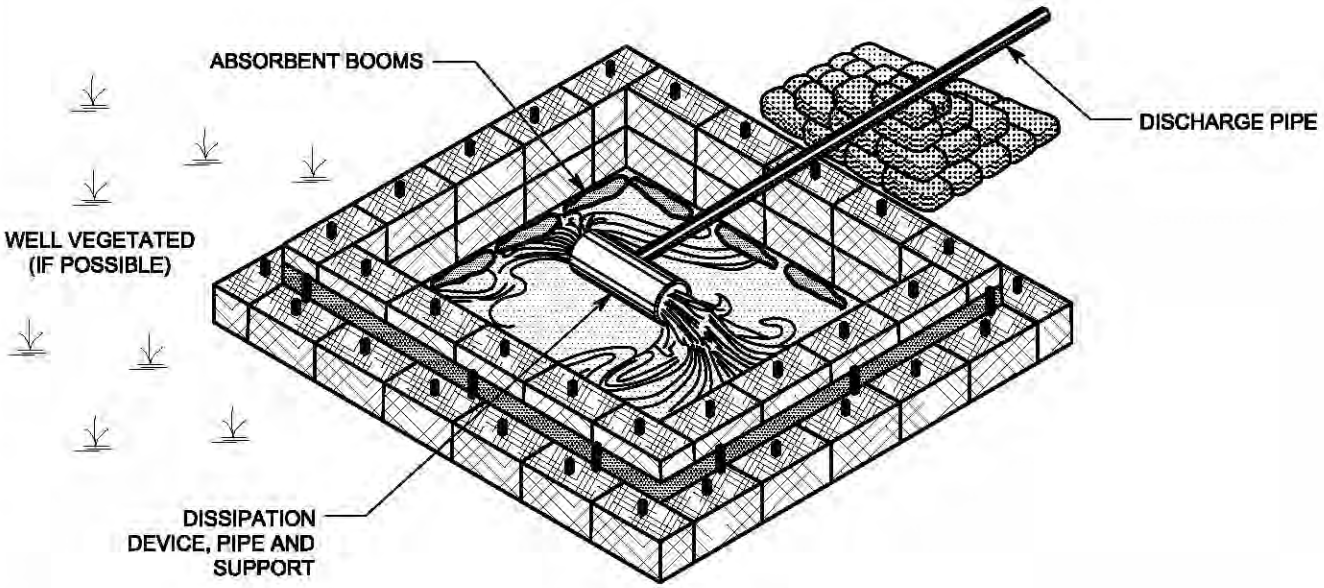
NOTES:

1. (SB) TEMPORARY SEDIMENT BARRIER OF SILT FENCE AND/ OR STRAW BALES, OR OTHER APPROPRIATE MATERIALS
2. INSTALL AND SEAL SANDBAGS UPSTREAM AND DOWNSTREAM OF THE CROSSING.
3. CREATE AN UPSTREAM SUMP USING SANDBAGS IF NATURAL SUMP IS UNAVAILABLE FOR THE INTAKE HOSE.
4. EXCAVATE ACROSS STREAM CHANNEL FOLLOWING WATER REROUTING.
5. DO NOT REFUEL OR STORE FUEL WITHIN 100 FEET OF THE WATERBODY. IF NOT FEASIBLE, ALTERNATIVE METHODS MUST BE APPROVED BY ENVIRONMENTAL INSPECTOR.
6. MONITOR PUMPS AT ALL TIMES DURING STREAM CROSSING PROCEDURE.
7. (P) USE SUFFICIENT PUMPS, INCLUDING ONSITE BACKUP PUMPS, TO MAINTAIN DOWNSTREAM FLOW.
8. SCREEN PUMP INTAKES. PREVENT SCOURING WITHIN WATERBODY BY HOSE DISCHARGE.

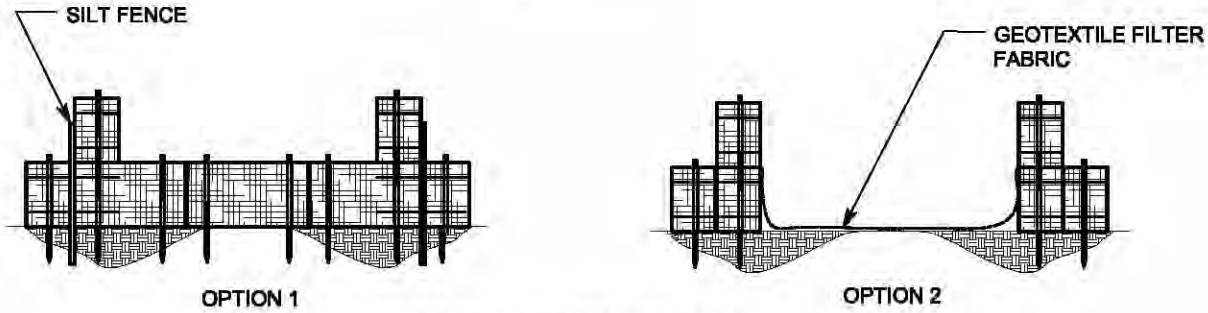
TYPICAL DAM-AND-PUMP WATERBODY CROSSING

FIGURE WC-4

DWG. ES-0035 REV.



PLAN VIEW

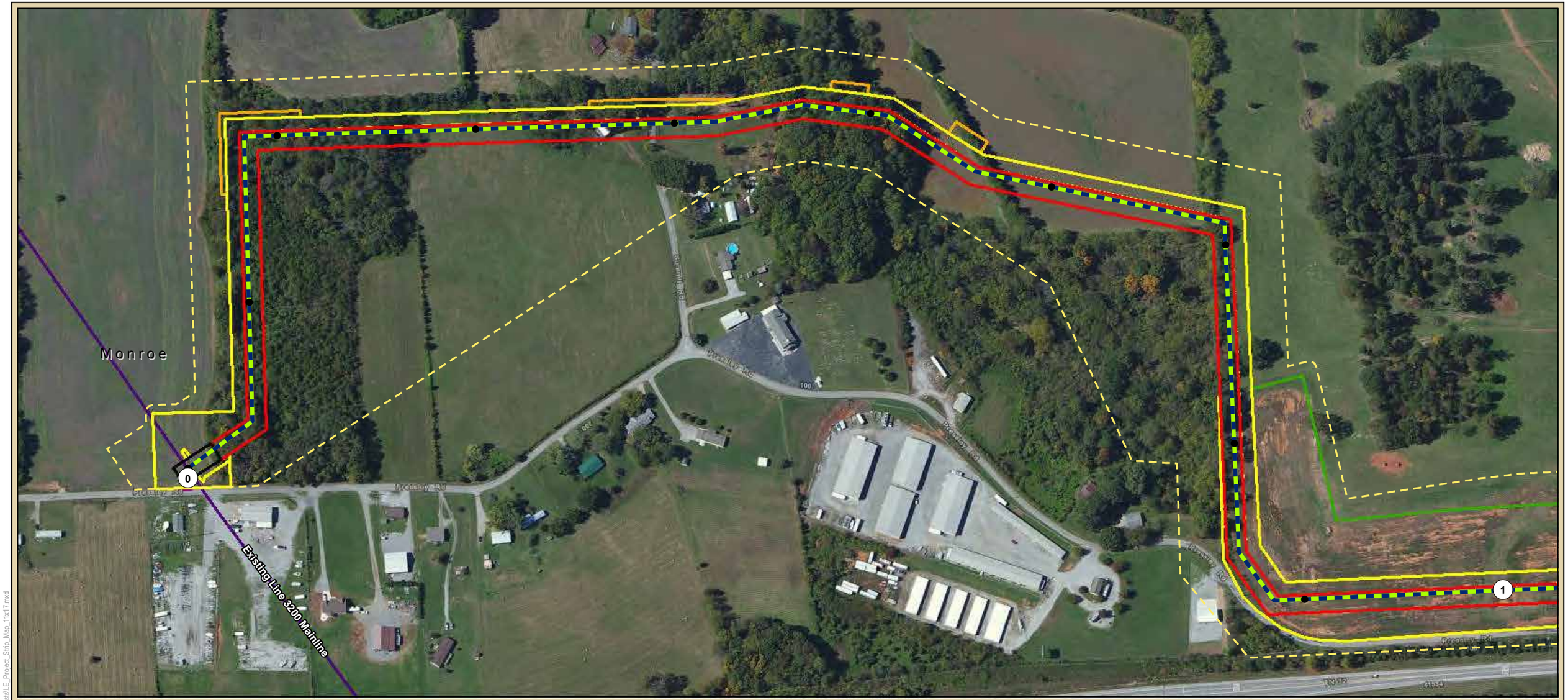


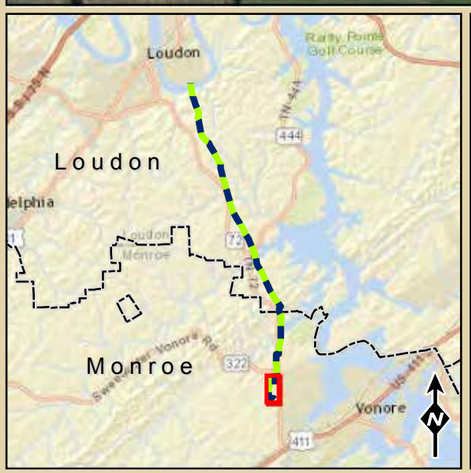
CROSS SECTION VIEWS

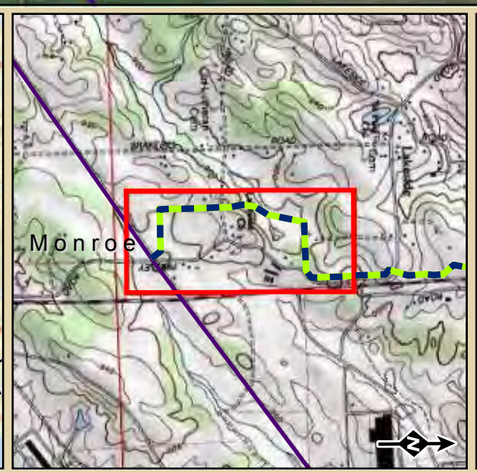
NOTES:

1. SIZE AND DIMENSION OF DEWATERING STRUCTURE WILL VARY DEPENDING ON THE VOLUME AND RATE OF DISCHARGE. STAGGER PLACEMENT OF STRAW BALES WHEN TWO ROWS ARE USED.
2. COVER THE BASE OF THE DISCHARGE STRUCTURE EITHER WITH STRAW BALES (OPTION 1) OR LINE WITH GEOTEXTILE FABRIC (OPTION 2).
3. PROVIDE SUPPORT TO ENSURE THAT DISCHARGE PIPE DOES NOT REST ON STRAW BALES.
4. PLASTIC SHEETING, WOODEN MATS OR STEEL PLATES MAY ALSO BE USED, AS DIRECTED BY THE ENVIRONMENTAL INSPECTOR, TO PREVENT EROSION, STREAMBED SCOUR, SUSPENSION OF SEDIMENTS OR EXCESSIVE STREAMFLOW.
5. ABSORBENT BOOMS MUST BE USED DURING DISCHARGES FROM EXISTING / USED PIPE OR AS DIRECTED BY PERMIT REQUIREMENTS.
6. PREVENT EROSION, STREAMBED SCOUR, SUSPENSION OF SEDIMENTS AND EXCESSIVE STREAMFLOW BY PROPER DESIGN OF STRUCTURE, REGULATING THE WATER DISCHARGE RATE AS WELL AS USE OF ENERGY DISSIPATION DEVICE(S) AND SEDIMENT BARRIERS, AS NECESSARY.

	DISCHARGE STRUCTURE FOR HYDROSTATIC TEST WATER	FIGURE WD-2
		DWG. ES-0026 REV.







- Project Centerline
- (10) Milepost
- Existing Line 3200 Mainline
- Existing Loudon-Lenoir City Lateral
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- Above Ground Facility
- Proposed Permanent Easement
- HDD - Permanent Easement
- Temporary Workspace
- Additional Temporary Workspace
- Permanent Access Road
- Temporary Access Road
- Ware Yard
- County Boundary

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Feet

Sources: USGS, ESRI, Spectra, TRC **Map Coordinate System:** NAD 1983 UTM Zone 16N

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Loudon Expansion Project

Sheet 1 of 15

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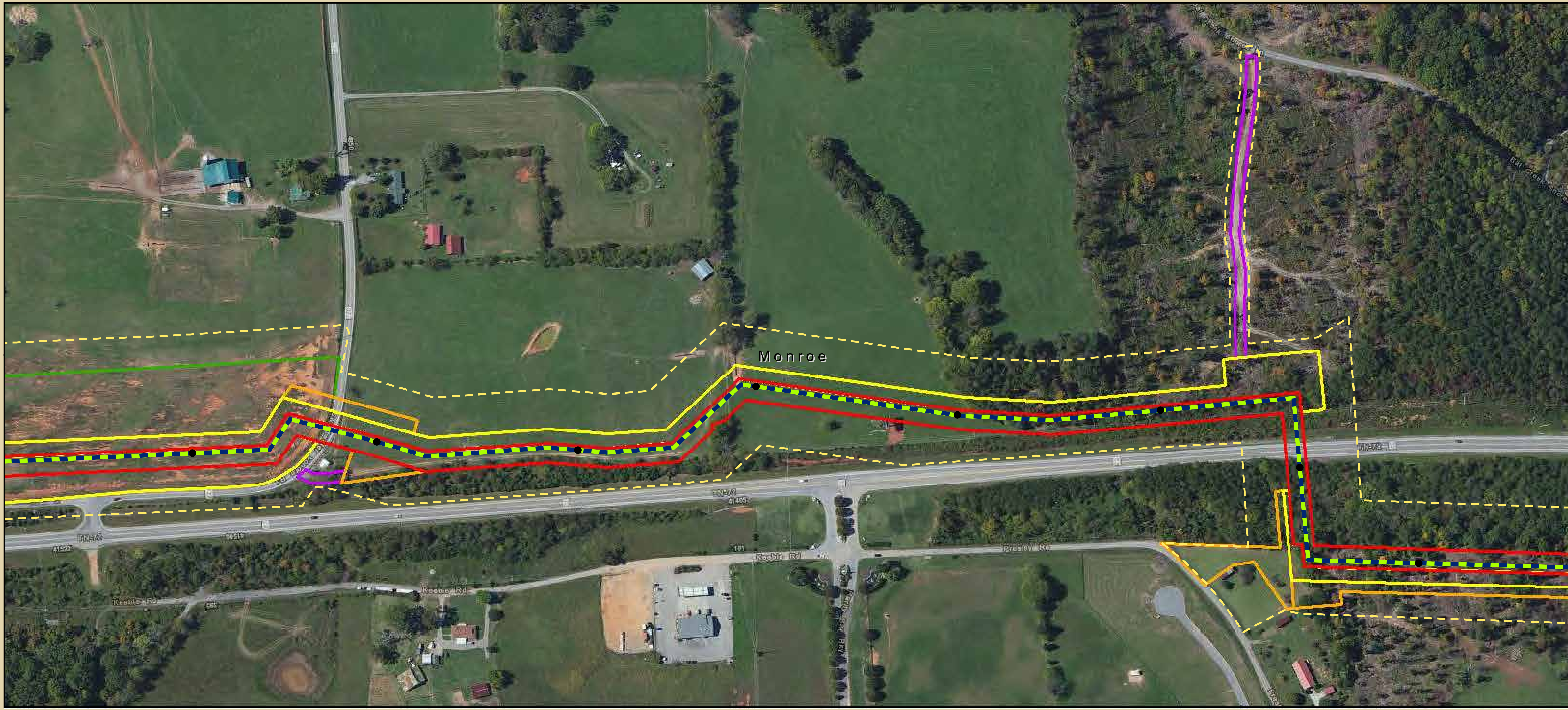

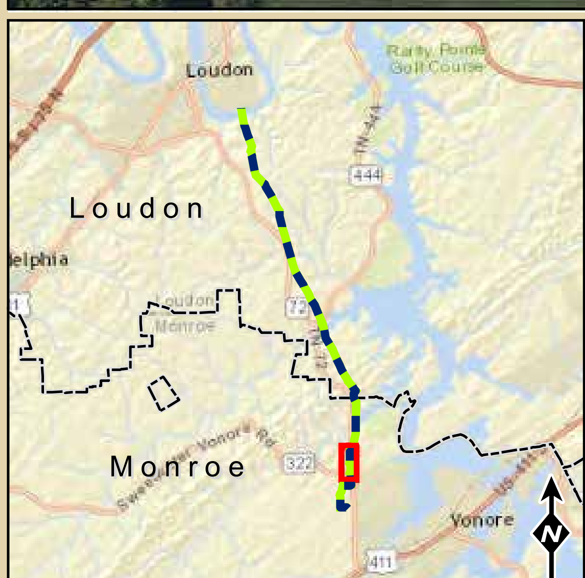

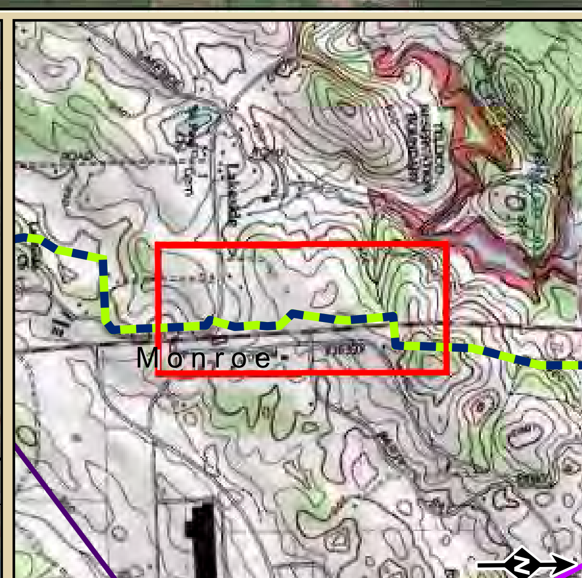

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Sources: USGS, ESRI, Spectra, TRC **Map Coordinate System:** NAD 1983 UTM Zone 16N

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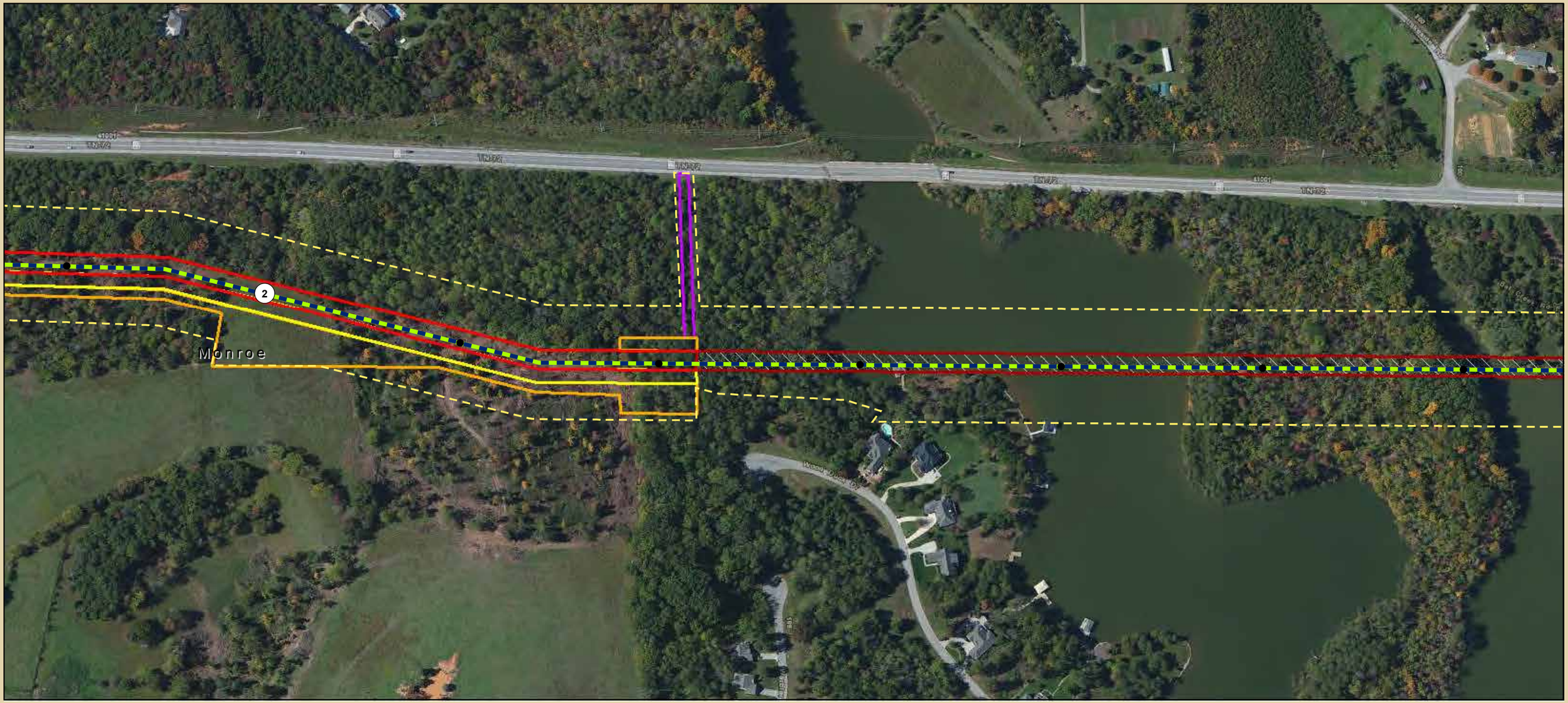
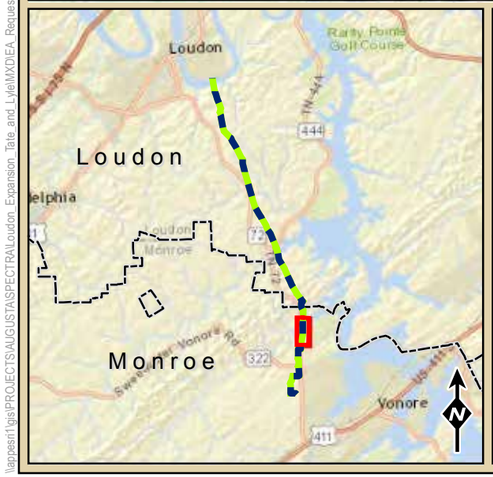
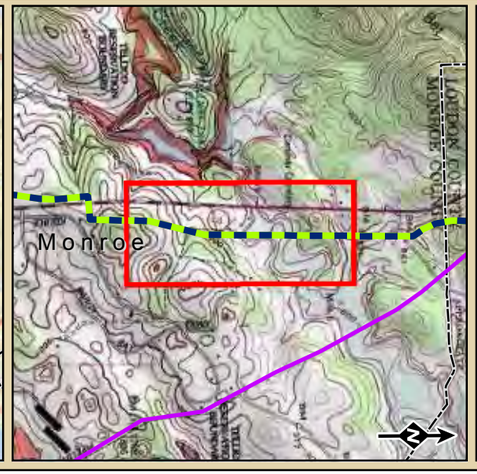
Loudon Expansion Project

Sheet 2 of 15

12/7/2015







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Feet

Sources: USGS, ESRI, Spectra, TRC **Map Coordinate System:** NAD 1983 UTM Zone 16N

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Loudon Expansion Project

Sheet 3 of 15

12/7/2015

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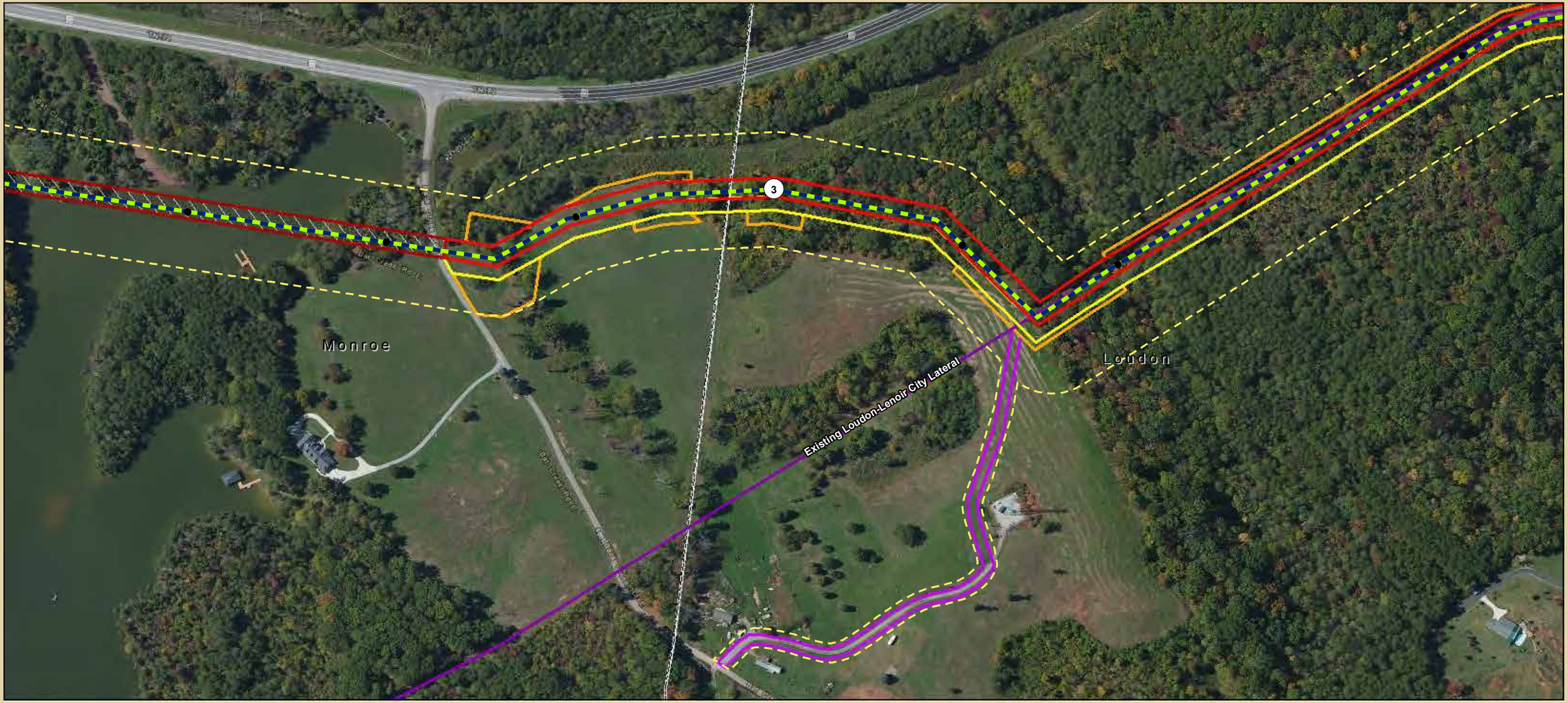

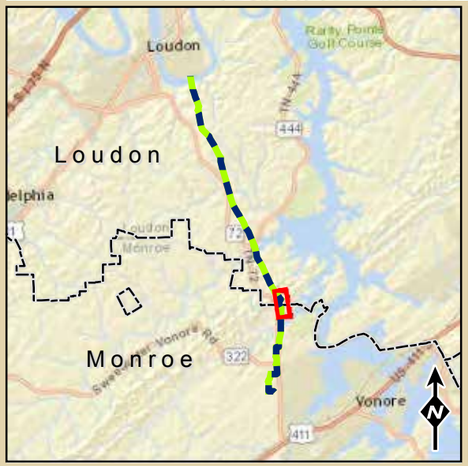

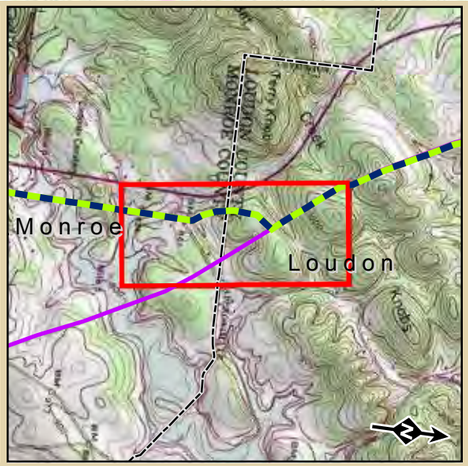

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Feet

Sources: USGS, ESRI, Spectra, TRC **Map Coordinate System:** NAD 1983 UTM Zone 16N

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Loudon Expansion Project

Sheet 4 of 15

12/7/2015

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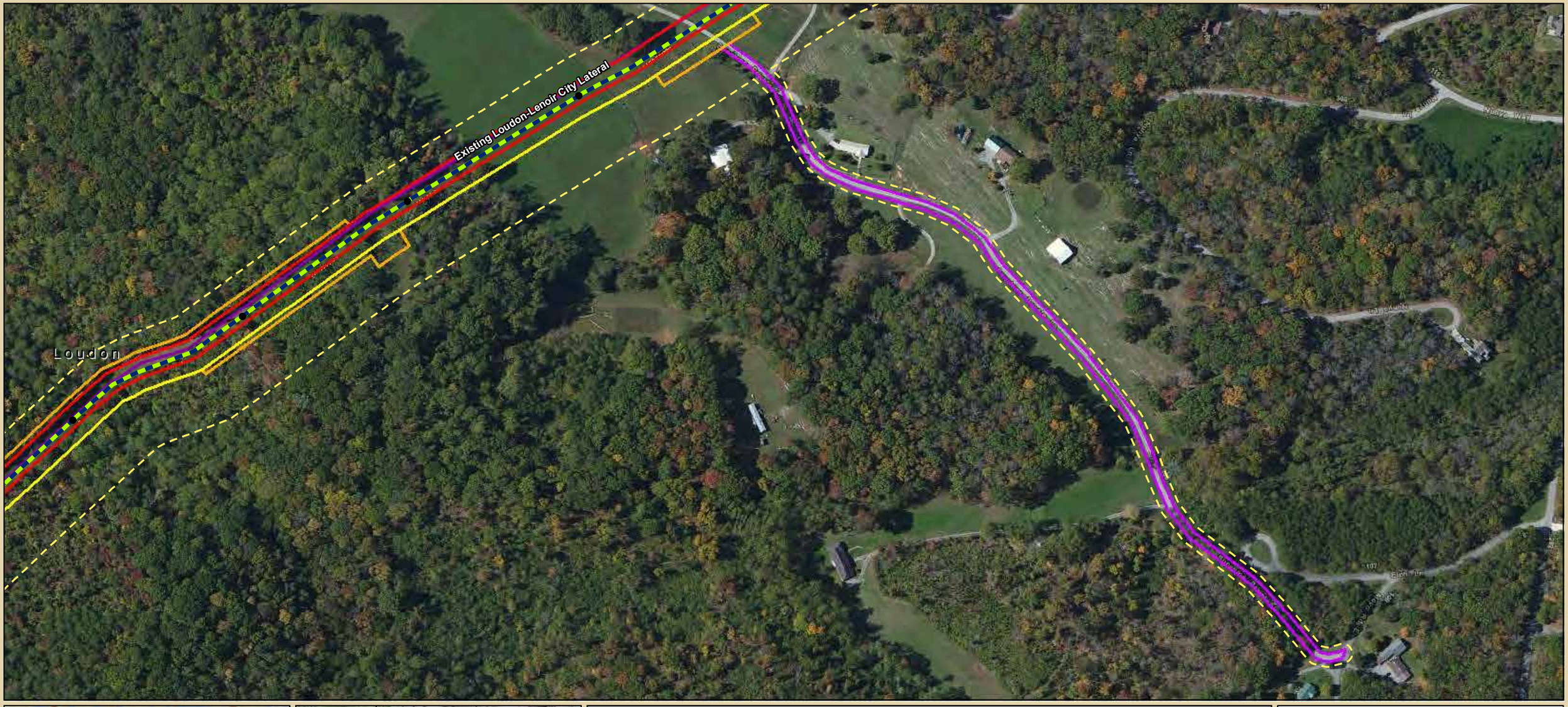

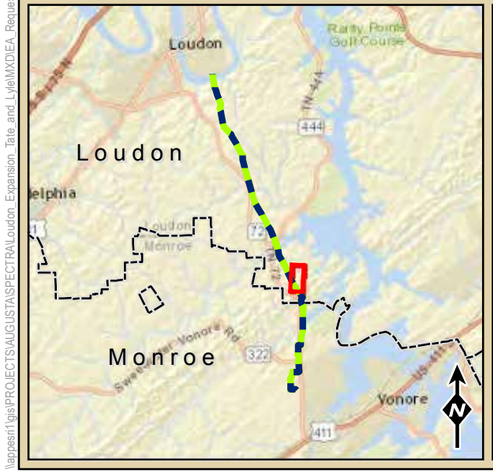

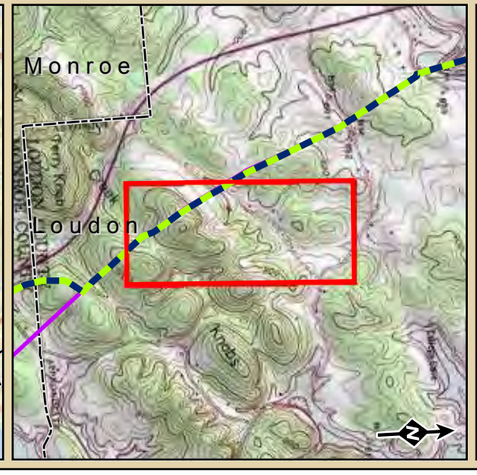

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Sources: USGS, ESRI, Spectra, TRC **Map Coordinate System:** NAD 1983 UTM Zone 16N

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Loudon Expansion Project

Sheet 5 of 15

12/7/2015

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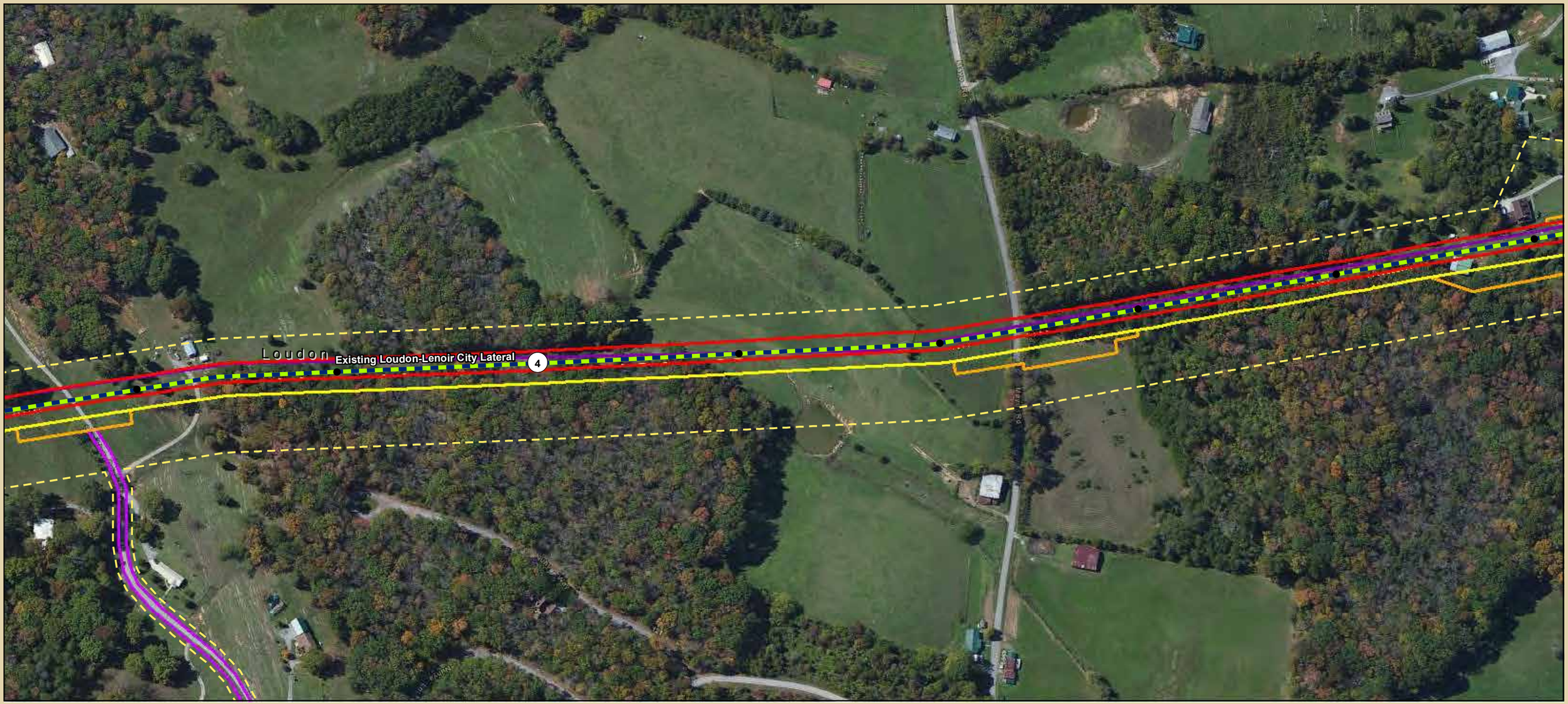

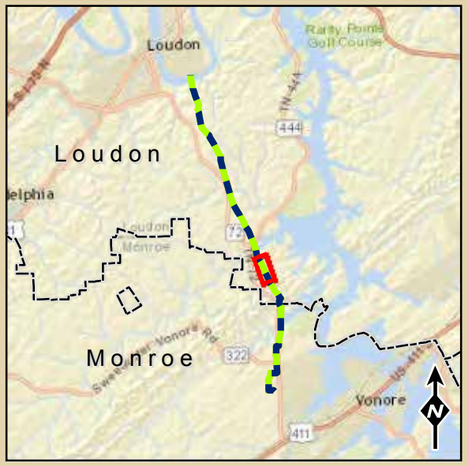

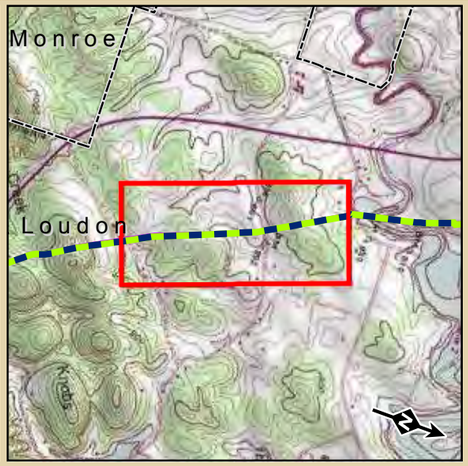

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- Temporary Workspace
- Additional Temporary Workspace
- Permanent Access Road
- Temporary Access Road
- Ware Yard
- County Boundary

N

0 250 500

Feet

Sources: USGS, ESRI, Spectra, TRC **Map Coordinate System:** NAD 1983 UTM Zone 16N

Spectra Energy Partners

Loudon Expansion Project

Sheet 6 of 15

12/7/2015

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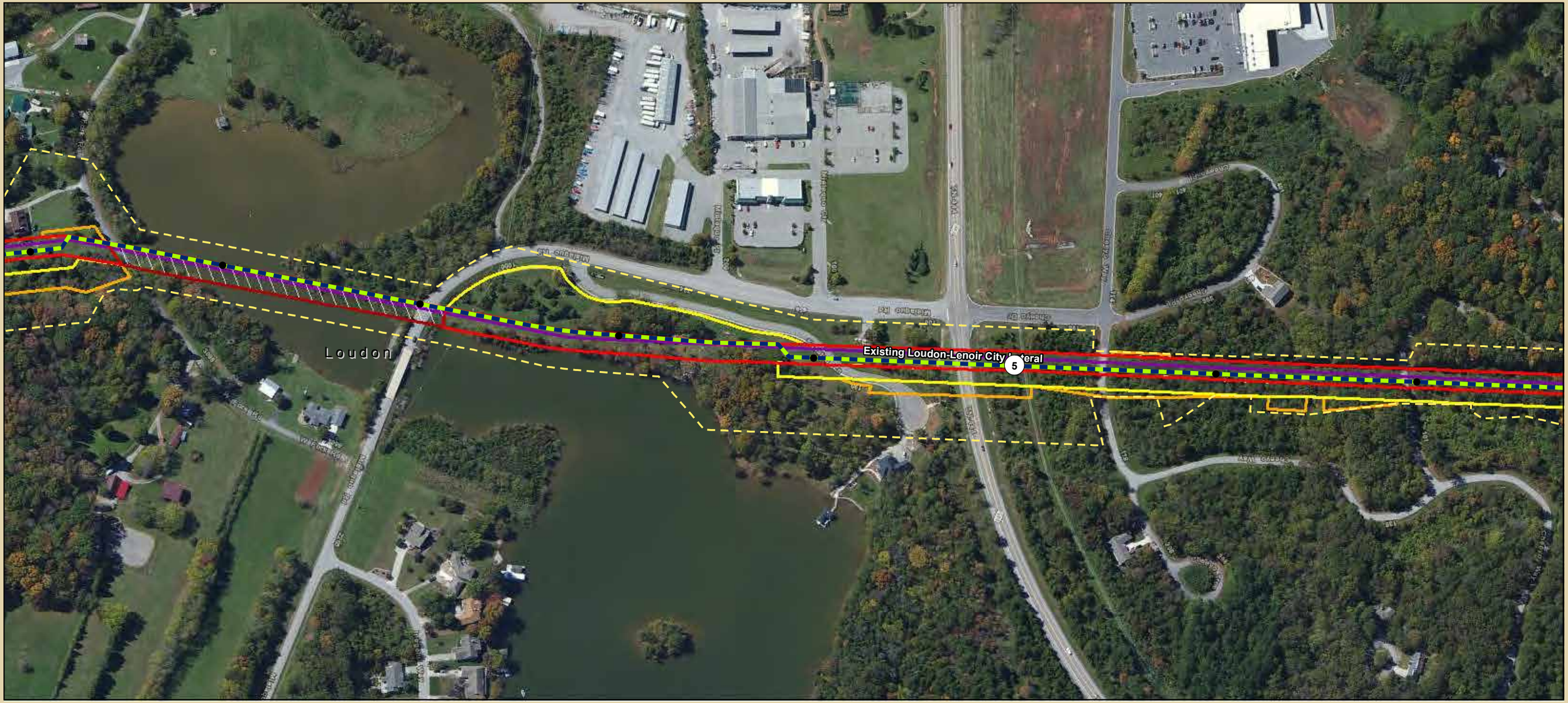

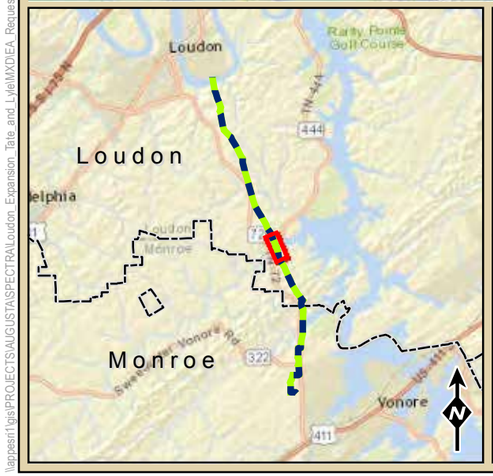

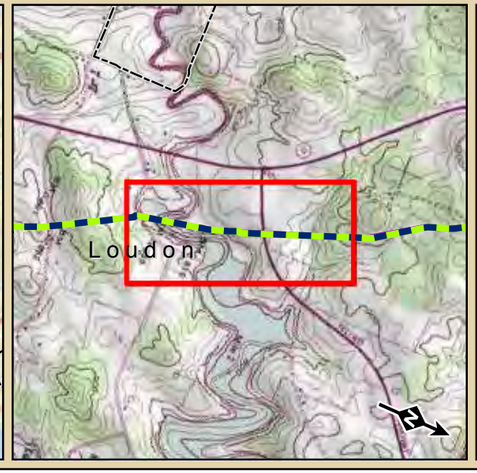

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Loudon Expansion Project

Sheet 7 of 15

12/7/2015

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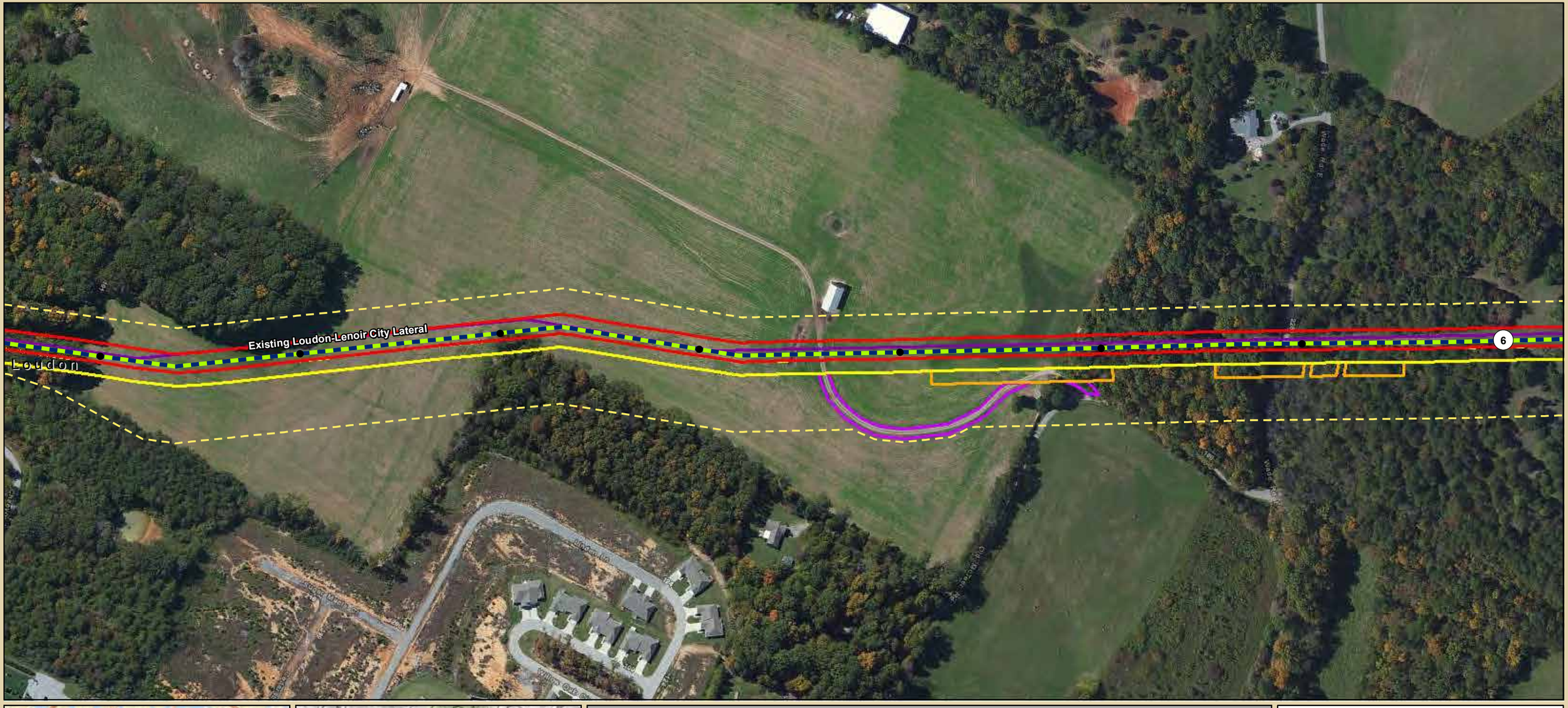

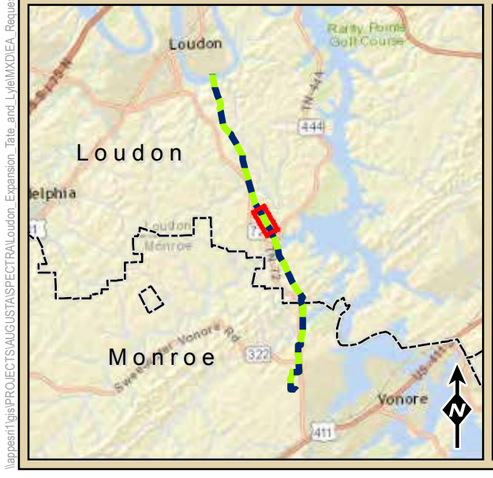

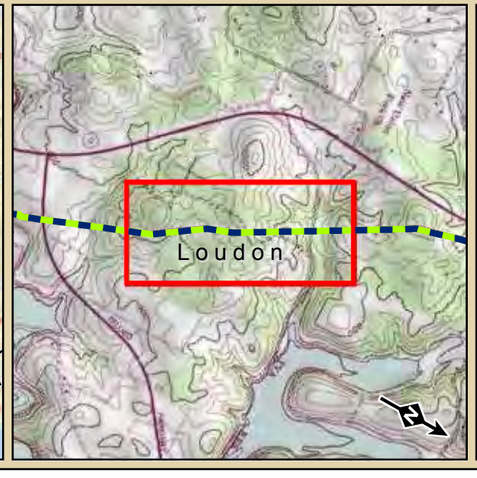

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Loudon Expansion Project

Sheet 8 of 15

12/7/2015

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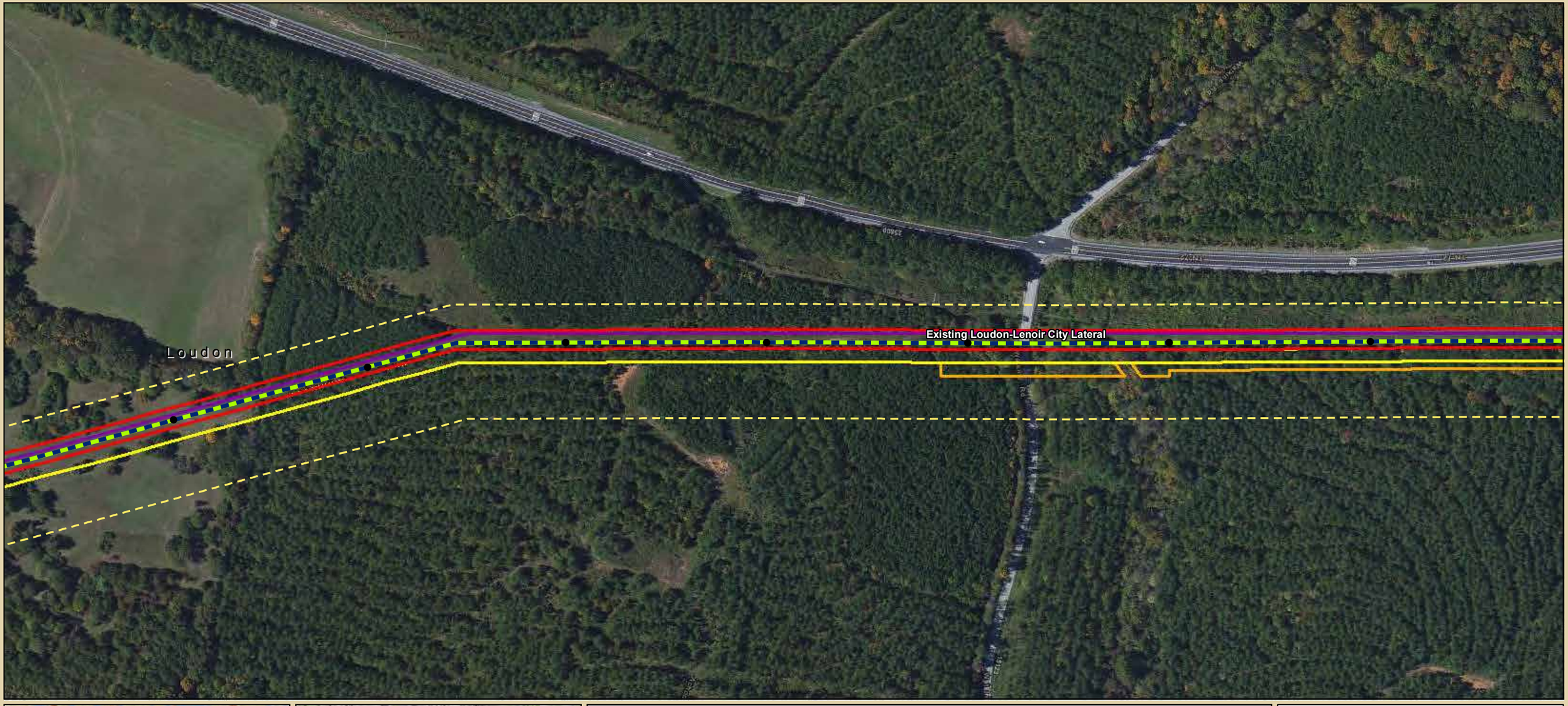

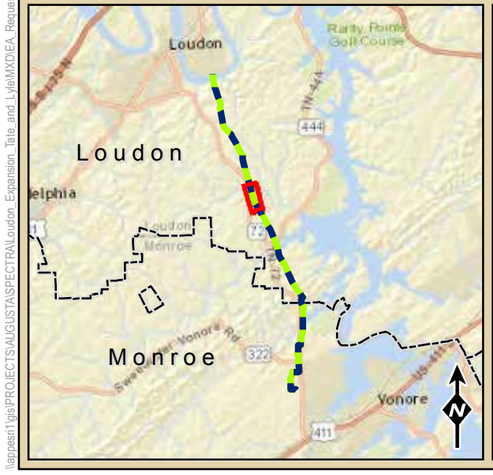

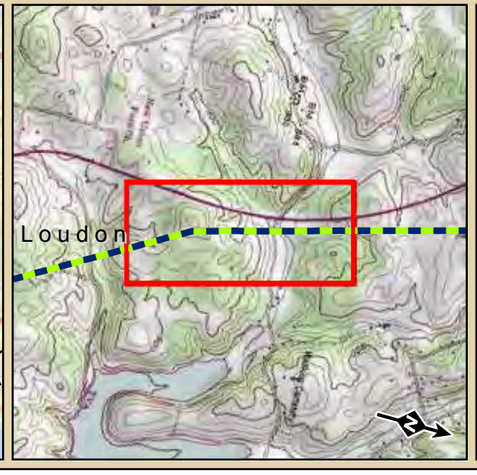

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Loudon Expansion Project

Sheet 9 of 15

12/7/2015

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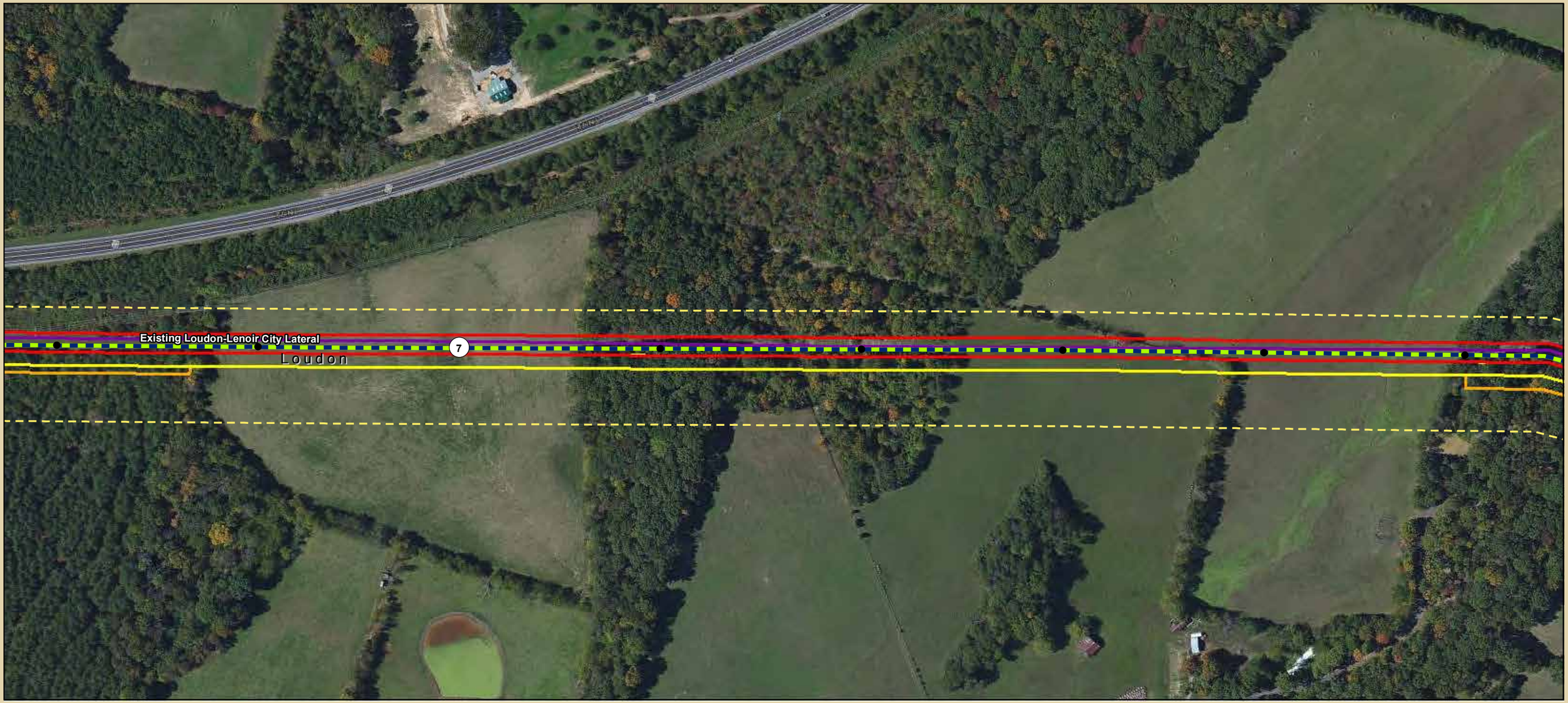

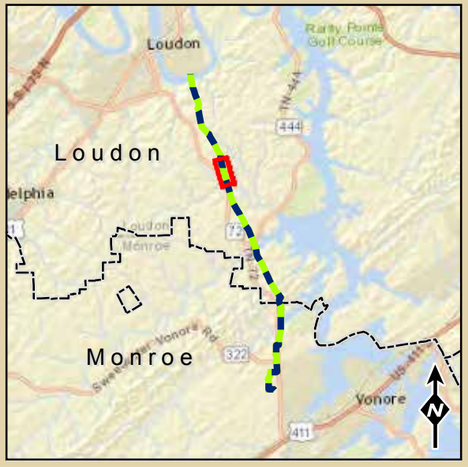

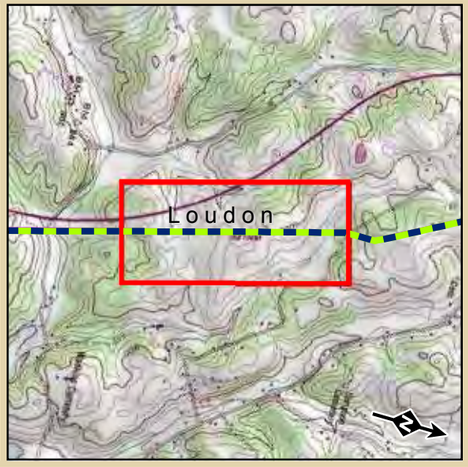

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Feet

Sources: USGS, ESRI, Spectra, TRC **Map Coordinate System:** NAD 1983 UTM Zone 16N

Spectra Energy Partners

Loudon Expansion Project

Sheet 10 of 15

12/7/2015

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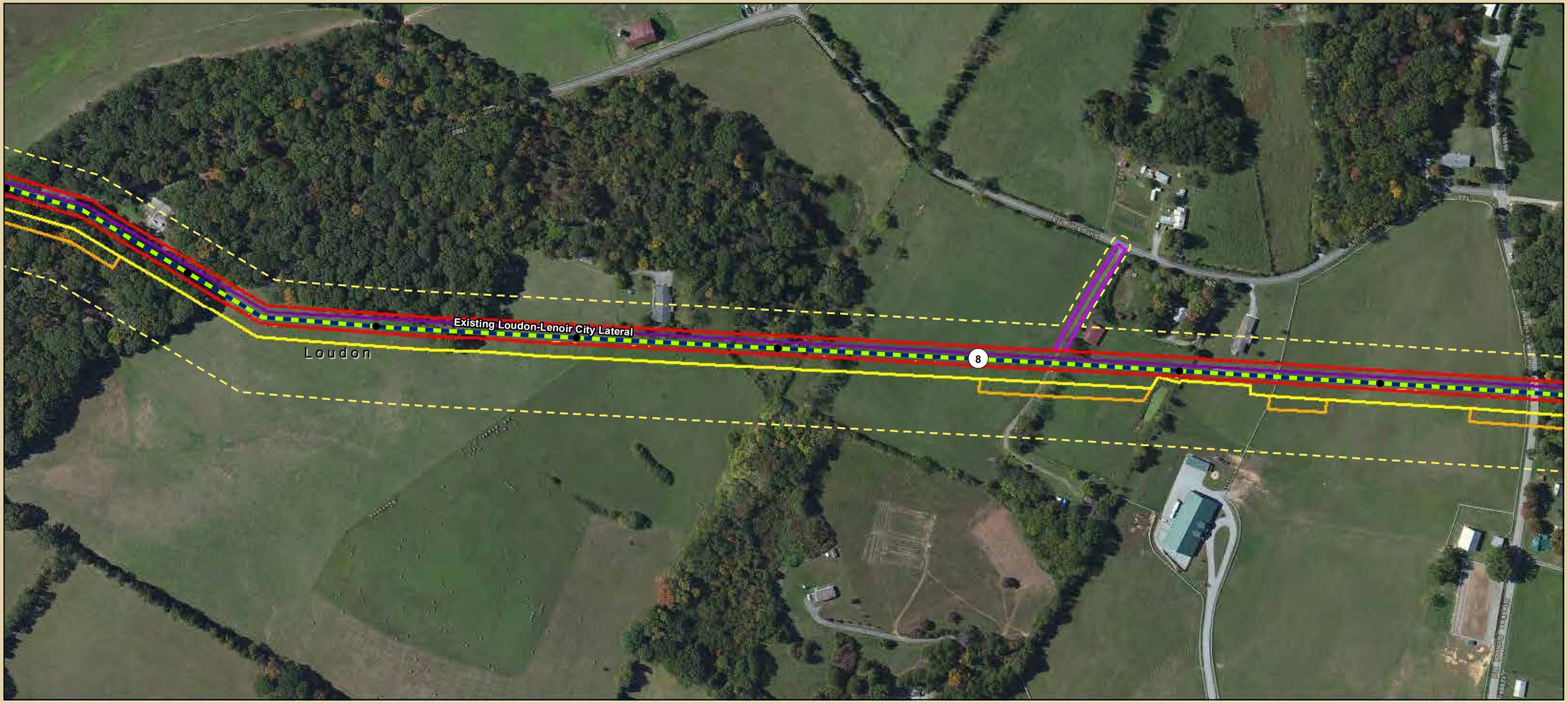

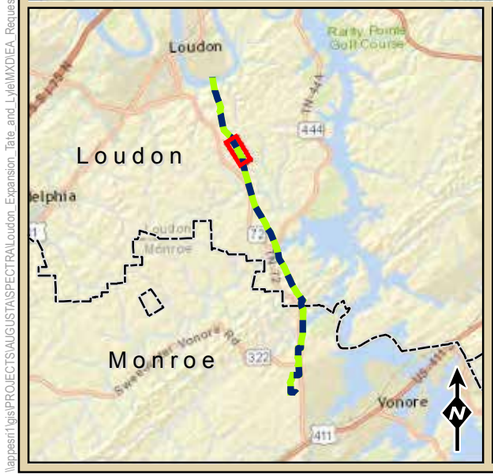

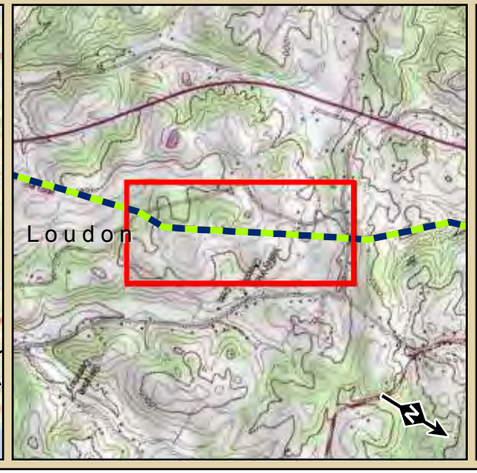

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Sources: USGS, ESRI, Spectra, TRC **Map Coordinate System:** NAD 1983 UTM Zone 16N

Spectra Energy Partners

Loudon Expansion Project

Sheet 11 of 15

12/7/2015

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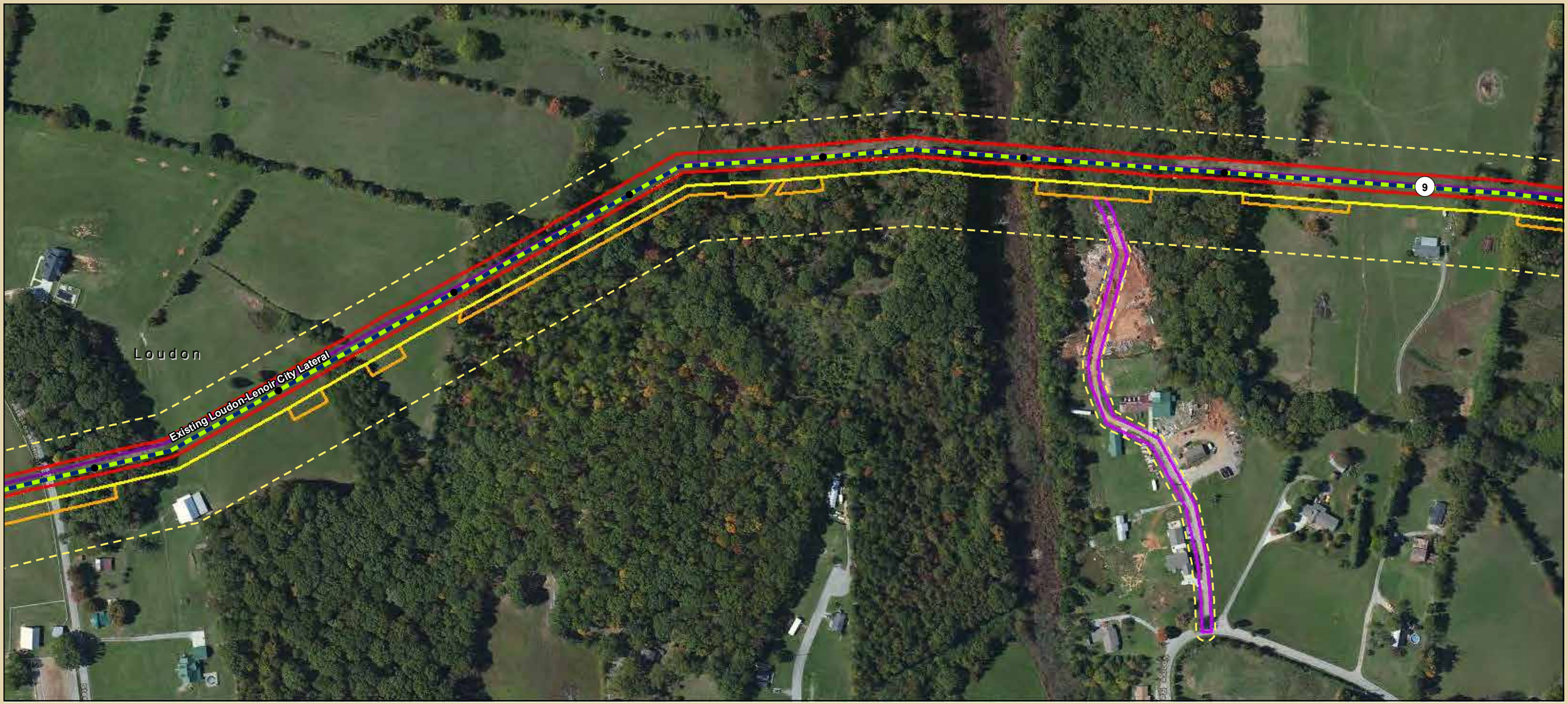

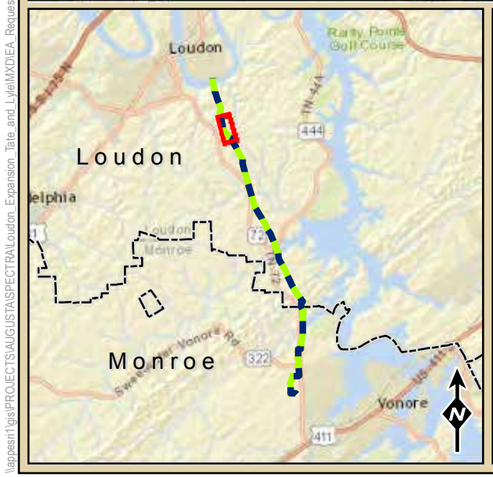

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Loudon Expansion Project

Sheet 12 of 15

12/7/2015

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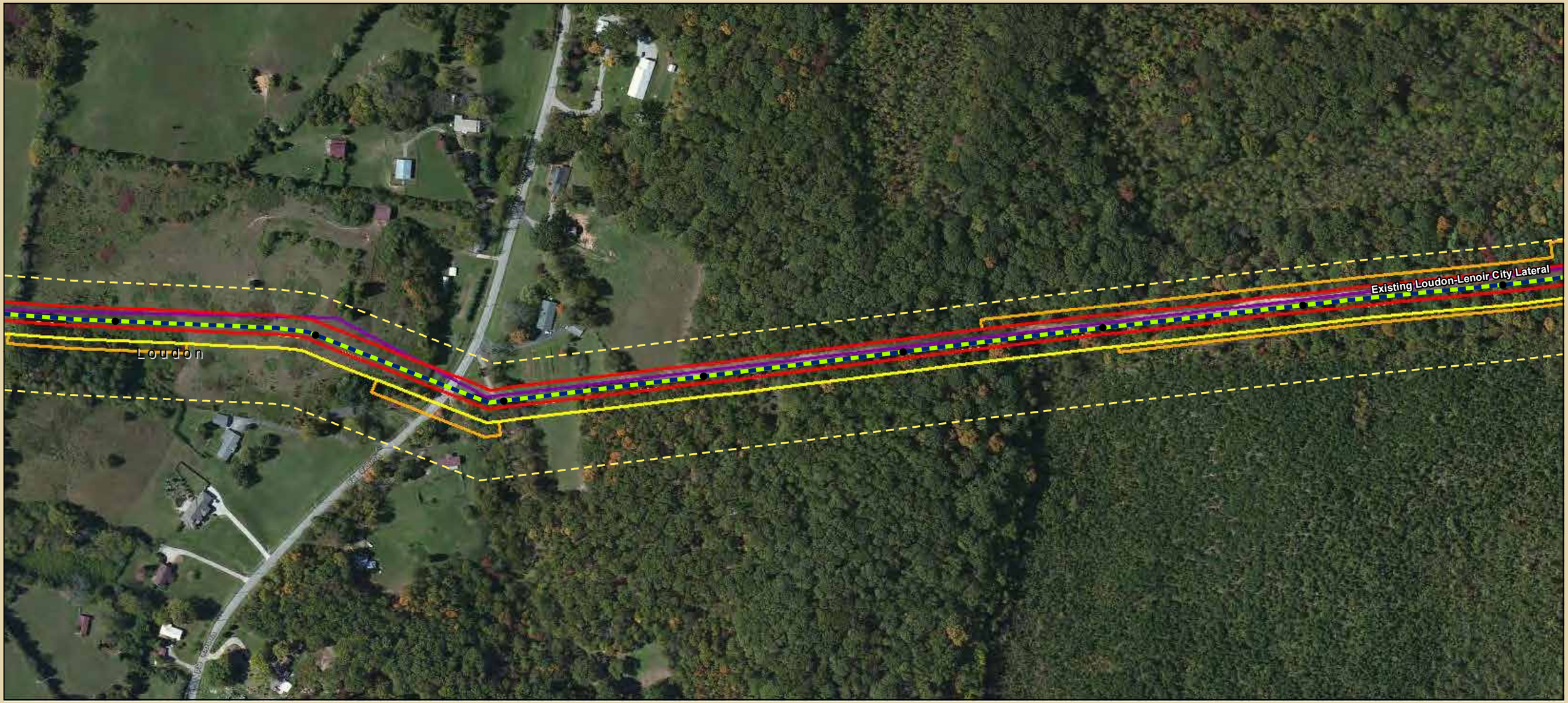

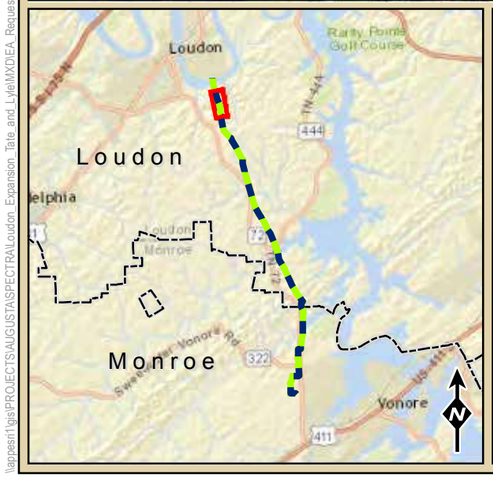

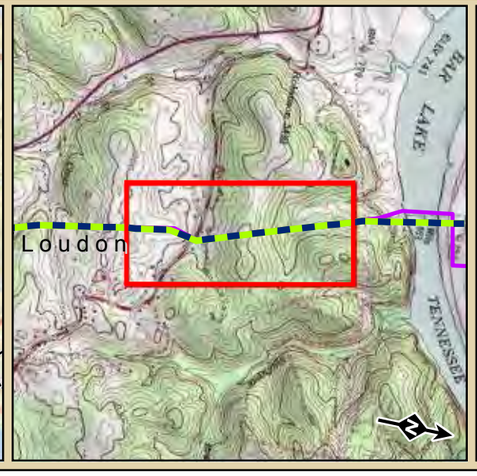

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Feet

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Loudon Expansion Project

Sheet 13 of 15

12/7/2015

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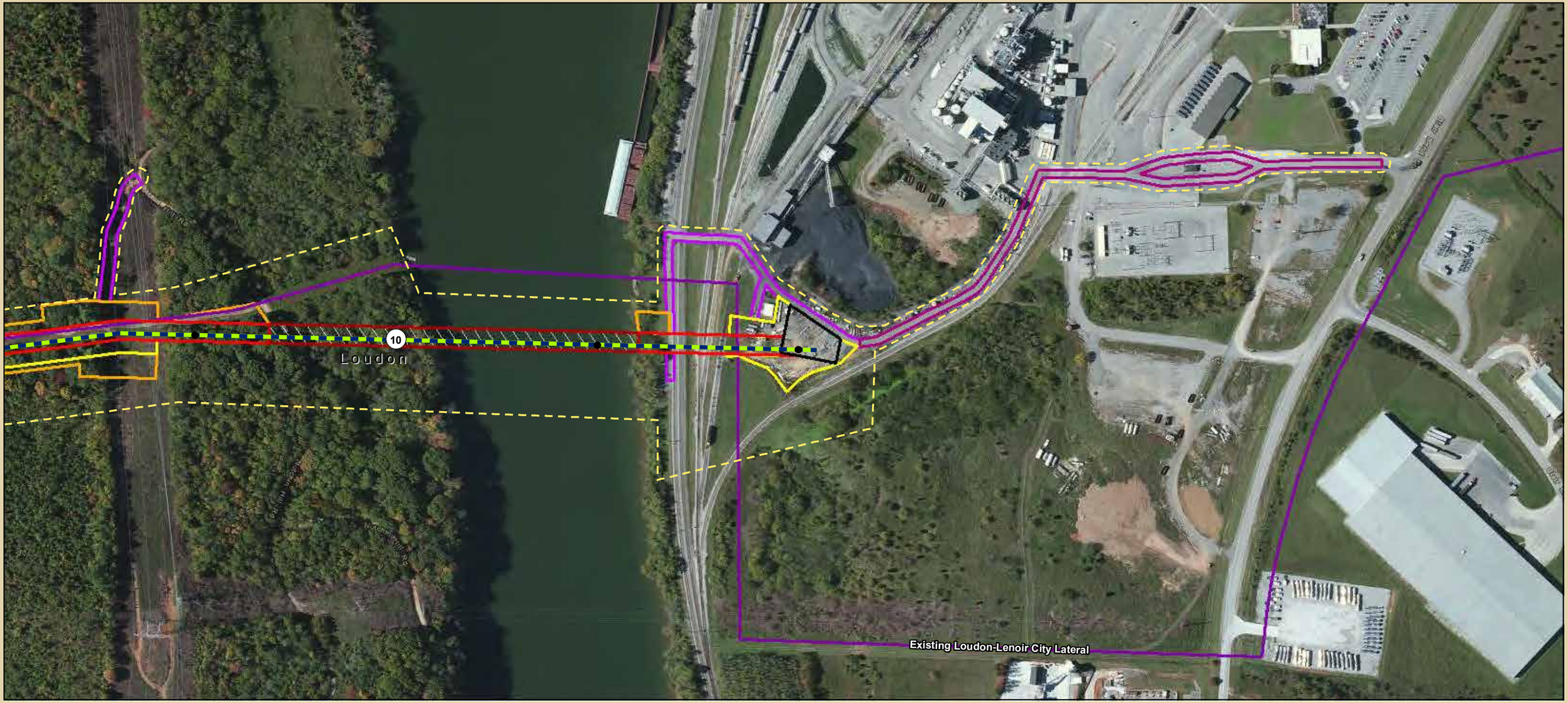

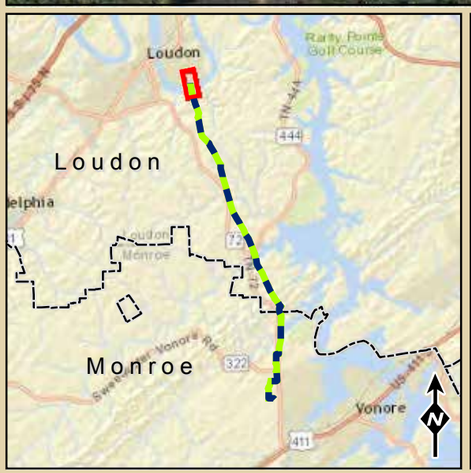

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Spectra Energy Partners

Loudon Expansion Project

Sheet 14 of 15

12/7/2015

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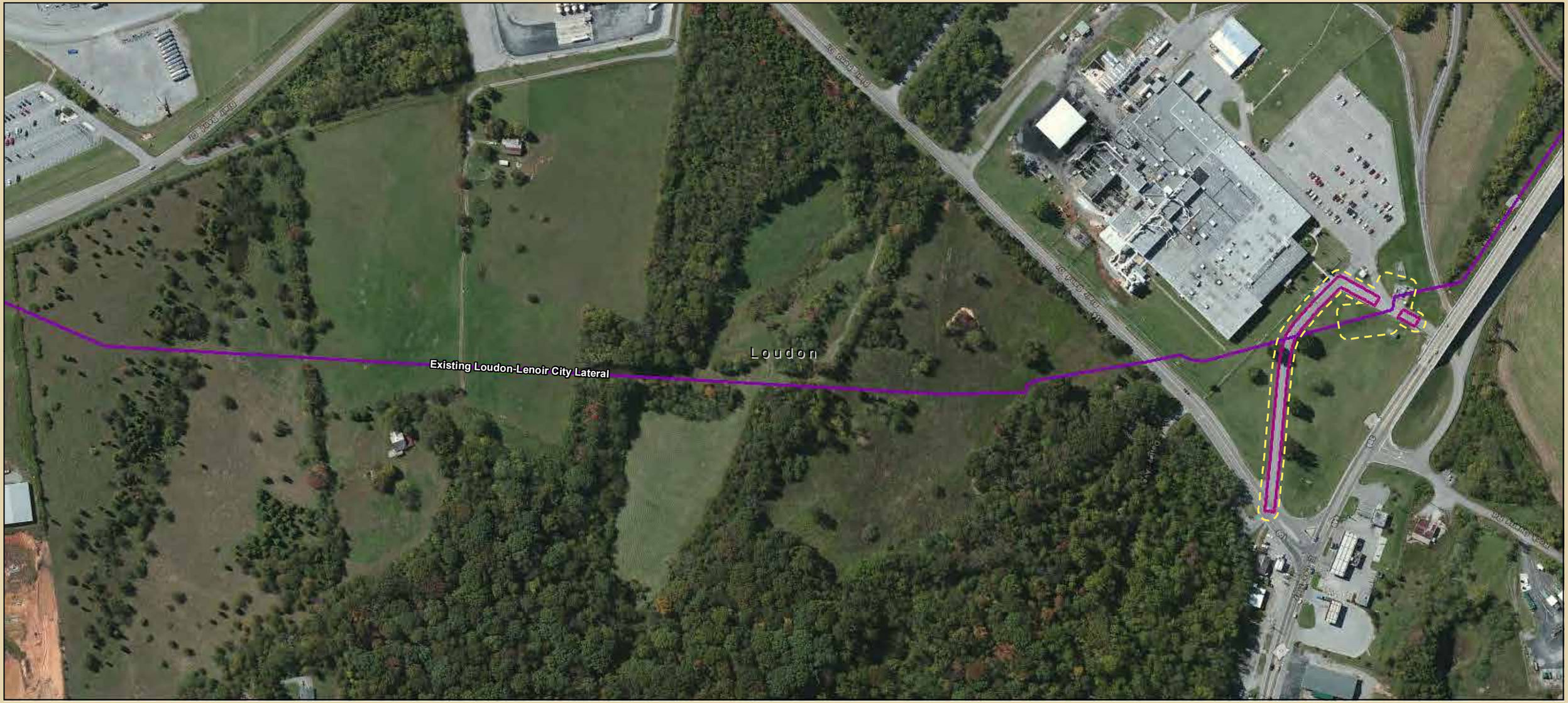

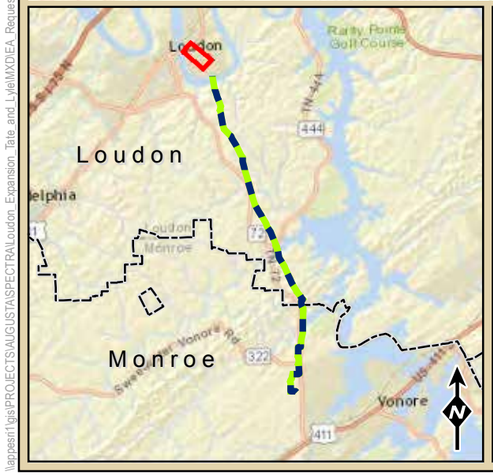

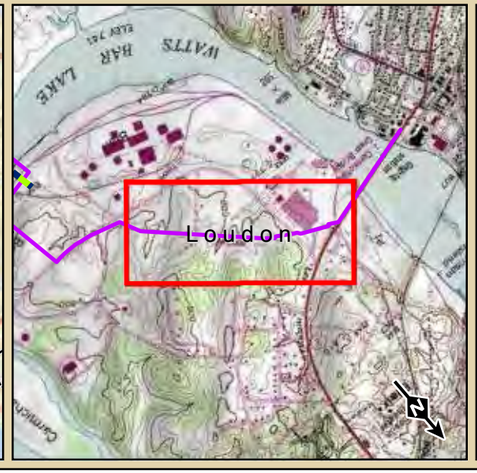

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Spectra Energy Partners

Loudon Expansion Project

Sheet 15 of 15

12/7/2015

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Appendix B

Location of Additional Temporary Workspaces along the Loudon Expansion Project

Location of Additional Temporary Workspaces along the Loudon Expansion Project			
Approximate Milepost	**Workspace Purpose**	**Land Use**	**Acres**
0.2	P.I.	Forest	0.14
0.4	Road Crossing	Agricultural	0.06
0.4	Road Crossing	Forest	0.06
0.4	Road Crossing	Road	0.01
0.5	Steep Side Slope	Forest	0.06
0.5	Steep Side Slope	Agricultural	0.08
1.2	Road Crossing	Agricultural	0.25
1.2	Road Crossing	Road	0.03
1.2	Road Crossing	Agricultural	0.18
1.2	Road Crossing	Forest	0.02
1.7	P.I.; Road Crossing	Forest	0.10
1.7	P.I.; Road Crossing	Residential	0.53
1.8	HDD Staging and Pullback	Agricultural	0.94
1.8	HDD Staging and Pullback	Forest	1.69
1.8	HDD Staging and Pullback	Residential	0.08
2.2	HDD Staging and Pullback	Forest	0.16
2.8	HDD Drill Rig and Staging	Agricultural	0.43
2.8	HDD Drill Rig and Staging	Road	0.01
2.8	HDD Drill Rig and Staging	Agricultural	0.07
2.8	HDD Drill Rig and Staging	Forest	0.14
2.9	P.I.	Agricultural	0.12
2.9	P.I.	Forest	0.03
2.9	P.I.	ROW	0.02
2.9	P.I.	Agricultural	0.09
3.0	P.I.	Forest	0.12
3.1	P.I	Agricultural	0.09
3.1	P.I.	Forest	0.08
3.1	P.I.	ROW	0.02
3.2	Steep Side Slope	Forest	0.54
3.2	Steep Side Slope	ROW	0.17
3.5	Steep Side Slope	Forest	0.30
3.8	Road Crossing	Agricultural	0.22
3.8	Road Crossing	Road	0.02
4.2	Road Crossing	Agricultural	0.36
4.2	Road Crossing	Forest	0.06
4.2	Road Crossing	Road	0.04

Location of Additional Temporary Workspaces along the Loudon Expansion Project			
Approximate	**Workspace Purpose**	**Land Use**	**Acres**
4.5	HDD Staging, Drill Rig, and Pullback	Forest	0.61
4.5	HDD Staging, Drill Rig, and Pullback	Road	0.004
4.5	HDD Staging, Drill Rig, and Pullback	Residential	0.03
4.5	HDD Staging, Drill Rig, and Pullback	Road	0.0004
4.5	HDD Staging, Drill Rig, and Pullback	ROW	0.05
4.9	HDD Staging, Drill Rig, and Pullback	Forest	0.10
4.9	HDD Staging, Drill Rig, and Pullback	Open	0.10
4.9	HDD Staging, Drill Rig, and Pullback	Road	0.13
5.0	HDD Staging, Drill Rig, and Pullback	Forest	0.12
5.0	HDD Staging, Drill Rig, and Pullback	Road	0.02
5.1	HDD Staging and Pullback; Road crossing	Forest	0.01
5.1	HDD Staging and Pullback; Road crossing	ROW	0.02
5.1	Stream Crossing	Forest	0.08
5.2	Stream Crossing; Road Crossing	Forest	0.10
5.7	Stream Crossing	Agricultural	0.28
5.7	Road Crossing	Forest	0.10
5.9	Road Crossing; Stream Crossing	Forest	0.14
5.9	Road Crossing; Stream Crossing	Road	0.05
5.9	Stream Crossing	Forest	0.05
5.9	Stream Crossing	Forest	0.12
6.5	Road Crossing; Stream Crossing	Agricultural	0.34
6.5	Road Crossing	Road	0.03
6.6	Steep Side Slope	Agricultural	0.72
7.5	Road Crossing	Forest	0.27
8.0	Road Crossing	Agricultural	0.36
8.2	Road Crossing	Agricultural	0.12
8.3	Road Crossing	Agricultural	0.12
8.3	Road Crossing	Forest	0.11
8.3	Road Crossing	Road	0.03
8.4	Steep Side Slope	Agricultural	0.08
8.5	Steep Side Slope	Agricultural	0.08
8.5	Steep Side Slope	Agricultural	0.01
8.5	Steep Side Slope	Forest	0.53
8.7	Steep Side Slope	Forest	0.09
8.8	Road Crossing	Forest	0.24
8.9	Steep Side Slope	Agricultural	0.16

Location of Additional Temporary Workspaces along the Loudon Expansion Project			
Approximate	**Workspace Purpose**	**Land Use**	**Acres**
9.0	Steep Side Slope	Agricultural	0.003
9.0	Steep Side Slope	Forest	0.25
9.0	Steep Side Slope	Scrub	0.02
9.2	Road Crossing	Forest	0.05
9.2	Road Crossing	Residential	0.20
9.2	Road Crossing	Road	0.03
9.2	Road Crossing	Scrub	0.01
9.5	HDD Staging and Pullback; Road Crossing	Forest	0.71
9.5	HDD Staging and Pullback; Road Crossing	ROW	0.55
9.6	HDD Staging and Pullback; Road Crossing	Forest	0.49
9.6	HDD Staging and Pullback; Road Crossing	ROW	0.22
9.9	HDD Staging and Pullback; Road Crossing	Forest	0.05
9.9	HDD Staging and Pullback; Road Crossing	ROW	0.13
10.1	HDD and Hydrotest Water Source Pumps	Forest	0.06
10.1	HDD and Hydrotest Water Source Pumps	Industrial	0.03
10.1	HDD and Hydrotest Water Source Pumps	Water	0.01
		TOTAL:	**15.6**
ROW: right-of-way			

Appendix C

Best Drilling Practices, Monitoring and Clean-up of Horizontal Directional Drilling Inadvertent Returns for the Loudon Expansion Project Plan

Best Drilling Practices, Monitoring and Clean-up of Horizontal Directional Drilling Inadvertent Returns for the Loudon Expansion Project

February 2015, Updated November 2015

TABLE OF CONTENTS

1.0 INTRODUCTION

East Tennessee Natural Gas, LLC ("ETNG") is proposing to expand its pipeline systems to provide up to 40,000 Dekatherms per day ("Dth/d") of firm transportation service to the Project Shipper, Tate & Lyle Americas Ingredients, LLC ("Tate & Lyle" or "Project Shipper"), for service to Tate & Lyle's existing manufacturing facility ("Tate & Lyle Plant") in Loudon County, Tennessee. To accomplish this ETNG is filing an application for a certificate of public convenience and necessity ("Certificate") from the Federal Energy Regulatory Commission ("FERC"). ETNG is requesting authorization for the activities and facilities associated with the proposed Loudon Expansion Project ("Loudon Project" or "Project") under Section 7(c) of the Natural Gas Act ("NGA").

ETNG has developed this Best Drilling Practices Plan ("BDP Plan") for monitoring the Horizontal Directional Drilling ("HDD") program. This BDP Plan will be kept on-site at HDD locations and will be available and implemented by all proposed personnel described in the following sections of this BDP Plan. All drilling during each pipeline installation will be managed in accordance with this BDP Plan.

1.1 Project Description

East Tennessee proposes the following Project facilities and modifications:

(i) Construction of approximately 10 miles of new 12-inch diameter natural gas pipeline mainline extension ("Loudon Mainline Extension"), with a crossover to the Loudon-Lenoir City Lateral Line 3218D-100 in Monroe and Loudon Counties, Tennessee;

(ii) Installation of a new meter facility and related appurtenances located at the end of the Loudon Mainline Extension at the Tate & Lyle Plant in Loudon County, Tennessee;

(iii) Installation of a pressure regulator at existing meter station 59039 on the Loudon-Lenoir City Lateral Line 3218D-100 in Loudon County, Tennessee; and

(iv) Installation of a 12-inch mainline valve, two 12-inch Tee Taps and related appurtenant facilities at the interconnection of the new Loudon Mainline Extension with the 12-inch Line 3200-1 mainline near milepost ("MP") 234.35 in Monroe County, Tennessee.

2.0 BEST AVAILABLE DRILLING PRACTICES

2.1 Description of the Work

ETNG will use the HDD method at the following locations, which will cross waterbodies. The HDD's include:

- 12-inch Tellico Lake HDD 1 - MP 2.4 (approximately 3,516 linear feet) in Monroe County, TN, which includes Tellico Lake;
- 12-inch Tellico Lake HDD 2 - MP 4.6 (approximately 1,159 linear feet) in Monroe County, TN, which includes Tellico Lake and West Fork Rd.; and
- 12-inch Tennessee River HDD - MP 10.0 (approximately 1,740 linear feet) in Monroe and Loudon County, TN, which includes Popular Springs Rd. and the Tennessee River.

The HDD method typically involves establishing land-based staging areas along both sides of the proposed crossing. The process commences with the boring of a pilot hole beneath the waterbody and roadways to the opposite side of the crossing and then enlarging the hole with one or more passes of a reamer until the hole is the necessary diameter to facilitate the pull-back (installation) of the pipeline.

Once the reaming passes are completed, a prefabricated pipe segment is then pulled through the hole to complete the crossing. While the HDD method is a proven technology, there are certain impacts that could occur as a result of the drilling such as the inadvertent release of drilling fluid, which is a slurry of bentonite clay and water and is classified as non-toxic to the aquatic environment and is a non-hazardous substance. Drilling fluids that are released typically contain a lower concentration of bentonite when they surface because the bentonite is filtered out as its passes through existing sediments of varying types. The proposed drilling program is expected to be initiated and completed in 2014. The following sections provide the process of HDD and procedures to be implemented in the case of drill failure or the inadvertent release of drilling fluid.

2.2 Background

The HDD process uses bentonite-based drilling fluids. The drilling fluids are tested for specific engineering properties to ensure a successful HDD installation. An environmental impact associated with HDD is the inadvertent release of drilling fluids to the surface along the drill alignment during drilling operations.

The drilling fluids are typically a mixture of fresh water and bentonite (sodium montmorillonite). Bentonite is natural clay usually mined in Wyoming. Bentonite is extremely hydrophilic and can absorb up to ten times its weight in water. Typically, the drilling fluid contains no more than 5 percent bentonite (95 percent fresh water).

The slurry is designed to:

- Stabilize the hole against collapse;
- Lubricate, cool, and clean the cutters;
- Transport cuttings by suspension and flow to entry and exit points; and
- Reduce soil friction and required pull loads.

2.2.1 HDD Working Procedures

Prior to drilling operations, site-specific HDD Procedures will be prepared by the HDD contractor and submitted to ETNG for review and approval. As a minimum, the HDD Procedures will address the following:

Annular Pressure or Release Mitigation – Once it is indicated to the driller that annular pressures are abnormally high or that a release has occurred, the driller has the following options (or any combination of these options):

- Decrease pump pressure;
- Decrease penetration rate;
- Retract the drill string a distance to restore circulation ("swab" the hole);
- Introduce additional flow along the borehole using "weeper" subs; and
- Modify the drilling mud with lost circulation additives.

2.3 HDD Contingency Plan

Several possible scenarios and/or conditions exist that could prevent the successful completion of a pilot hole, reaming or pipeline pullback operation. Examples of these possible scenarios and/or conditions are as follows:

1. Inability to maintain mud circulation during pilot drilling due to uncontrolled fluid loss into subterranean voids or fissures.

2. Inability to steer the down hole pilot assembly on the prescribed drill profile due to deflection that could occur when geological obstructions such as boulders and cobble are encountered.

3. Inability to steer the down hole pilot assembly on the prescribed drill profile due to deflection that could occur in areas where a geologic formation is encountered that will not provide adequate resistance to support the weight of the down hole pilot assembly.

4. Inability to complete reaming due to geological obstructions such as boulders or cobble that could migrate into the path that has already been piloted or reamed.

5. Inability to retrieve drilling or reaming equipment components and/or drill pipe that could be left down hole due mechanical failure.

6. Inability to pull the entire product pipeline section through the bore hole due to the collapse of the completed bore hole.

In the unlikely event that a HDD bore hole profile must be abandoned ETNG will implement one the following alternate installation procedures:

1. The pilot hole will be offset and drilled on a different profile from the same location;

2. ETNG will relocate the HDD to another location on the existing permanent easement; or

3. ETNG will acquire additional permanent easement to perform the HDD in an alternate location (the necessary clearance and permit amendments will be obtained prior to the initiation of this option).

In the event that a bore hole must be abandoned, the following remedial steps will be implemented:

1. The HDD contractor will fill the abandoned hole with a drilling mud/grout mixture. Once this is accomplished, ETNG would offset to another location and resume the HDD process as specified in steps 1-3 above.

2. Drilling mud from the pit at the abandoned location will be pumped into a tank for reuse or disposal and the pit will be backfilled.

3.0 MONITORING OF INADVERTENT RETURNS

3.1 Personnel and Responsibilities

The actions in this BDP Plan are to be implemented by the following personnel:

Chief Inspector – ETNG will designate a Chief Inspector ("CI") for the Project. The CI will have overall authority for construction activities that occur on the Project.

Environmental Inspector – At least one Environmental Inspector ("EI") will be designated by ETNG to monitor the HDD activities. The EI will have peer status with all other activity inspectors and will report directly to the CI who has overall authority. The EI will have the authority to stop activities that violate the environmental conditions of the FERC certificate (if applicable), other federal and state permits, or landowner requirements, and to order corrective action.

HDD Superintendent – is the senior on-site representative of the HDD contractor. The HDD Superintendent has overall responsibility for implementing this BDP Plan on behalf of the HDD contractor. The HDD Superintendent will be familiar with the aspects of the drilling activity, the contents of the BDP Plan and the conditions of approval under which the activity is permitted to take place. The HDD Superintendent will make available a copy of this BDP Plan to the appropriate construction personnel. The HDD Superintendent will ensure that workers are properly trained and familiar with the necessary procedures for response to an inadvertent release.

HDD Operator – is HDD contractor's driller operating the drilling rig and mud pumps. The HDD Operator is responsible for monitoring circulation back to the entry and exit locations and for monitoring annular pressures during pilot-hole drilling. In the event of loss of circulation or higher than expected annular pressures, the HDD Operator must communicate the event to the HDD Superintendent and HDD contractor field crews. The HDD Operator is responsible for stoppage or changes to the drilling program in the event of observed inadvertent returns.

HDD Contractor Personnel – during HDD installation, field crews will be responsible to monitor the HDD alignment along with the ETNG's field representatives'. Field crews in coordination with the EI are responsible for timely notifications and responses to observed releases in accordance with this BDP Plan. The EI ultimately must sign off on the action plan for mitigating the release.

3.2 Training

Prior to drilling, the HDD Superintendent, CI and the EI will verify that the HDD Operator and field crew receive the following site-specific training but not limited to:

- Project specific safety training;
- review provisions of this BDP Plan and site-specific permit requirements;
- review location of sensitive environmental resources at the site;
- review drilling procedures for release prevention;
- review the site-specific monitoring requirements;
- review the location and operation of release control equipment and materials; and
- review protocols for reporting observed inadvertent returns.

3.3 Monitoring & Reporting

Appropriate Monitoring & Reporting actions will be:

- If the HDD Operator observes an increase in annular fluid pressure or loss of circulation, the Operator will notify the HDD Superintendent and field crews of the event and approximate position of the cutting head;
- Where practical, a member of the field crew will visually inspect the ground surface near the position of the cutting head;
- If an inadvertent release is observed:
    - Field crew will notify (via hand-held radio or cell phone) the HDD Operator;
    - The HDD Operator will temporarily cease pumping of the drilling fluid and notify the HDD Superintendent and CI;
    - The CI will notify and coordinate a response with the EI;
    - The EI will notify appropriate permit authorities as necessary of the event and proposed response and provide required documentation within 24 hours:
        - Directors of Local Emergency Management
            - Loudon County – Daryl Smith (865) 458-7298
            - Monroe County – Brian Turpin (423) 519-7100
        - Tennessee Emergency Management Agency (TEMA) East Region Office (865) 594-5668;
        - Loudon Utility Board (865) 458-2091; and
- The CI will prepare a report that summarizes the incident.

4.0 RESPONSE TO INADVERTENT RETURNS

Typically, inadvertent releases are most often detected in an area near the entry or exit points of the drill alignment when the pilot bore is at shallow depths, above bedrock, and in permeable/porous soils. In these occurrences the release will be assessed by the HDD Superintendent, EI and CI to determine an estimated volume and foot-print of the release. They will also assess the potential of the release to reach adjacent waterbodies, wetlands, or other types of infrastructure.

The HDD Superintendent will assess the drilling parameters (depth, annular pressures, fluid flow rate and drill fluid characteristics) and incorporate appropriate changes.

The HDD Superintendent, EI, and CI will implement installation of appropriate containment structures and additional response measures. Access for personnel and equipment to the release site is a major factor in determining the methods used for containment and disposal. Typically, containment is achieved by excavating a small sump pit (5 cubic yards) at the site of the release and to surround the release with hay bales, silt fence and/or sand bags. Once contained, the drilling fluid is either collected by vacuum trucks or pumped to a location where vacuum trucks can be accessed. The fluids are then transported either back to the HDD Drilling Rig or to a disposal site.

If the release is mitigated and controlled, forward progress of the drilling will be approved by the EI in coordination with the HDD Superintendent and CI.

The site-specific response will follow these guidelines:

4.1 Upland Location

- Evaluate the amount of release to determine if containment structures are warranted and if they will effectively contain the release.
- Promptly implement appropriate containment measures as needed to contain and recover the slurry.
- If the release is within 50-foot of a wetland or waterbody, silt fence and/or hay bales will be installed between the release site and the wetland or waterbody.
- If the release cannot be contained, then the HDD Operator must suspend drilling operations until appropriate containment is in place.
- Remove the fluids using either a vacuum truck or by pumping to a location where a vacuum truck is accessible.
- After the HDD installation is complete, perform final clean-up (see Section 5).

4.2 Wetland Location

- Evaluate the amount of release to determine if containment structures are warranted and if they will effectively contain the release.
- Promptly implement appropriate containment measures to contain and recover the slurry;
    - Efforts to contain and recover slurry in wetlands may result in further disturbance by equipment and personnel, and possibly offset the benefit gained in removing the slurry.
    - If the amount of the slurry is too small to allow the practical collection from the affected area, the fluid will be diluted with fresh water or allowed to dry and dissipate naturally.
- If the release cannot be controlled or contained, immediately suspend drilling operations until appropriate containment is in place.

- Remove the fluids using either a vacuum truck or by pumping to a location where a vacuum truck is accessible.
- After the HDD installation is complete, perform final clean-up (see Section 5).

4.3 Major Waterbody Location

ETNG's three proposed HDD's are designed to minimize the potential for inadvertent releases into these waterbody crossing locations. The HDD crossing profiles are to occur in bedrock, and this will allow flow of drilling fluids from the drill path below the waterbody bed between the HDD entry and exit points at the surface. However, due to possible fractures in the bedrock, it is possible for some drilling fluid to inadvertently release to the waterbody bed. The HDD contractor will monitor crossing locations visually for any sign of inadvertent releases to the waterbody. In addition, the HDD Operator will continually monitor the equipment and gauges of the HDD rig during the drilling process as described in this BDP Plan. If an inadvertent release is visually or mechanical identified, the HDD contractor will implement the contingency and response measures described in this BDP Plan.

5.0 CLEAN-UP

After completion of the HDD installation, site-specific clean-up measures will be developed by the CI, HDD Superintendent, for approval by the EI. Potential for secondary impact from the clean-up process is to be evaluated and benefits of clean-up activities.

The following measures are considered appropriate:

- Drilling mud will be cleaned up by hand using hand shovels, buckets and soft bristled brooms minimizing damage to existing vegetation.
- Fresh water washes may be employed if deemed beneficial and feasible.
- Containment structures will be pumped out and the ground surface scraped to bare topsoil minimizing loss of topsoil or damage to adjacent vegetation.
- The recovered drilling fluid will be recycled or disposed of at an approved upland location or disposal facility. No recovered drilling fluid will be disposed of in streams or storm drains
- All containment structures will be removed.
- Recovered materials will be collected in containers for temporary storage prior to removal from the site.
- Disturbed areas will be stabilized by seeding and mulching as approved by the EI.

Appendix D

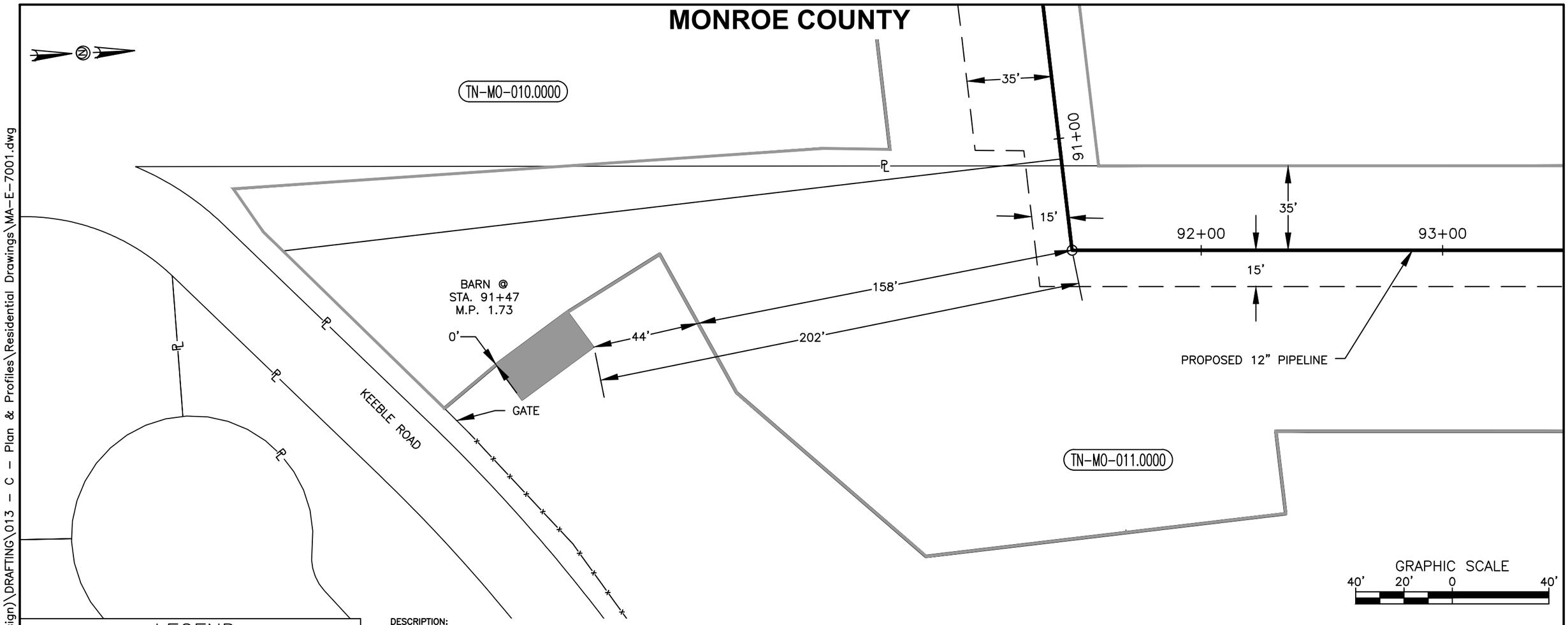
Location of Additional Temporary Workspaces within 50 Feet of Waterbodies along the Loudon Expansion Project

Location of Additional Temporary Workspaces Within 50 Feet of Wetlands or Waterbodies along the Loudon Expansion Project					
Approximate Milepost	**Workspace Purpose**	**Land Use**	**ATWS Within Wetland or Waterbody (Yes-Waterbody Name/No)**	**ATWS Within 50 feet of Wetland or Waterbody (Yes-Waterbody Name/No)**	**Acres**
1.7	P.I.; Road Crossing	Forest	Yes – D10TRC002	Yes – D10TRC002	0.10
2.2	HDD Staging and Pullback	Forest	No	Yes – D10TRC003, D10TRC004, D10TRC005, & D10TRC006	0.16
2.8	HDD Drill Rig and Staging	Agricultural	No	Yes – D10TRC008	0.43
2.8	HDD Drill Rig and Staging	Road	No	Yes – D10TRC008	0.01
2.9	P.I.	Forest	No	Yes – S10TRC010	0.03
4.5	HDD Staging, Drill Rig, and Pullback	Forest	No	Yes – S1TRC002b	0.61
4.9	HDD Staging, Drill Rig, and Pullback	Open	Yes – D1TRC002d, D1TRC001b	Yes – D1TRC002d, D1TRC001b	0.10
5.1	HDD Staging and Pullback; Road crossing	Forest	No	Yes – S2TRC017	0.01
5.2	Stream Crossing; Road Crossing	Forest	No	Yes – S2TRC017	0.10
5.7	Stream Crossing	Agricultural	No	Yes-S1TRC004a	0.28
5.9	Road Crossing; Stream Crossing	Forest	No	Yes – S1TRC006b	0.14
5.9	Stream Crossing	Forest	No	Yes – S1TRC006b, D1TRC005b	0.05
5.9	Stream Crossing	Forest	No	Yes – S1TRC006b	0.12
6.5	Road Crossing; Stream Crossing	Agricultural	No	Yes – S1TRC001	0.34
6.6	Steep Side Slope	Agricultural	Yes – D1TRC002c, D1TRC003b	Yes – S1TRC001, D1TRC002c, D1TRC003b	0.72
8.0	Road Crossing	Agricultural	No	Yes – WB1TRC006	0.36
8.5	Steep Side Slope	Forest	No	Yes – D1TRC009	0.53
8.7	Steep Side Slope	Forest	No	Yes – D1TRC009	0.09
9.2	Road Crossing	Residential	Yes – D1TRC010	Yes – D1TRC010	0.20
10.1	HDD and Hydrotest Water Source Pumps	Forest	Yes-S1TRC002a	Yes-S1TRC002a	0.06

Appendix E

Site-specific Construction Plans for Structures within 25 feet of the Edge of the Proposed Construction Workspace

MONROE COUNTY



LEGEND

- PROPOSED PIPELINE
- CONSTRUCTION WORK AREA (CWA)
- PERMANENT EASEMENT
- SAFETY FENCE
- PROPERTY LINE
- EXISTING FENCE
- ℄ ACCESS ROAD

DESCRIPTION:

AT SURVEY STATION 91+47 THERE IS A BARN LOCATED 0' TO THE RIGHT OF THE CWA AND 202' RIGHT OF THE PROPOSED 12" PIPELINE.

NOTES:

1. (CWA) REFERS TO THE CONSTRUCTION WORK AREA.
2. SAFETY FENCE WILL BE INSTALLED AT THE EDGE OF THE CONSTRUCTION WORK AREA FOR A DISTANCE OF 100 FEET ON EITHER SIDE OF THE RESIDENCE OR BUSINESS ESTABLISHMENT.
3. STRUCTURES WITHIN CWA WILL BE REMOVED, RELOCATED OR PROTECTED PER LAND OWNER AGREEMENT.
4. CONTRACTOR SHALL AVOID REMOVAL OF MATURE TREES AND LANDSCAPING WITHIN THE CONSTRUCTION WORK AREA UNLESS NECESSARY FOR SAFE OPERATION OF EQUIPMENT, OR AS SPECIFIED IN LANDOWNER AGREEMENTS.
5. RESTORE ALL LAWN AREAS AND LANDSCAPING IMMEDIATELY FOLLOWING CLEAN UP OPERATIONS, OR AS SPECIFIED IN LANDOWNER AGREEMENTS.

REV.#	DESCRIPTION	DATE		DATE
			PROJ. ENG.	
			CHECKED BY: HMM	
			DRAWN BY: HMM	
			SCALE: 1" = 40'	

Hatch Mott MacDonald
101 CROSLEY STREET
WEST MONROE, LOUISIANA 71291
PHONE (318) 329-0095
FAX (318) 3290096

TITLE:
MADISONVILLE DISCHARGE
LOUDON EXPANSION PROJECT
PROPOSED 12" LINE

LOC.: **MONROE COUNTY, TENNESSEE** REV.:

YR.: **2016** W.B.S. **C.E.000094.001** DWG. NO. **MA-E-7001**

Spectra Energy
East Tennessee Natural Gas, LLC
5400 Westheimer Court, Houston, TX 77056-5310 713 / 627-5400

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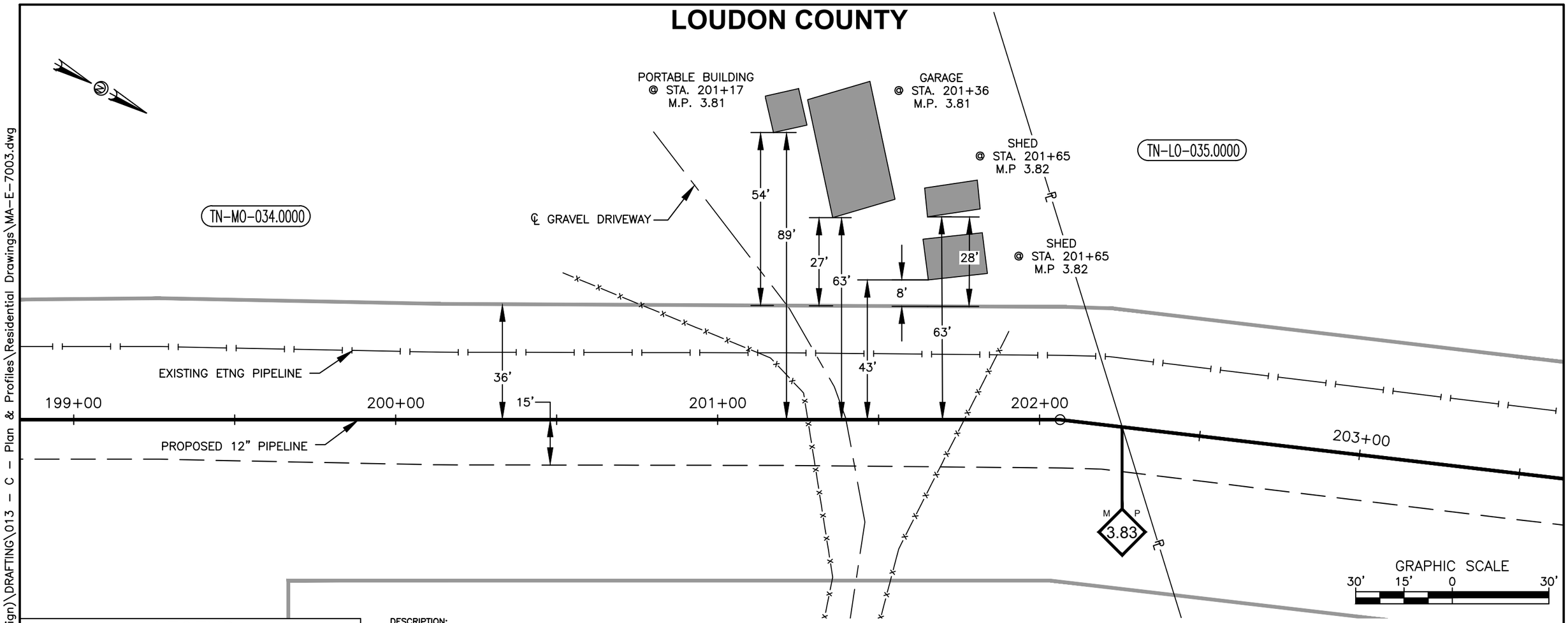
LOUDON COUNTY



LEGEND

- PROPOSED PIPELINE
- CONSTRUCTION WORK AREA (CWA)
- PERMANENT EASEMENT
- SAFETY FENCE
- PROPERTY LINE
- ACCESS ROAD

DESCRIPTION:

AT SURVEY STATION 200+21 THERE IS A HOUSE LOCATED 48' TO THE LEFT OF THE CWA AND 84' LEFT OF THE PROPOSED 12" PIPELINE.

AT SURVEY STATION 201+17 THERE IS A PORTABLE BUILDING LOCATED 54' TO THE LEFT OF THE CWA AND 89' RIGHT OF THE PROPOSED 12" PIPELINE.

AT SURVEY STATION 201+36 THERE IS A SHOP LOCATED 27' TO THE LEFT OF THE CWA AND 63' LEFT OF THE PROPOSED 12" PIPELINE

AT SURVEY STATION 201+65 THERE ARE 2 SHEDS LOCATED 8' AND 28' TO THE LEFT OF THE CWA AND 43' AND 63' LEFT OF THE PROPOSED 12" PIPELINE.

NOTES:
1. (CWA) REFERS TO THE CONSTRUCTION WORK AREA.
2. SAFETY FENCE WILL BE INSTALLED AT THE EDGE OF THE CONSTRUCTION WORK AREA FOR A DISTANCE OF 100 FEET ON EITHER SIDE OF THE RESIDENCE OR BUSINESS ESTABLISHMENT.
3. STRUCTURES WITHIN CWA WILL BE REMOVED, RELOCATED OR PROTECTED PER LAND OWNER AGREEMENT.
4. CONTRACTOR SHALL AVOID REMOVAL OF MATURE TREES AND LANDSCAPING WITHIN THE CONSTRUCTION WORK AREA UNLESS NECESSARY FOR SAFE OPERATION OF EQUIPMENT, OR AS SPECIFIED IN LANDOWNER AGREEMENTS.
5. RESTORE ALL LAWN AREAS AND LANDSCAPING IMMEDIATELY FOLLOWING CLEAN UP OPERATIONS, OR AS SPECIFIED IN LANDOWNER AGREEMENTS.

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			SCALE: 1" = 30'	

Hatch Mott MacDonald
101 CROSLEY STREET
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PHONE (318) 329-0095
FAX (318) 3290096

TITLE:
MADISONVILLE DISCHARGE
LOUDON EXPANSION PROJECT
12" PROPOSED PIPELINE

LOC.: **LOUDON COUNTY, TENNESSEE** REV.:

YR.: **2016** W.B.S. **C.E.000094.001** DWG. NO. **MA-E-7003**

Spectra Energy
East Tennessee Natural Gas, LLC
5400 Westheimer Court, Houston, TX 77056-5310 713 / 627-5400

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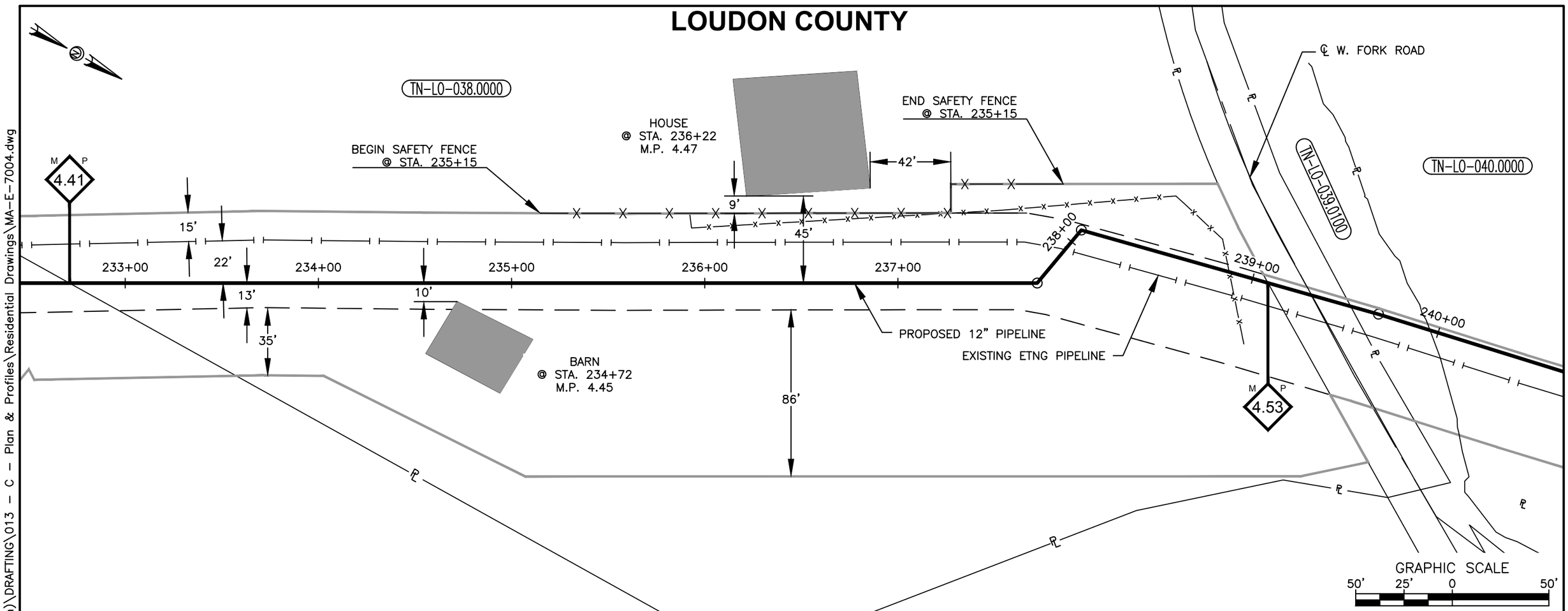
LOUDON COUNTY



LEGEND

- PROPOSED PIPELINE
- CONSTRUCTION WORK AREA (CWA)
- PERMANENT EASEMENT
- SAFETY FENCE
- PROPERTY LINE
- EXISTING FENCE
- ℄ ACCESS ROAD

DESCRIPTION:

AT SURVEY STATION 234+72 THERE IS A BARN LOCATED 10' TO THE RIGHT OF THE PROPOSED 12" PIPELINE.

AT SURVEY STATION 236+22 THERE IS A HOUSE LOCATED 9' TO THE LEFT OF THE CWA AND 45' LEFT OF THE PROPOSED 12" PIPELINE.

NOTES:

1. (CWA) REFERS TO THE CONSTRUCTION WORK AREA.
2. SAFETY FENCE WILL BE INSTALLED AT THE EDGE OF THE CONSTRUCTION WORK AREA FOR A DISTANCE OF 100 FEET ON EITHER SIDE OF THE RESIDENCE OR BUSINESS ESTABLISHMENT.
3. STRUCTURES WITHIN CWA WILL BE REMOVED, RELOCATED OR PROTECTED PER LAND OWNER AGREEMENT.
4. CONTRACTOR SHALL AVOID REMOVAL OF MATURE TREES AND LANDSCAPING WITHIN THE CONSTRUCTION WORK AREA UNLESS NECESSARY FOR SAFE OPERATION OF EQUIPMENT, OR AS SPECIFIED IN LANDOWNER AGREEMENTS.
5. RESTORE ALL LAWN AREAS AND LANDSCAPING IMMEDIATELY FOLLOWING CLEAN UP OPERATIONS, OR AS SPECIFIED IN LANDOWNER AGREEMENTS.

CONSTRUCTION TECHNIQUES:

ONE OF THE FOLLOWING TECHNIQUES SHALL BE UTILIZED FOR A LONGITUDINAL DISTANCE OF 100' FEET EITHER SIDE OF THE RESIDENCE:

1. THE SEWER LINE TECHNIQUE IS A LESS EFFICIENT ALTERNATIVE TO THE MAINLINE METHOD OF CONSTRUCTION. TYPICALLY USED WHEN THE PIPELINE IS TO BE INSTALLED IN VERY CLOSE PROXIMITY TO AN EXISTING STRUCTURE OR WHEN AN OPEN DITCH WOULD ADVERSELY IMPACT A COMMERCIAL/INDUSTRIAL ESTABLISHMENT. THE TECHNIQUE INVOLVES INSTALLING PIPE ONE JOINT AT A TIME WHEREBY THE WELDING, X-RAY AND COATING ACTIVITIES ARE ALL PERFORMED IN THE OPEN TRENCH. AT THE END OF EACH DAY THE NEWLY INSTALLED PIPE IS BACKFILLED OR THE OPEN TRENCH IS COVERED WITH STEEL PLATES OR TIMBER MATS. THE TRENCH MAY BE LEFT OPEN TO FACILITATE TIE-INS OR OTHER ACTIVITY AS DEEMED NECESSARY BY COMPANY, PROVIDED THE SITE IS ADEQUATELY SECURED WITH SAFETY FENCING OR EQUIVALENT AND A NIGHT WATCH PERSON IS PRESENT TO SECURE THE SITE DURING NON-WORKING HOURS.
2. THE DRAG SECTION CONSTRUCTION TECHNIQUE, WHILE LESS EFFICIENT THAN MAINLINE METHODS, IS NORMALLY PREFERRED OVER THE SEWER LINE ALTERNATIVE. THIS TECHNIQUE INVOLVES THE TRENCHING, INSTALLATION AND BACKFILL OF A PREFABRICATED LENGTH OF PIPE CONTAINING SEVERAL SEGMENTS ALL IN ONE DAY. AT THE END OF EACH DAY THE NEWLY INSTALLED PIPE IS BACKFILLED AND/OR COVERED WITH STEEL PLATES OR TIMBER MATS. THE TRENCH MAY BE LEFT OPEN TO FACILITATE TIE-INS OR OTHER ACTIVITY AS DEEMED NECESSARY BY COMPANY, PROVIDED THE SITE IS ADEQUATELY SECURED WITH SAFETY FENCING OR EQUIVALENT AND A NIGHT WATCH PERSON IS PRESENT TO SECURE THE SITE DURING NON-WORKING HOURS.

REV.#	DESCRIPTION	DATE		DATE
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			DRAWN BY: HMM	
			SCALE: 1" = 50'	

Hatch Mott MacDonald
101 CROSLEY STREET
WEST MONROE, LOUISIANA 71291
PHONE (318) 329-0095
FAX (318) 3290096

TITLE:

MADISONVILLE DISCHARGE
LOUDON EXPANSION PROJECT
PROPOSED 12" LINE

LOC.: **LOUDON COUNTY, TENNESSEE** REV.:

YR.: **2015** W.B.S. **C.E.000094.001** DWG. NO. **MA-E-7004**

Spectra Energy Partners.
Texas Eastern Transmission, LP
5400 Westheimer Ct. Houston, TX 77056-5310 713/627-5400

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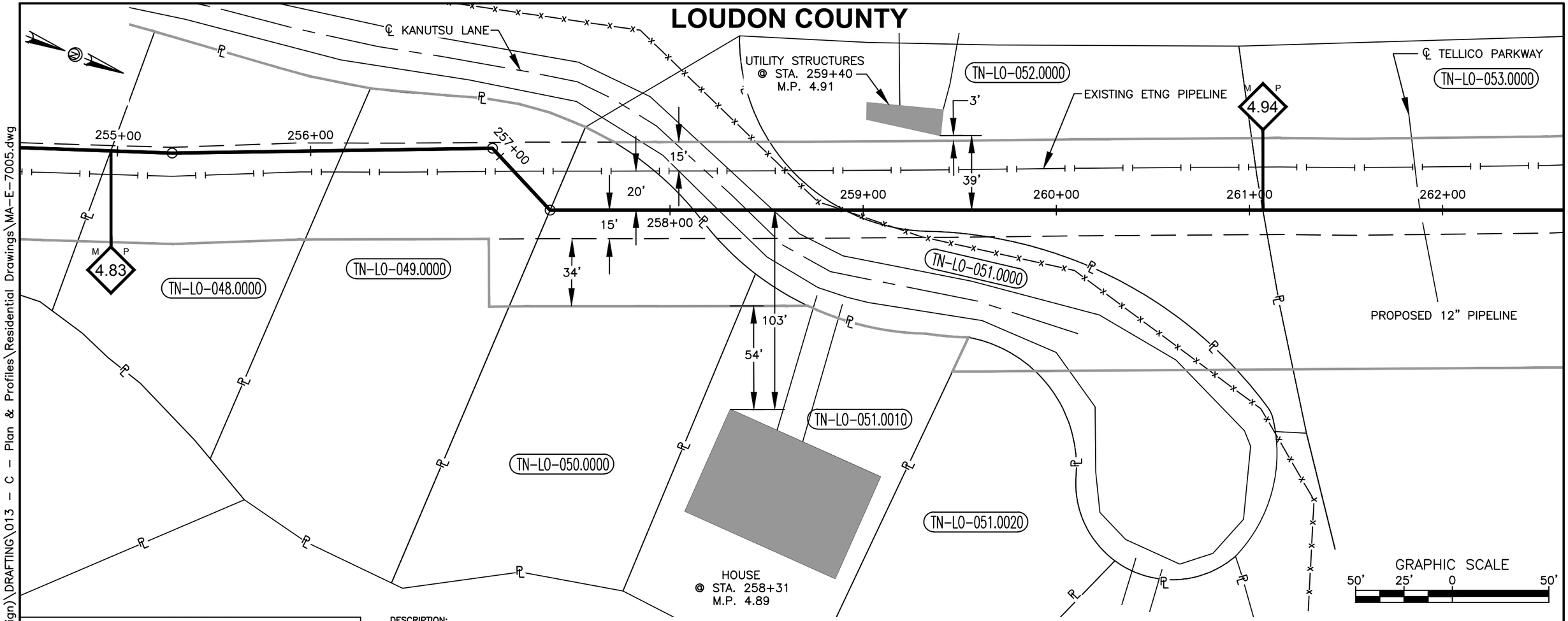
LOUDON COUNTY



LEGEND

- PROPOSED PIPELINE
- CONSTRUCTION WORK AREA (CWA)
- PERMANENT EASEMENT
- SAFETY FENCE
- PROPERTY LINE
- EXISTING FENCE
- ℄ ACCESS ROAD

DESCRIPTION:

AT SURVEY STATION 258+31 THERE IS A HOUSE LOCATED 54' TO THE RIGHT OF THE CWA AND 103' RIGHT OF THE PROPOSED 12" PIPELINE.

NOTES:

1. (CWA) REFERS TO THE CONSTRUCTION WORK AREA.
2. SAFETY FENCE WILL BE INSTALLED AT THE EDGE OF THE CONSTRUCTION WORK AREA FOR A DISTANCE OF 100 FEET ON EITHER SIDE OF THE RESIDENCE OR BUSINESS ESTABLISHMENT.
3. STRUCTURES WITHIN CWA WILL BE REMOVED, RELOCATED OR PROTECTED PER LAND OWNER AGREEMENT.
4. CONTRACTOR SHALL AVOID REMOVAL OF MATURE TREES AND LANDSCAPING WITHIN THE CONSTRUCTION WORK AREA UNLESS NECESSARY FOR SAFE OPERATION OF EQUIPMENT, OR AS SPECIFIED IN LANDOWNER AGREEMENTS.
5. RESTORE ALL LAWN AREAS AND LANDSCAPING IMMEDIATELY FOLLOWING CLEAN UP OPERATIONS, OR AS SPECIFIED IN LANDOWNER AGREEMENTS.

REV.#	DESCRIPTION	DATE		DATE
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			DRAWN BY: HMM	
			SCALE: 1" = 50'	

Hatch Mott MacDonald
101 CROSLEY STREET
WEST MONROE, LOUISIANA 71291
PHONE (318) 329-0095
FAX (318) 3290096

TITLE:

MADISONVILLE DISCHARGE
LOUDON EXPANSION PROJECT
12" PROPOSED PIPELINE

LOC.: **LOUDON COUNTY, TENNESSEE** REV.:

YR.: **2016** W.B.S. **CE.000094.001** DWG. NO. **MA-E-7005**

Spectra Energy®
East Tennessee Natural Gas, LLC
5400 Westheimer Court, Houston, TX 77056-5310 713 / 627-5400

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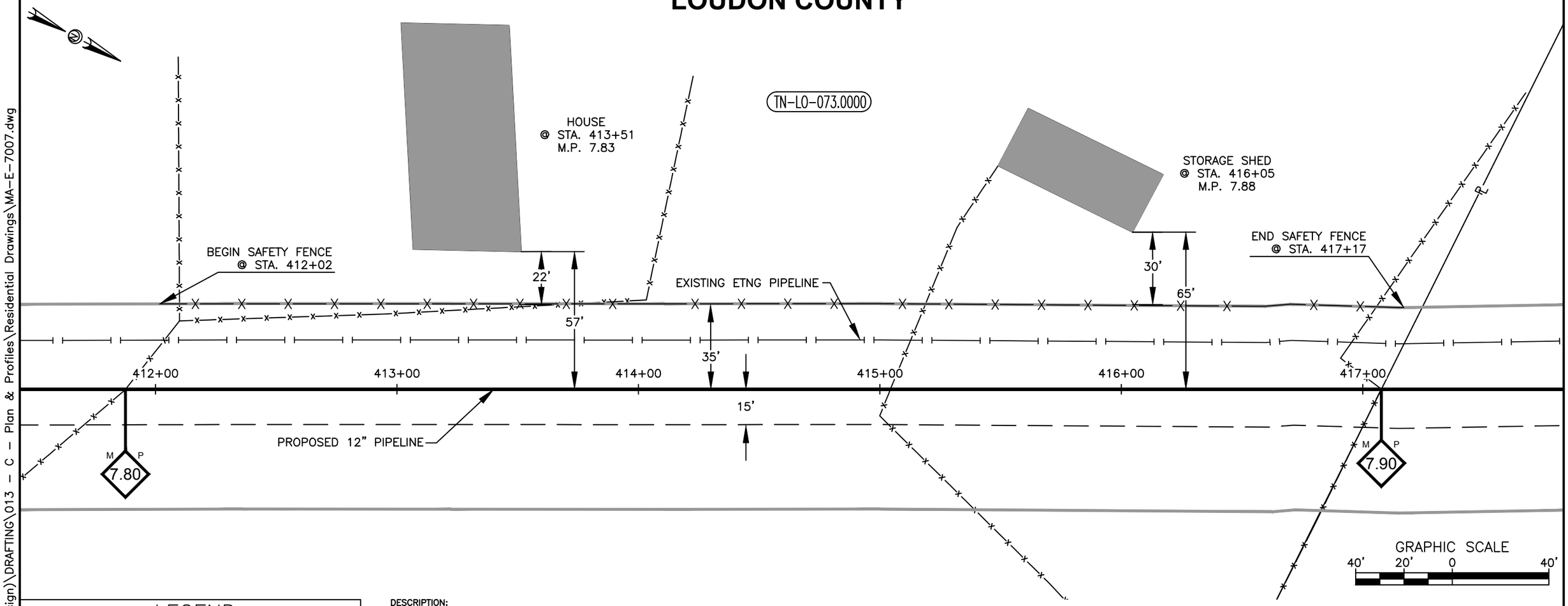
LOUDON COUNTY



LEGEND

- PROPOSED PIPELINE
- CONSTRUCTION WORK AREA (CWA)
- PERMANENT EASEMENT
- SAFETY FENCE —— X ——
- PROPERTY LINE ——℄——
- EXISTING FENCE —x—x—x—
- ℄ ACCESS ROAD

DESCRIPTION:

AT SURVEY STATION 413+51 THERE IS A HOUSE LOCATED 22' TO THE LEFT OF THE CWA AND 57' LEFT OF THE PROPOSED 12" PIPELINE.

AT SURVEY STATION 416+05 THERE IS A STORAGE SHED LOCATED 30' TO THE LEFT OF THE CWA AND 65' LEFT OF THE PROPOSED 12" PIPELINE.

NOTES:

1. (CWA) REFERS TO THE CONSTRUCTION WORK AREA.
2. SAFETY FENCE WILL BE INSTALLED AT THE EDGE OF THE CONSTRUCTION WORK AREA FOR A DISTANCE OF 100 FEET ON EITHER SIDE OF THE RESIDENCE OR BUSINESS ESTABLISHMENT.
3. STRUCTURES WITHIN CWA WILL BE REMOVED, RELOCATED OR PROTECTED PER LAND OWNER AGREEMENT.
4. CONTRACTOR SHALL AVOID REMOVAL OF MATURE TREES AND LANDSCAPING WITHIN THE CONSTRUCTION WORK AREA UNLESS NECESSARY FOR SAFE OPERATION OF EQUIPMENT, OR AS SPECIFIED IN LANDOWNER AGREEMENTS.
5. RESTORE ALL LAWN AREAS AND LANDSCAPING IMMEDIATELY FOLLOWING CLEAN UP OPERATIONS, OR AS SPECIFIED IN LANDOWNER AGREEMENTS.

CONSTRUCTION TECHNIQUES:

ONE OF THE FOLLOWING TECHNIQUES SHALL BE UTILIZED FOR A LONGITUDINAL DISTANCE OF 100' FEET EITHER SIDE OF THE RESIDENCE:

1. THE SEWER LINE TECHNIQUE IS A LESS EFFICIENT ALTERNATIVE TO THE MAINLINE METHOD OF CONSTRUCTION. TYPICALLY USED WHEN THE PIPELINE IS TO BE INSTALLED IN VERY CLOSE PROXIMITY TO AN EXISTING STRUCTURE OR WHEN AN OPEN DITCH WOULD ADVERSELY IMPACT A COMMERCIAL/INDUSTRIAL ESTABLISHMENT. THE TECHNIQUE INVOLVES INSTALLING PIPE ONE JOINT AT A TIME WHEREBY THE WELDING, X-RAY AND COATING ACTIVITIES ARE ALL PERFORMED IN THE OPEN TRENCH. AT THE END OF EACH DAY THE NEWLY INSTALLED PIPE IS BACKFILLED OR THE OPEN TRENCH IS COVERED WITH STEEL PLATES OR TIMBER MATS. THE TRENCH MAY BE LEFT OPEN TO FACILITATE TIE-INS OR OTHER ACTIVITY AS DEEMED NECESSARY BY COMPANY, PROVIDED THE SITE IS ADEQUATELY SECURED WITH SAFETY FENCING OR EQUIVALENT AND A NIGHT WATCH PERSON IS PRESENT TO SECURE THE SITE DURING NON-WORKING HOURS.
2. THE DRAG SECTION CONSTRUCTION TECHNIQUE, WHILE LESS EFFICIENT THAN MAINLINE METHODS, IS NORMALLY PREFERRED OVER THE SEWER LINE ALTERNATIVE. THIS TECHNIQUE INVOLVES THE TRENCHING, INSTALLATION AND BACKFILL OF A PREFABRICATED LENGTH OF PIPE CONTAINING SEVERAL SEGMENTS ALL IN ONE DAY. AT THE END OF EACH DAY THE NEWLY INSTALLED PIPE IS BACKFILLED AND/OR COVERED WITH STEEL PLATES OR TIMBER MATS. THE TRENCH MAY BE LEFT OPEN TO FACILITATE TIE-INS OR OTHER ACTIVITY AS DEEMED NECESSARY BY COMPANY, PROVIDED THE SITE IS ADEQUATELY SECURED WITH SAFETY FENCING OR EQUIVALENT AND A NIGHT WATCH PERSON IS PRESENT TO SECURE THE SITE DURING NON-WORKING HOURS.

REV.#	DESCRIPTION	DATE		DATE
			PROJ. ENG.	
			CHECKED BY: HMM	
			DRAWN BY: HMM	
			SCALE: 1" = 40'	

Hatch Mott MacDonald
101 CROSLEY STREET
WEST MONROE, LOUISIANA 71291
PHONE (318) 329-0095
FAX (318) 3290096

TITLE:

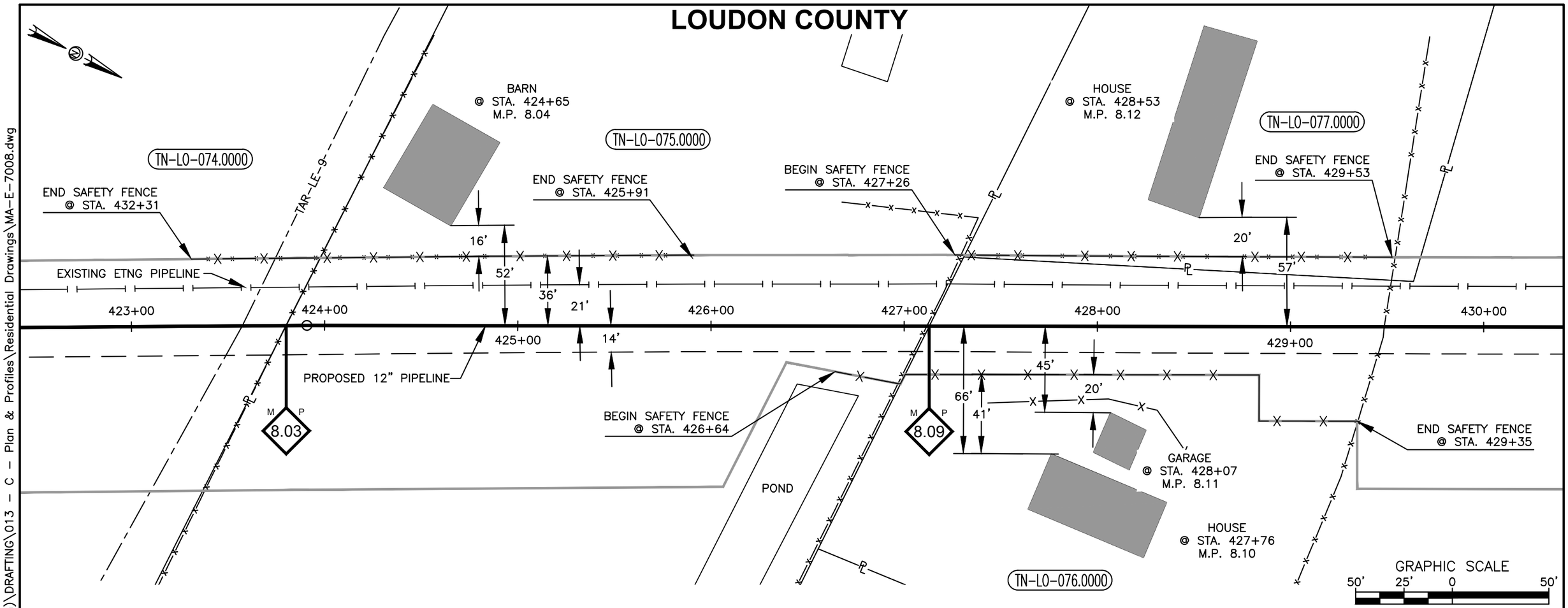
MADISONVILLE DISCHARGE
LOUDON EXPANSION PROJECT
12" PROPOSED PIPELINE

LOC.: **LOUDON COUNTY, TENNESSEE**		REV.: **REV**
YR.: **2016**	W.B.S. **CE.000094.001**	DWG. NO. **MA-E-7007**

Spectra Energy
East Tennessee Natural Gas, LLC
5400 Westheimer Court, Houston, TX 77056-5310 713 / 627-5400

P:\36 - Spectra Energy\347464 - Loudon Expansion (Design)\DRAFTING\013 - C - Plan & Profiles\Residential Drawings\MA-E-7007.dwg

LOUDON COUNTY



LEGEND

- PROPOSED PIPELINE
- CONSTRUCTION WORK AREA (CWA)
- PERMANENT EASEMENT
- SAFETY FENCE
- PROPERTY LINE
- EXISTING FENCE
- ℄ ACCESS ROAD

DESCRIPTION:

AT SURVEY STATION 424+65 THERE IS A BARN LOCATED 16' TO THE LEFT OF THE CWA AND 52' LEFT OF THE PROPOSED 12" PIPELINE.

AT SURVEY STATION 427+76 THERE IS A HOUSE LOCATED 41' TO THE RIGHT OF THE CWA AND 66' RIGHT OF THE PROPOSED 12" PIPELINE.

AT SURVEY STATION 428+07 THERE IS A GARAGE LOCATED 20' TO THE RIGHT OF THE CWA AND 45' RIGHT OF THE PROPOSED 12" PIPELINE.

AT SURVEY STATION 429+53 THERE IS A HOUSE LOCATED 20' TO THE LEFT OF THE CWA AND 57' LEFT OF THE PROPOSED 12" PIPELINE.

NOTES:

1. (CWA) REFERS TO THE CONSTRUCTION WORK AREA.
2. SAFETY FENCE WILL BE INSTALLED AT THE EDGE OF THE CONSTRUCTION WORK AREA FOR A DISTANCE OF 100 FEET ON EITHER SIDE OF THE RESIDENCE OR BUSINESS ESTABLISHMENT.
3. STRUCTURES WITHIN CWA WILL BE REMOVED, RELOCATED OR PROTECTED PER LAND OWNER AGREEMENT.
4. CONTRACTOR SHALL AVOID REMOVAL OF MATURE TREES AND LANDSCAPING WITHIN THE CONSTRUCTION WORK AREA UNLESS NECESSARY FOR SAFE OPERATION OF EQUIPMENT, OR AS SPECIFIED IN LANDOWNER AGREEMENTS.
5. RESTORE ALL LAWN AREAS AND LANDSCAPING IMMEDIATELY FOLLOWING CLEAN UP OPERATIONS, OR AS SPECIFIED IN LANDOWNER AGREEMENTS.

CONSTRUCTION TECHNIQUES:

ONE OF THE FOLLOWING TECHNIQUES SHALL BE UTILIZED FOR A LONGITUDINAL DISTANCE OF 100' FEET EITHER SIDE OF THE RESIDENCE:

1. THE SEWER LINE TECHNIQUE IS A LESS EFFICIENT ALTERNATIVE TO THE MAINLINE METHOD OF CONSTRUCTION. TYPICALLY USED WHEN THE PIPELINE IS TO BE INSTALLED IN VERY CLOSE PROXIMITY TO AN EXISTING STRUCTURE OR WHEN AN OPEN DITCH WOULD ADVERSELY IMPACT A COMMERCIAL/INDUSTRIAL ESTABLISHMENT. THE TECHNIQUE INVOLVES INSTALLING PIPE ONE JOINT AT A TIME WHEREBY THE WELDING, X-RAY AND COATING ACTIVITIES ARE ALL PERFORMED IN THE OPEN TRENCH. AT THE END OF EACH DAY THE NEWLY INSTALLED PIPE IS BACKFILLED OR THE OPEN TRENCH IS COVERED WITH STEEL PLATES OR TIMBER MATS. THE TRENCH MAY BE LEFT OPEN TO FACILITATE TIE-INS OR OTHER ACTIVITY AS DEEMED NECESSARY BY COMPANY, PROVIDED THE SITE IS ADEQUATELY SECURED WITH SAFETY FENCING OR EQUIVALENT AND A NIGHT WATCH PERSON IS PRESENT TO SECURE THE SITE DURING NON-WORKING HOURS.
2. THE DRAG SECTION CONSTRUCTION TECHNIQUE, WHILE LESS EFFICIENT THAN MAINLINE METHODS, IS NORMALLY PREFERRED OVER THE SEWER LINE ALTERNATIVE. THIS TECHNIQUE INVOLVES THE TRENCHING, INSTALLATION AND BACKFILL OF A PREFABRICATED LENGTH OF PIPE CONTAINING SEVERAL SEGMENTS ALL IN ONE DAY. AT THE END OF EACH DAY THE NEWLY INSTALLED PIPE IS BACKFILLED AND/OR COVERED WITH STEEL PLATES OR TIMBER MATS. THE TRENCH MAY BE LEFT OPEN TO FACILITATE TIE-INS OR OTHER ACTIVITY AS DEEMED NECESSARY BY COMPANY, PROVIDED THE SITE IS ADEQUATELY SECURED WITH SAFETY FENCING OR EQUIVALENT AND A NIGHT WATCH PERSON IS PRESENT TO SECURE THE SITE DURING NON-WORKING HOURS.

REV.#	DESCRIPTION	DATE		DATE
			PROJ. ENG.	
			CHECKED BY: HMM	
			DRAWN BY: HMM	
			SCALE: 1" = 50'	

Hatch Mott MacDonald
101 CROSLEY STREET
WEST MONROE, LOUISIANA 71291
PHONE (318) 329-0095
FAX (318) 3290096

TITLE:
MADISONVILLE DISCHARGE
LOUDON EXPANSION PROJECT
12" PROPOSED PIPELINE

LOC.: **LOUDON COUNTY, TENNESSEE** | REV.:

YR.: **2016** | W.B.S. **CE.000094.001** | DWG. NO. **MA-E-7008**

Spectra Energy
East Tennessee Natural Gas, LLC
5400 Westheimer Court, Houston, TX 77056-5310 713 / 627-5400

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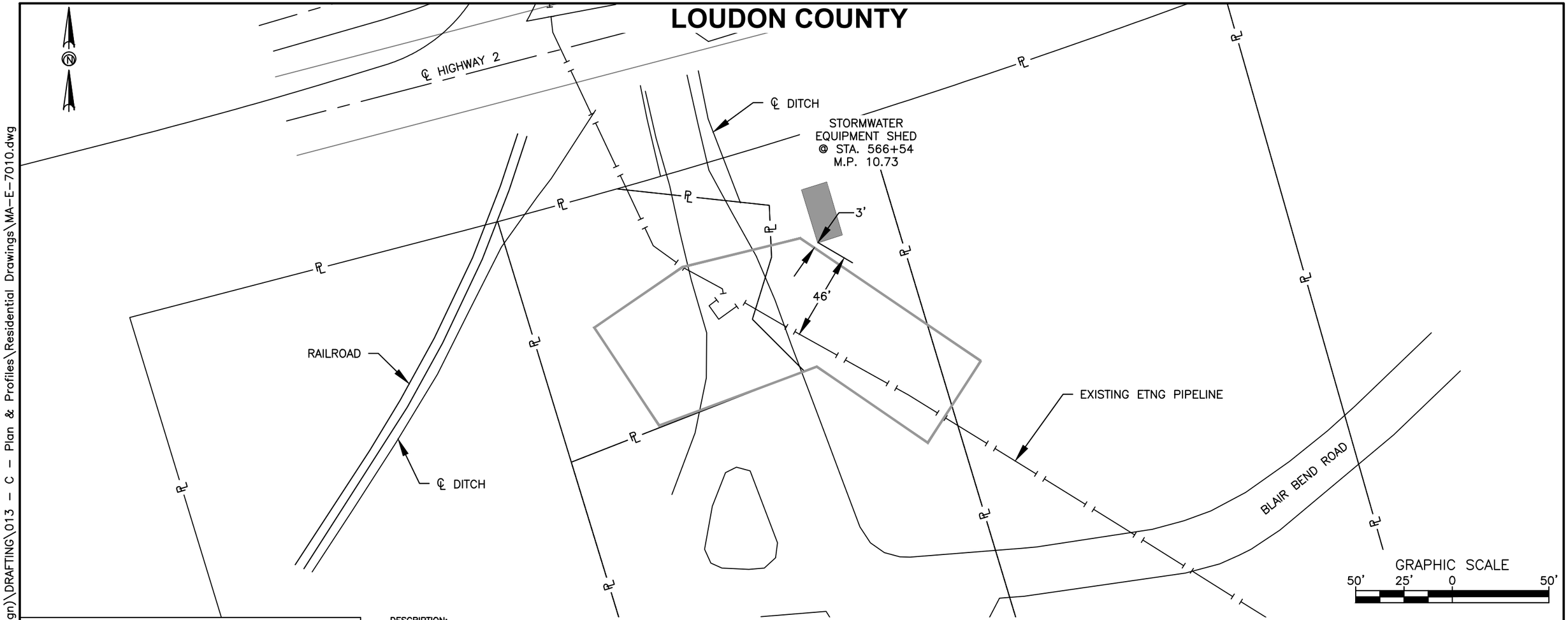
LOUDON COUNTY



LEGEND

- PROPOSED PIPELINE
- CONSTRUCTION WORK AREA (CWA)
- PERMANENT EASEMENT
- SAFETY FENCE
- PROPERTY LINE
- EXISTING FENCE
- ℄ ACCESS ROAD

DESCRIPTION:

AT SURVEY STATION 566+54 THERE IS A STORMWATER EQUIPMENT SHED LOCATED 3' TO THE RIGHT OF THE CWA AND 46' RIGHT OF THE EXISTING 12" PIPELINE.

NOTES:

1. (CWA) REFERS TO THE CONSTRUCTION WORK AREA.
2. SAFETY FENCE WILL BE INSTALLED AT THE EDGE OF THE CONSTRUCTION WORK AREA FOR A DISTANCE OF 100 FEET ON EITHER SIDE OF THE RESIDENCE OR BUSINESS ESTABLISHMENT.
3. STRUCTURES WITHIN CWA WILL BE REMOVED, RELOCATED OR PROTECTED PER LAND OWNER AGREEMENT.
4. CONTRACTOR SHALL AVOID REMOVAL OF MATURE TREES AND LANDSCAPING WITHIN THE CONSTRUCTION WORK AREA UNLESS NECESSARY FOR SAFE OPERATION OF EQUIPMENT, OR AS SPECIFIED IN LANDOWNER AGREEMENTS.
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101 CROSLEY STREET
WEST MONROE, LOUISIANA 71291
PHONE (318) 329-0095
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TITLE:

MADISONVILLE DISCHARGE
LOUDON EXPANSION PROJECT
12" PROPOSED PIPELINE

LOC.: **LOUDON COUNTY, TENNESSEE** REV.:

YR.: **2016** W.B.S. **CE.000094.001** DWG. NO. **MA-E-7010**

Spectra Energy®
East Tennessee Natural Gas, LLC
5400 Westheimer Court, Houston, TX 77056-5310 713 / 627-5400

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Appendix F

Karst Mitigation Plan

EAST TENNESSEE NATURAL GAS, LLC

LOUDON EXPANSION PROJECT

Docket No. CP15-91-000

KARST MITIGATION PLAN

November 2015

KARST MITIGATION PLAN
LOUDON EXPANSION PROJECT

Introduction

East Tennessee Natural Gas, LLC ("ETNG") is proposing to expand its pipeline systems to provide up to 40,000 Dekatherms per day ("Dth/d") of firm transportation service to the Project Shipper, Tate & Lyle Americas Ingredients, LLC ("Tate & Lyle" or "Project Shipper"), for service to Tate & Lyle's existing manufacturing facility ("Tate & Lyle Plant") in Loudon County, Tennessee. To accomplish this ETNG is filing an application for a certificate of public convenience and necessity ("Certificate") from the Federal Energy Regulatory Commission ("FERC"). ETNG is requesting authorization for the activities and facilities associated with the proposed Loudon Expansion Project ("Loudon Project" or "Project") under Section 7(c) of the Natural Gas Act ("NGA"). The proposed Project will include:

(i) Construction of approximately 10.2 miles of new 12-inch diameter natural gas pipeline mainline extension ("Loudon Mainline Extension"), with a crossover to the Loudon-Lenoir City Lateral Line 3218D-100 in Monroe and Loudon Counties, Tennessee;

(ii) Installation of a new meter facility and related appurtenances located at the end of the Loudon Mainline Extension at the Tate & Lyle Plant in Loudon County, Tennessee ("Tate & Lyle meter station");

(iii) Installation of a pressure regulator at existing meter station 59039 on the Loudon-Lenoir City Lateral Line 3218D-100 in Loudon County, Tennessee; and

(iv) Installation of a 12-inch mainline valve, two 12-inch Tee Taps and related appurtenant facilities at the interconnection of the new Loudon Mainline Extension with the 12-inch Line 3200-1 mainline near milepost ("MP") 234.35 in Monroe County, Tennessee.

This Karst Mitigation Plan outlines the corrective measures that ETNG and its contractor would implement in the event that known or unknown sinkhole/closed depressions or karst features should require remediation during project activities.

Pre-Construction Literature Review and Field Surveys

Karst terrain is formed by the solution of carbonate rock (*e.g.*, limestone, dolostone, and marble) by percolating, acidic rainwater and groundwater, often along fractures, joints, and bedding planes. It is characterized by cavern openings, closed depressions, and sinking streams, and can sometimes lead to engineering problems due to surface subsidence. According to the Engineering Aspects of Karst map layer of the National Atlas (National Atlas, 2013), the entire Project lies within an area that may contain karst or karst-like features. As shown on the Project alignment sheets (see Appendix 1A of Resource Report 1), ETNG has identified surface features consistent with sinkholes/closed depressions or karst features on sheets MADI-A-1000, MADI-A-1001, MADI-A-1003, MADI-A-1004, MADI-A-1005, MADI-A-1006, MADI-A-1007, and MADI-A-1008.

Training and Awareness

As part of ETNG's Karst Mitigation Plan for the Loudon Project, ETNG will conduct awareness training for karst-like features such as portals, voids, or sinkholes. During the Supervisory Staff Environmental Training Program, the Contractor's field supervisory personnel, including the Superintendent and Crew Foreman, and the Company's supervisory personnel including the Chief Inspector, Craft Inspectors, and the Environmental Inspector, will be trained on potential unanticipated karst features that could be discovered during trenching operations. The training will also provide the appropriate protocol for work stoppage if a karst feature is discovered in the immediate area and a communication plan to alert the appropriate Company and Contractor Supervisors of such discovery.

Construction Phase and Karst Remediation

In the event that a known sinkhole or karst feature should require remediation or if an unanticipated karst feature is discovered during trenching or other construction activities, such as from vibration or surficial thinning from grading, work in the immediate area will be immediately stopped and the communication plan will be implemented to alert appropriate Company and Contractor Supervisors. Erosion and sedimentation controls will be installed at the direction of the Environmental Inspector to minimize the potential for surface water runoff intrusion into the ground water. A designated Project geotechnical engineer/geologist will be contacted and directed to the feature to conduct a detailed evaluation. Based on the evaluation and recommendations, ETNG may attempt a minor field realignment. ETNG will notify the Federal Energy Regulatory Commission ("FERC") Staff in the event that a necessary realignment will result in the need for additional workspace not previously authorized. If a minor field alignment is not feasible and/or does not prevent or otherwise minimize impacts of the feature, the Project geotechnical engineer/geologist will be requested to further evaluate the feature and develop specific design and mitigation measures. In addition, ETNG will implement its Sinkhole Remediation and Mitigation Plan (see Appendix A).

Once the analysis of the karst feature is complete, and assuming that graduated rock fill would be the remedial technique employed to stabilize the void, the first step would be to excavate the void to expose the throat. Once the limit of the throat is determined, the opening would be filled with clean graded rock fill. The fill would consist of graded large rock, coarse aggregate backfill, flowable fill or geotextile fabric, and compacted soil that would be applied to cap the surface. This remedial technique minimizes the potential for surface water runoff intrusion into the ground water while allowing continued percolation or recharge of water to the karst system. This remedial technique also provides new and enhanced stability to the void and increases the long term stability and integrity to the pipeline right of way. Final grading of contours and any necessary permanent erosion and sediment controls will be designed to prevent runoff from accumulating in the area of the void. In addition, during the discharge of any hydrostatic test water from the lateral pipeline, a discharge location will be selected that will prevent the discharged water from encountering any unanticipated features discovered during trenching activities.

In the event that an unanticipated karst feature or void is discovered during construction or post construction monitoring and karst mitigation is required, ETNG will notify and coordinate with the Tennessee Department of Environment and Conservation in accordance with applicable permits and requirements.

Post Construction Monitoring

ETNG will conduct visual, post construction inspections of the pipeline right-of-ways to evaluate the success of the mitigation activities performed for any karst features or voids discovered and mitigated during construction. The frequency of inspections will generally comply with those required under the Tennessee Department of Environment and Conservation general stormwater permit and FERC's Upland Erosion Control, Revegetation, and Maintenance Plan ("FERC Plan") and FERC's Wetland and Waterbody Construction and Mitigation Procedures ("FERC Procedures"), May 2013 versions, but would more specifically be based on severity of the mitigation activities and the Project geotechnical engineer recommendations with a decreasing frequency over the two year monitoring period. As required by the FERC Plan and FERC Procedures, monitoring will be conducted for up to two years after construction completion. If a new karst feature or void were to develop within the right of way as a result of ETNG's subsequent construction activities, ETNG would contact the Project geotechnical engineer to evaluate the feature and make additional remedial recommendations.

References

National Atlas. 2013. Map Layer Info: Engineering Aspects of Karst. Online: http://www.nationalatlas.gov/mld/karst0m.html Accessed on May 13, 2013.

APPENDIX A

Sinkhole Remediation and Mitigation Plan

Sinkhole Remediation and Mitigation Plan
Loudon Expansion Project

SUMMARY OF SITE RECONNAISSANCE

ETNG and S&ME, Inc. performed site reconnaissance of the Loudon Expansion Project and as shown on the Project alignment sheets (see Appendix 1A of Resource Report 1), ETNG has identified surface features consistent with sinkholes/closed depressions or karst features on sheets MADI-A-1000, MADI-A-1001, MADI-A-1003, MADI-A-1004, MADI-A-1005, MADI-A-1006, MADI-A-1007, and MADI-A-1008.

TYPICAL SINKHOLE REMEDIATION AND MITIGATION

Several options are considered viable for remediation/mitigation of the sinkholes/depressions that may be encountered along the Project route. ETNG would employ one of four (4) general sinkhole remediation/mitigation plans depending on the actual field conditions encountered and observed at the time of construction. These plans are described below.

ETNG anticipates that the *Inverted Filter Approach for Pipeline Excavation Structural Zones* will likely be the most applicable and preferred approach for the Loudon Expansion Project; however, the other three approaches may also be implemented in certain situations. The goal with any of the remediation approaches will be to minimize the overall impact to natural/existing storm water infiltration/recharge rates and flow direction.

1. Inverted Filter Approach for Pipeline Excavation Structural Zones

In this approach, the sinkhole area would be excavated until the throat (i.e., cavity solution) of the underlying bedrock is encountered. On occasion, the throat may not be fully identified. It is often advantageous to inject water into the excavation in order to further identify and clean the throat location. At which point, a field decision regarding the more suitable repair method would be developed. This approach is anticipated for those cases in which the pipeline traverses directly across the bottom or near the throat of a sinkhole.

If the inverted filter approach is selected, a non-woven geotextile fabric and large (typically 1 to 2 feet diameter size) rock would be initially placed to establish a working base and fill the sinkhole bottom and/or throat. Layers of progressively smaller size rock would then be placed at an appropriate elevation to allow placement of well-compacted structural soil fill. After placement of stone is complete, the stone filter backfill should be wrapped with the geotextile and the excavation capped with well-compacted soil fill to achieve proposed subgrade elevation. See Figure 1 below.

2. Concrete Plug Approach for Pipeline Excavation Structural Zones

This approach would initially consist of excavating to and cleaning out the throat or open void to allow placement of a concrete plug consisting of flowable fill. Depending on the size and shape of the throat opening, it may be prudent to initially place graded stone within the throat area. The concrete plug would be installed such that it is bonded to adjacent bedrock. The thickness of the concrete plug would be based on field observations, but in general, the thickness should be at a minimum of two (2) times the width of the plug. Large rock fill may be incorporated into the flowable fill to reduce the overall volume and cost of flowable fill material. After curing, the remaining site area can be filled with well-compacted soil if required to achieve proposed subgrade elevation. This approach is anticipated for those cases in which

the pipeline traverses directly across a sinkhole void/opening in non-closed depression areas that typically do not receive normal storm water flow (i.e., along a hillside for example) or if an unanticipated opening is identified during pipeline excavation. See Figure F-2 below.

3. Large Rock Placement in Cave or Opening

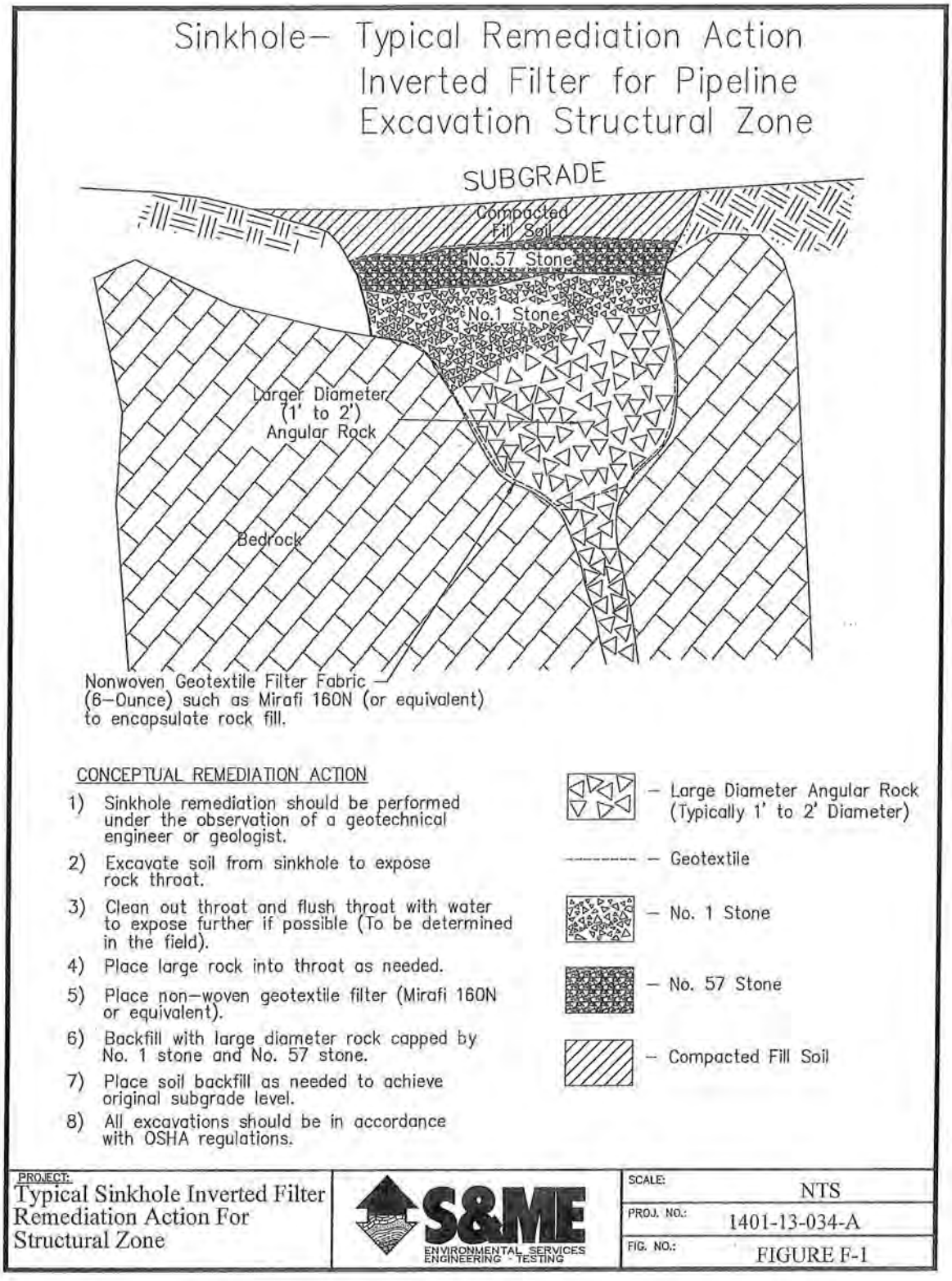
In cases where the pipeline will traverse a large open void or cave feature, stabilizing and filling the large opening would be implemented to minimize disturbance of the underlying cave feature or large open void. Initially, large rock (several feet in diameter) will be securely placed and wedged into the opening or cave feature. Additional angular rock (up to 2 feet in size) may be placed prior to placement of a non-woven filter fabric. The remaining depth may be capped with No. 1 stone, suitable graded rock, and soil backfill to achieve proposed subgrade elevation. See Figure F-3 below.

4. *General Site Filling Approach*

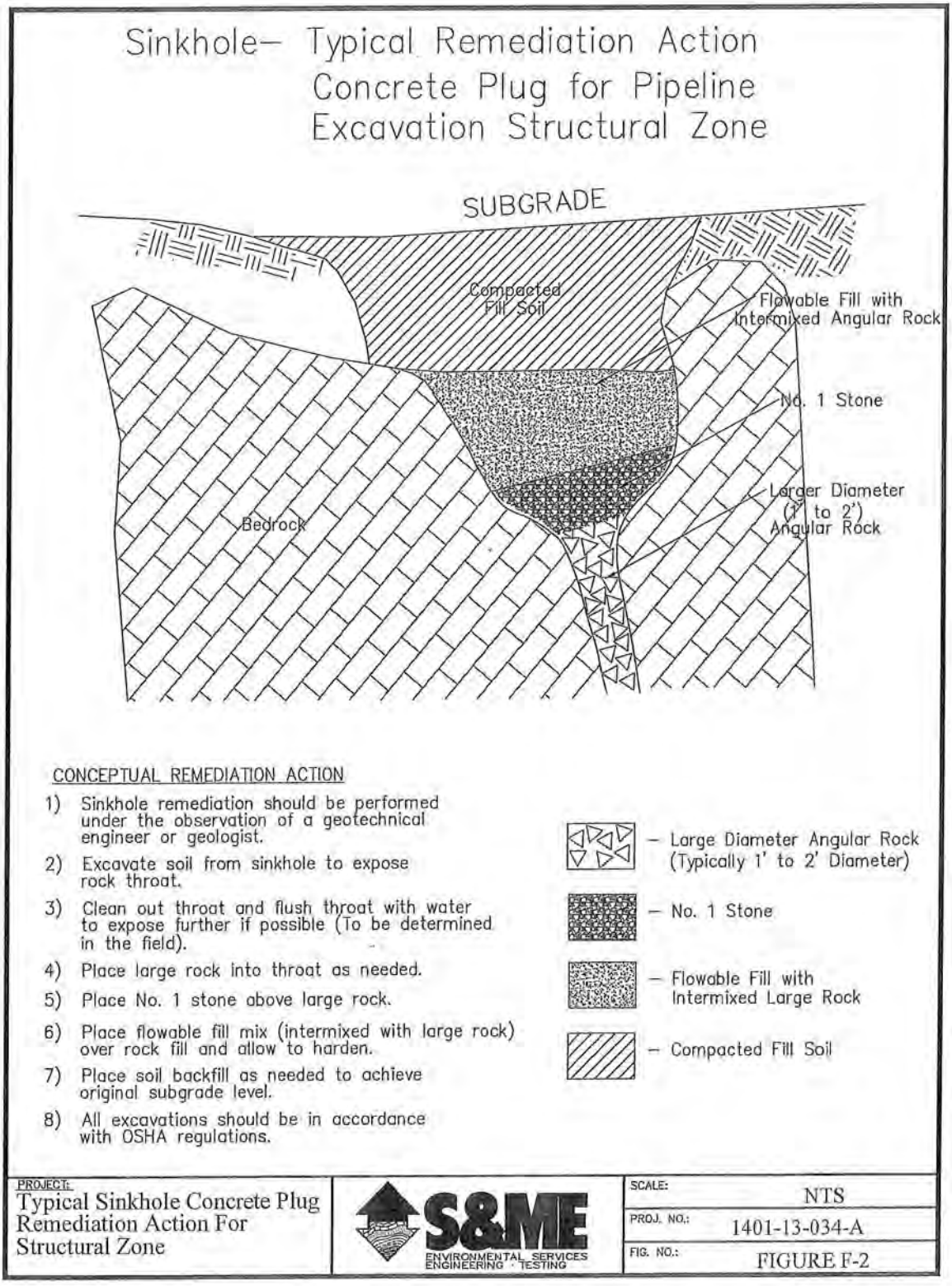
In some cases, pipeline construction will necessitate the backfilling of site features (i.e., closed depressions without visible openings/voids at the ground surface and depressions with karst voids or openings exposed to ground surface) in order to facilitate construction and installation of the pipeline. These closed depressions or karst features will typically be located within the CWA of the project but not within the actual pipeline excavation zone or pipe non-structural zone. Backfill activity for both situations would consist initially of vegetation removal and placement of a geogrid and non-woven filter fabric across the footprint of the site feature to be backfilled. Large angular rock (up to 2 feet in diameter) may be placed over the geogrid and geotextile. Placement of a layer of No. 1 size stone over the large angular rock may be utilized (if required) and will be based on field decision at the time of construction. As noted above, the goal of this remediation approach will be to minimize the overall impact to natural/existing storm water infiltration/recharge rates and flow direction. See Figures F- 4 and F-5 below.

Although not expected to be applicable, one additional sinkhole remediation option may be a viable solution in certain situations (such as road crossings). The use of a process known as “cap” grouting is used to fill fractured bedrock and sinkhole throat areas. Drill casing is advanced into the subgrade until bedrock is encountered and grout is injected under pressure until certain criteria are achieved (e.g., adequate pressure, grout-take, etc.). The process is finalized using compaction grouting which injects low-mobility grout under high pressures on top of the grout “cap”. Compaction grouting acts to densify and compress the soils between grouting locations and can significantly reduce the potential for future sinkhole formation. However, there are several limitations which would likely cause this method to be very expensive and unfeasible. These include the size of the area which would require remediation and the depth to which drilling and grouting would need to occur (in some cases) to be of substantial benefit. Also the potential of impacting natural/existing storm water infiltration/recharge rates are problematic.

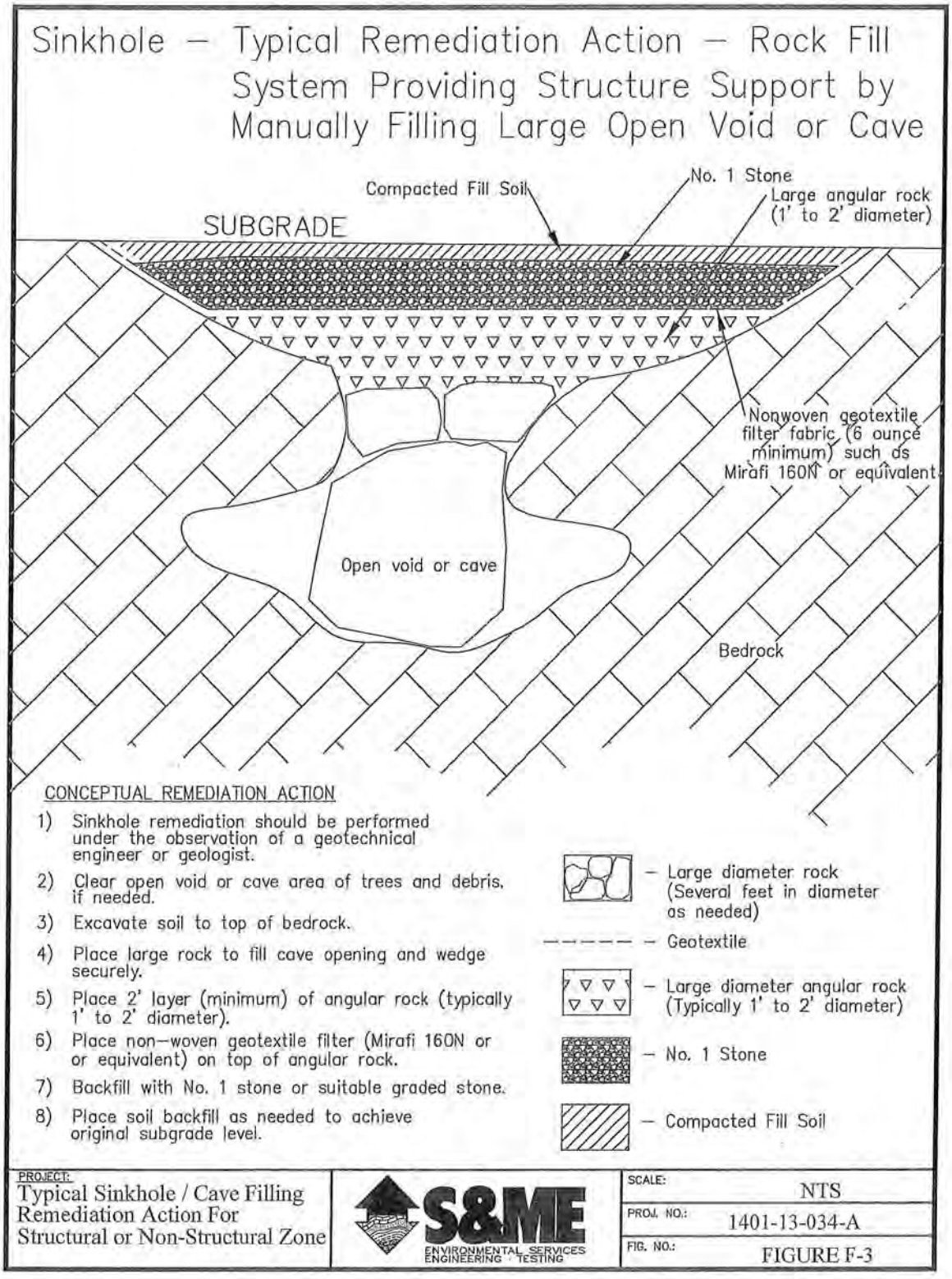
Sinkhole Remediation and Mitigation Plan
Loudon Expansion Project



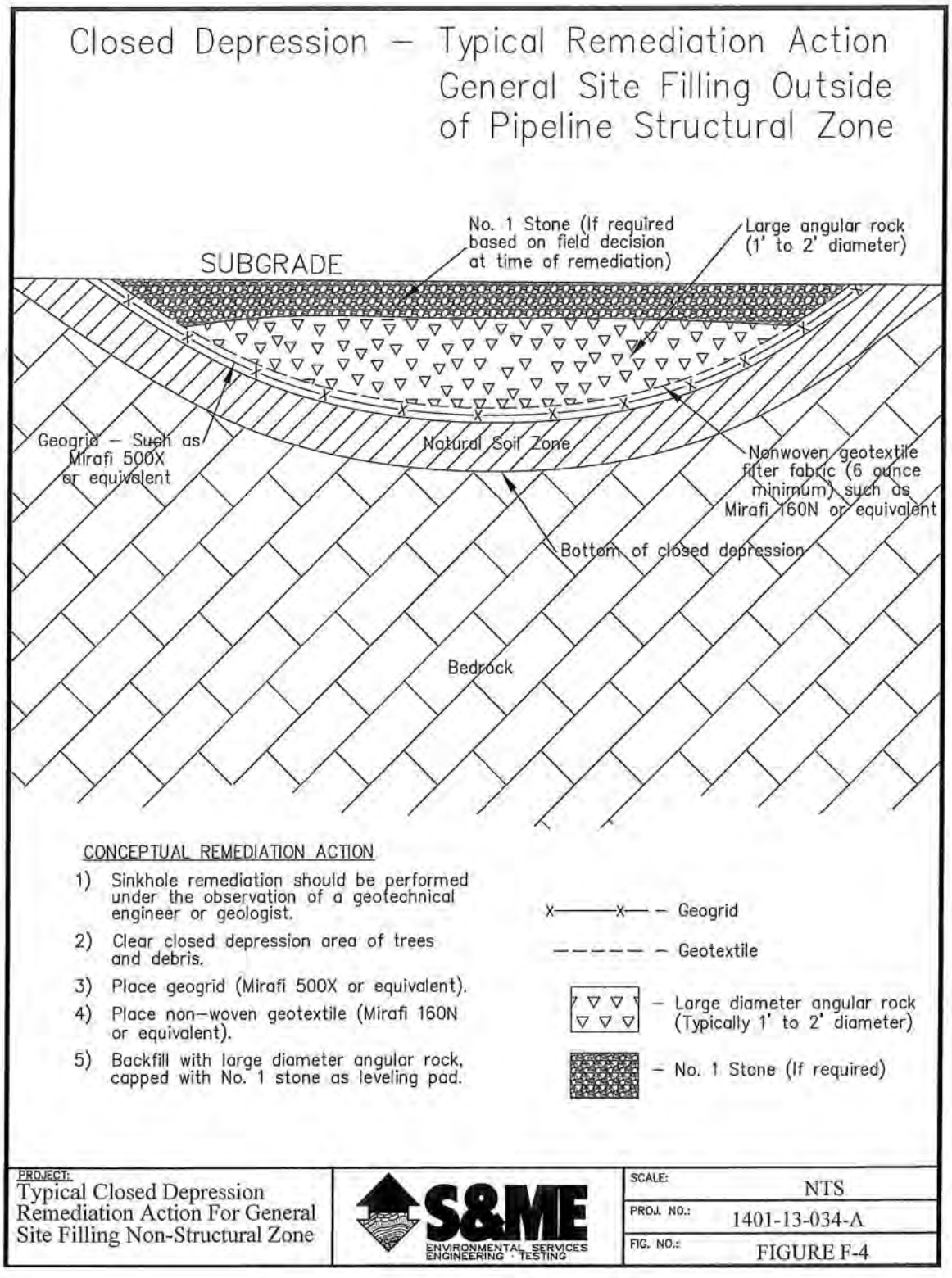
Sinkhole Remediation and Mitigation Plan
Loudon Expansion Project



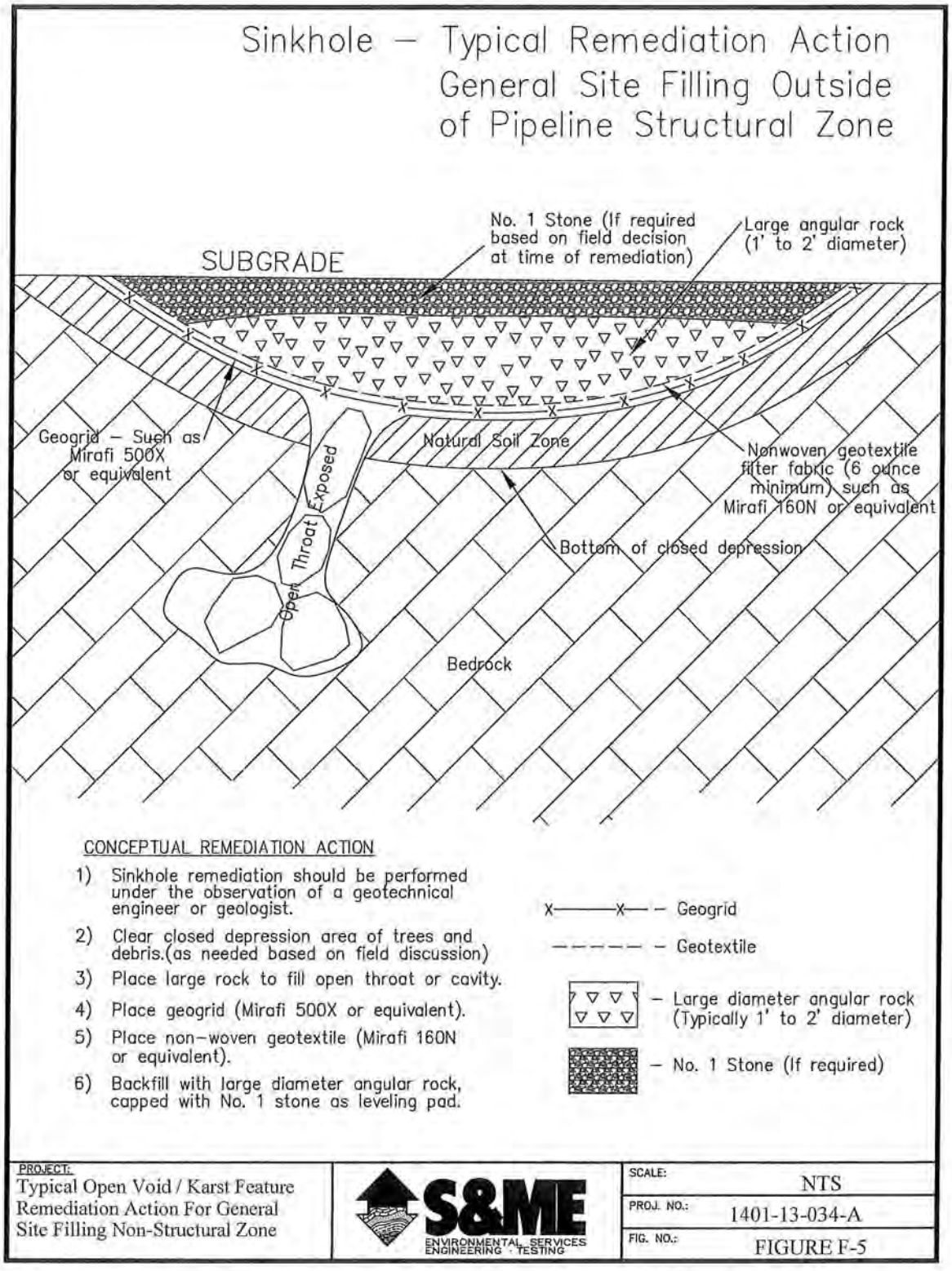
Sinkhole Remediation and Mitigation Plan
Loudon Expansion Project



Sinkhole Remediation and Mitigation Plan
Loudon Expansion Project



Sinkhole Remediation and Mitigation Plan
Loudon Expansion Project



Appendix G

HDD Crossing Alignment Sheets

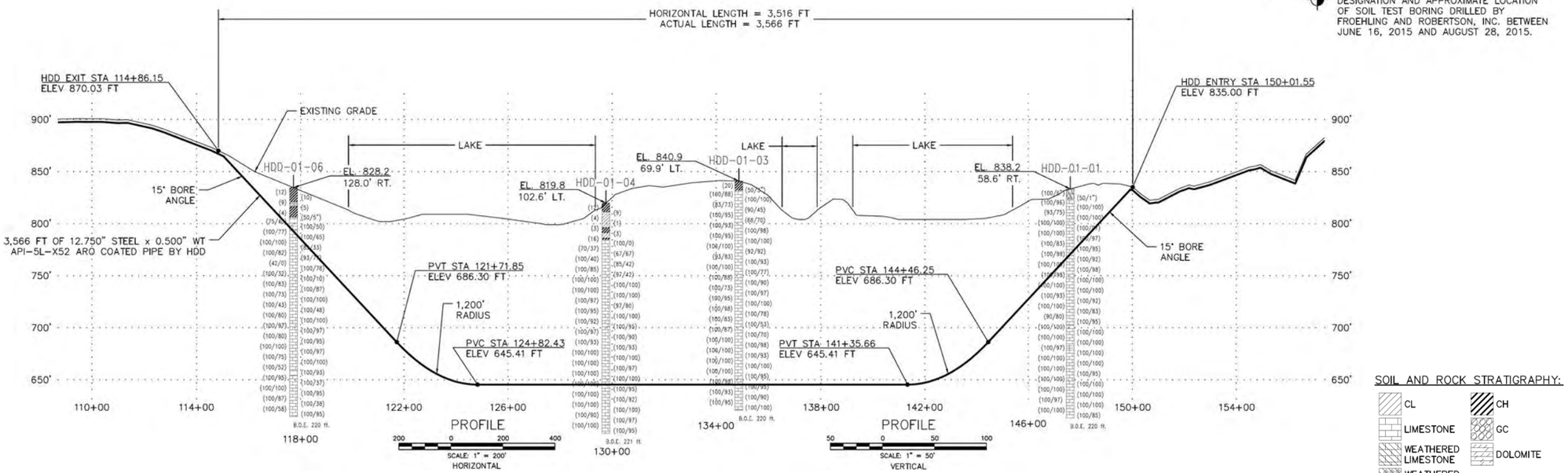


Figure 1-1: HDD No. 1 Plan and Profile

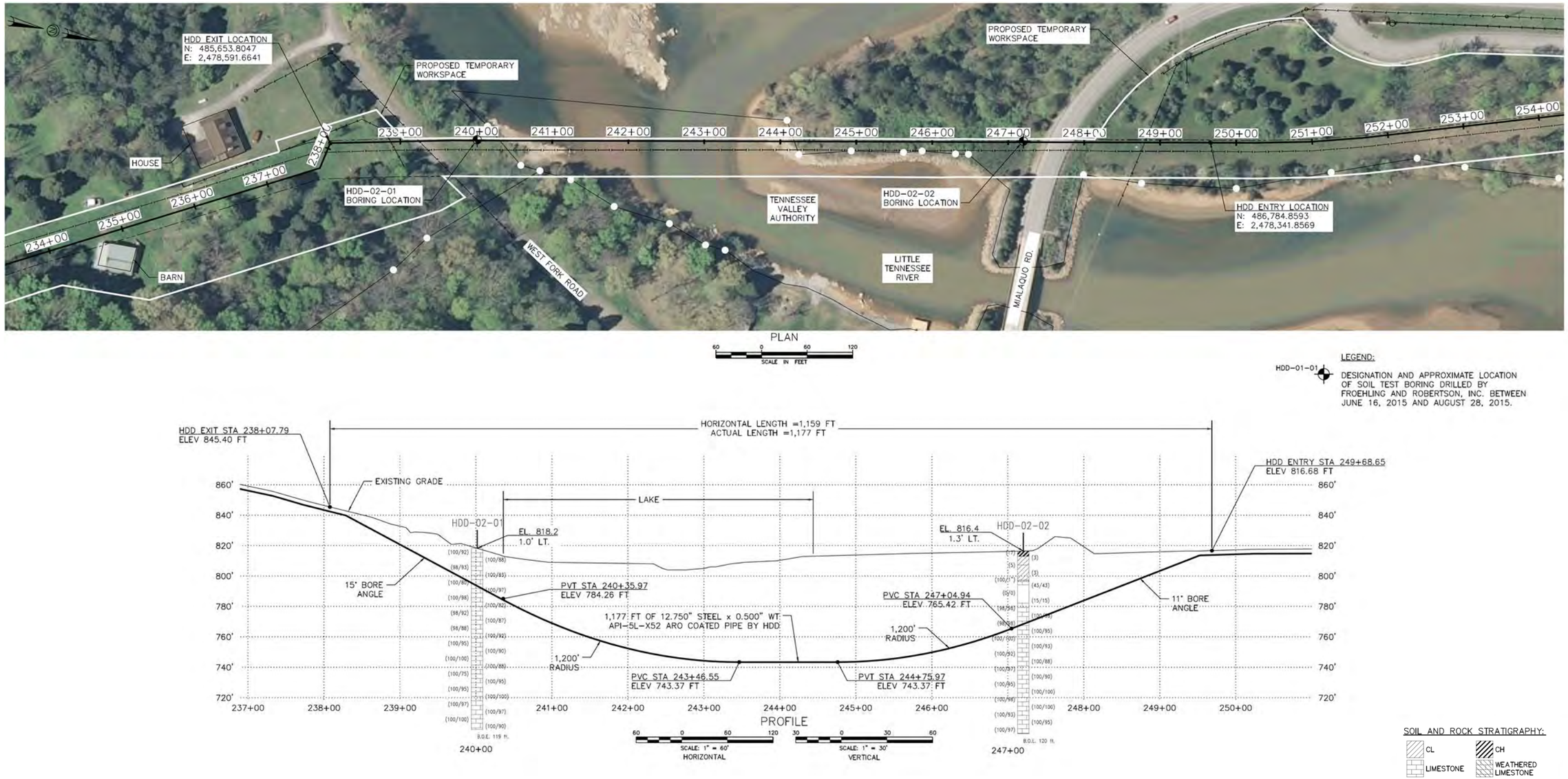


Figure 1-2: HDD No. 2 Plan and Profile

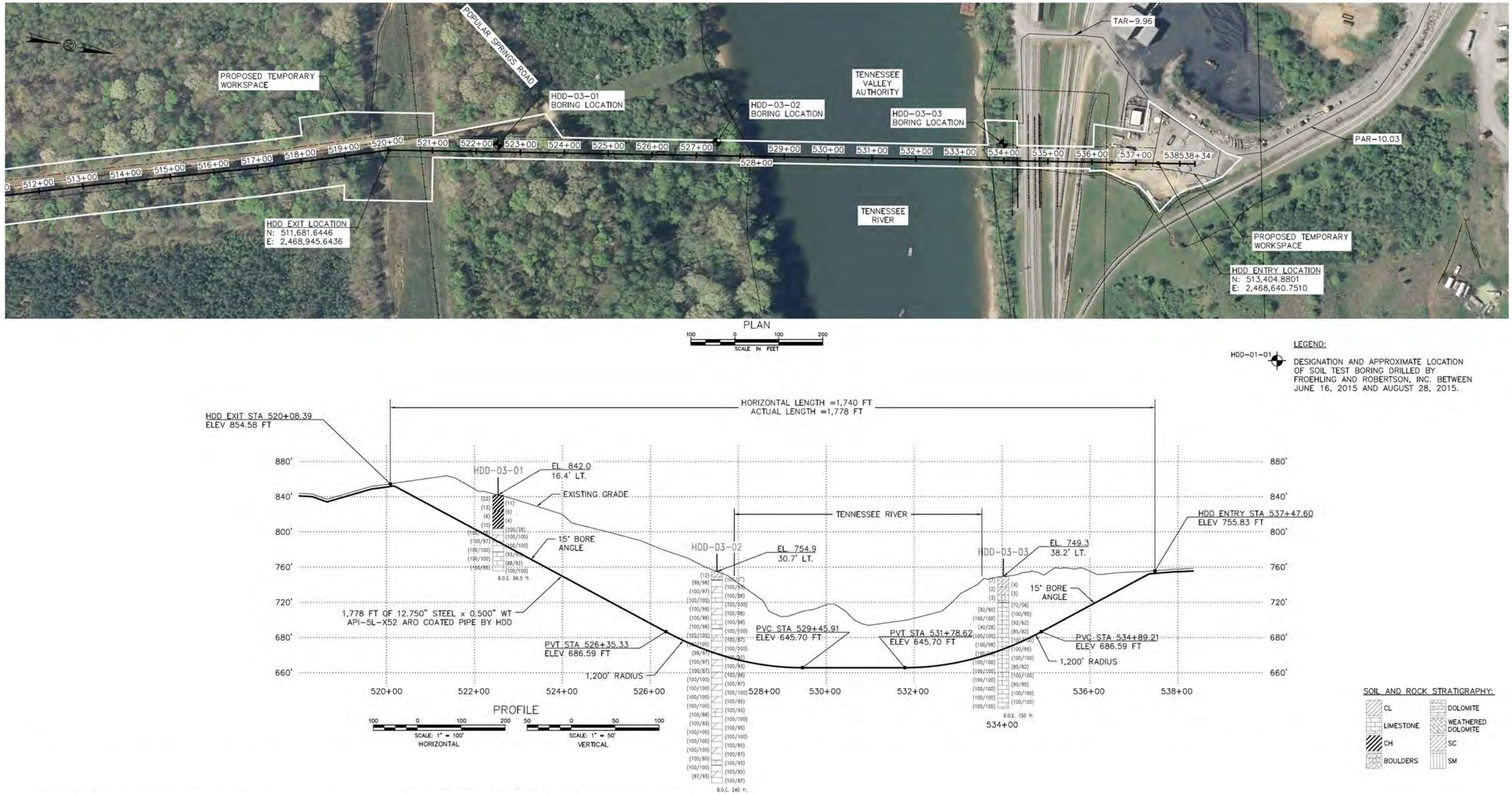


Figure 1-3: HDD No. 3 Plan and Profile

Appendix H

Soils Crossed by the Loudon Expansion Project

Soils Crossed by the Loudon Expansion Project										
Map Unit Symbol	**Map Unit Name**	**Milepost Range**	**Approximate Crossing Length (ft)**	**Soil Erosion Hazard**	**Wind Erodibility Group ("WEG")**	**USDA Farmland Designation**	**Hydric (Yes/No)**	**Depth to Bedrock (in)**	**Potential Blasting (Yes/No)**	**Drainage Class**
DgC3	Dewey silty clay loam, 5 to 12 percent slopes, severely eroded	0.00-0.05	240.35	Slight	Not rated or not available	Not prime farmland	No	>79 inches	No	Well drained
Em	Emory silt loam, 0 to 4 percent slopes, occasionally flooded	0.05-0.09	230.51	Slight	6	All areas are prime farmland	Yes	>79 inches	No	Well drained
DgC3	Dewey silty clay loam, 5 to 12 percent slopes, severely eroded	0.09-0.10	51.37	Slight	Not rated or not available	Not prime farmland	No	>79 inches	No	Well drained
Em	Emory silt loam, 0 to 4 percent slopes, occasionally flooded	0.10-0.12	130.21	Slight	6	All areas are prime farmland	Yes	>79 inches	No	Well drained
DgC3	Dewey silty clay loam, 5 to 12 percent slopes, severely eroded	0.12-0.16	175.59	Slight	Not rated or not available	Not prime farmland	No	>79 inches	No	Well drained
Em	Emory silt loam, 0 to 4 percent slopes, occasionally flooded	0.16-0.21	304.56	Slight	6	All areas are prime farmland	Yes	>79 inches	No	Well drained
DgC3	Dewey silty clay loam, 5 to 12 percent slopes, severely eroded	0.21-0.23	97.64	Slight	Not rated or not available	Not prime farmland	No	>79 inches	No	Well drained
DeC	Dewey silt loam, 5 to 12 percent slopes	0.23-0.33	501.93	Slight	Not rated or not available	Not prime farmland	No	>79 inches	No	Well drained
DmC	Dunmore silt loam, 5 to 12 percent slopes	0.33-0.38	268.27	Slight	Not rated or not available	Not prime farmland	No	>79 inches	No	Well drained
DmD2	Dunmore silt loam, 12 to 20 percent slopes, eroded	0.38-0.50	647.03	Moderate	Not rated or not available	Not prime farmland	No	>79 inches	No	Well drained
Ha	Hamblen silt loam	0.50-0.55	259.35	Slight	Not rated or not available	All areas are prime farmland	No	>79 inches	No	Moderately well drained
LeB	Leadvale silt loam, 2 to 5 percent slopes	0.55-0.70	777.93	Slight	Not rated or not available	All areas are prime farmland	No	58 inches	Yes	Moderately well drained
Em	Emory silt loam, 0 to 4 percent slopes, occasionally flooded	0.70-0.78	413.30	Slight	6	All areas are prime farmland	Yes	>79 inches	No	Well drained
DmD2	Dunmore silt loam, 12 to 20 percent slopes, eroded	0.78-0.80	138.58	Moderate	Not rated or not available	Not prime farmland	No	>79 inches	No	Well drained
DgC3	Dewey silty clay loam, 5 to 12 percent slopes, severely eroded	0.80-0.81	40.52	Slight	Not rated or not available	Not prime farmland	No	>79 inches	No	Well drained
DmD2	Dunmore silt loam, 12 to 20 percent slopes, eroded	0.81-0.91	526.80	Moderate	Not rated or not available	Not prime farmland	No	>79 inches	No	Well drained

Soils Crossed by the Loudon Expansion Project										
Map Unit Symbol	**Map Unit Name**	**Milepost Range**	**Approximate Crossing Length (ft)**	**Soil Erosion Hazard**	**Wind Erodibility Group ("WEG")**	**USDA Farmland Designation**	**Hydric (Yes/No)**	**Depth to Bedrock (in)**	**Potential Blasting (Yes/No)**	**Drainage Class**
DgD3	Dewey silty clay loam, 12 to 20 percent slopes, severely eroded	0.91-0.95	214.24	Moderate	Not rated or not available	Not prime farmland	No	>79 inches	No	Well drained
DgC3	Dewey silty clay loam, 5 to 12 percent slopes, severely eroded	0.95-0.98	139.67	Slight	Not rated or not available	Not prime farmland	No	>79 inches	No	Well drained
DgD3	Dewey silty clay loam, 12 to 20 percent slopes, severely eroded	0.98-1.10	633.70	Moderate	Not rated or not available	Not prime farmland	No	>79 inches	No	Well drained
DeC	Dewey silt loam, 5 to 12 percent slopes	1.10-1.24	757.65	Slight	Not rated or not available	Not prime farmland	No	>79 inches	No	Well drained
DeB	Dewey silt loam, 2 to 5 percent slopes	1.24-1.28	214.97	Slight	Not rated or not available	All areas are prime farmland	No	>79 inches	No	Well drained
DmC	Dunmore silt loam, 5 to 12 percent slopes	1.28-1.45	895.27	Slight	Not rated or not available	Not prime farmland	No	>79 inches	No	Well drained
DeC	Dewey silt loam, 5 to 12 percent slopes	1.45-1.50	262.38	Slight	Not rated or not available	Not prime farmland	No	>79 inches	No	Well drained
DmC	Dunmore silt loam, 5 to 12 percent slopes	1.50-1.55	280.90	Slight	Not rated or not available	Not prime farmland	No	>79 inches	No	Well drained
FtD	Fullerton cherty silt loam, 12 to 20 percent slopes	1.55-1.61	306.12	Moderate	Not rated or not available	Not prime farmland	No	>79 inches	No	Well drained
FtE	Fullerton cherty silt loam, 20 to 40 percent slopes	1.61-1.65	181.05	Moderate	Not rated or not available	Not prime farmland	No	>79 inches	No	Well drained
FtC	Fullerton gravelly silt loam, 5 to 12 percent slopes	1.65-1.69	218.76	Slight	7	Not prime farmland	No	>79 inches	No	Well drained
FtE	Fullerton cherty silt loam, 20 to 40 percent slopes	1.69-1.81	662.58	Moderate	Not rated or not available	Not prime farmland	No	>79 inches	No	Well drained
DeC	Dewey silt loam, 5 to 12 percent slopes	1.81-1.81	9.46	Slight	Not rated or not available	Not prime farmland	No	>79 inches	No	Well drained
FtE	Fullerton cherty silt loam, 20 to 40 percent slopes	1.81-1.87	317.02	Moderate	Not rated or not available	Not prime farmland	No	>79 inches	No	Well drained
DeD2	Dewey silt loam, 12 to 20 percent slopes, eroded	1.87-2.10	1166.88	Moderate	Not rated or not available	Not prime farmland	No	>79 inches	No	Well drained
FtD	Fullerton cherty silt loam, 12 to 20 percent slopes	2.10-2.20	550.26	Moderate	Not rated or not available	Not prime farmland	No	>79 inches	No	Well drained

Soils Crossed by the Loudon Expansion Project										
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DgD3	Dewey silty clay loam, 12 to 20 percent slopes, severely eroded	2.20-2.25	277.19	Moderate	Not rated or not available	Not prime farmland	No	>79 inches	No	Well drained
EtC	Etowah silt loam, 5 to 12 percent slopes	2.25-2.30	231.21	Slight	Not rated or not available	Not prime farmland	No	>79 inches	No	Well drained
ToD3	Tellico clay loam, 12 to 20 percent slopes, severely eroded	2.47-2.48	60.98	Moderate	Not rated or not available	Not prime farmland	No	58 inches	Yes	Well drained
SgC3	Sequoia silty clay, 5 to 12 percent slopes, severely eroded	2.48-2.53	268.02	Slight	Not rated or not available	Not prime farmland	No	34 inches	Yes	Well drained
LtC	Litz shaly silt loam, 5 to 12 percent slopes (sil)	2.53-2.57	189.26	Slight	Not rated or not available	Not prime farmland	No	22 inches	Yes	Well drained
LtD3	Litz shaly silt loam, 12 to 20 percent slopes, severely eroded (sil)	2.57-2.61	210.86	Moderate	Not rated or not available	Not prime farmland	No	22 inches	Yes	Well drained
Em	Emory silt loam, 0 to 4 percent slopes, occasionally flooded	2.64-2.65	11.92	Slight	6	All areas are prime farmland	Yes	>79 inches	No	Well drained
LtD3	Litz shaly silt loam, 12 to 20 percent slopes, severely eroded (sil)	2.77-2.78	62.61	Moderate	Not rated or not available	Not prime farmland	No	22 inches	Yes	Well drained
SeC2	Sequoia silt loam, 5 to 12 percent slopes, eroded	2.78-2.84	337.46	Slight	Not rated or not available	Not prime farmland	No	34 inches	Yes	Well drained
SeD2	Sequoia silt loam, 12 to 20 percent slopes, eroded	2.84-2.87	160.74	Moderate	Not rated or not available	Not prime farmland	No	34 inches	Yes	Well drained
TeD	Tellico loam, 12 to 20 percent slopes	2.87-2.90	140.16	Moderate	Not rated or not available	Not prime farmland	No	58 inches	Yes	Well drained
AaC	Alcoa loam, 5 to 12 percent slopes	2.90-2.99	462.82	Slight	Not rated or not available	Not prime farmland	No	>79 inches	No	Well drained
TlE2	Tellico loam, eroded steep phase	2.99-3.02	191.97	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
TlC2	Tellico loam, eroded sloping phase	3.02-3.12	508.37	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
TlE2	Tellico loam, eroded steep phase	3.12-3.21	453.67	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
TgE3	Tellico clay loam, severely eroded steep phase	3.21-3.32	586.63	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained

Soils Crossed by the Loudon Expansion Project										
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TlC2	Tellico loam, eroded sloping phase	3.32-3.33	87.66	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
TlD2	Tellico loam, eroded moderately steep phase	3.33-3.41	420.90	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
TgD3	Tellico clay loam, severely eroded moderately steep phase	3.41-3.57	806.20	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
TlC2	Tellico loam, eroded sloping phase	3.57-3.59	106.44	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
TlE2	Tellico loam, eroded steep phase	3.59-3.64	286.00	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
TlC2	Tellico loam, eroded sloping phase	3.64-3.68	212.90	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
AcC	Alcoa loam, sloping phase	3.68-3.71	131.24	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
TlD2	Tellico loam, eroded moderately steep phase	3.71-3.74	179.84	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
AcB	Alcoa loam, gently sloping phase	3.74-3.75	61.51	Slight	Not rated or not available	All areas are prime farmland	No	> 79 inches	No	Well drained
TlD2	Tellico loam, eroded moderately steep phase	3.75-3.77	97.38	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
Gl	Gullied land, limestone materials	3.77-3.80	145.19	Not rated	Not rated or not available	Not prime farmland	No	> 79 inches	No	
Ro	Rockland	3.80-3.85	288.16	Not rated	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
CbC	Colbert silty clay loam, sloping phase (barfield)	3.85-4.08	1232.32	Slight	Not rated or not available	Not prime farmland	No	20 inches	Yes	Well drained
Lo	Lindside silt loam, local alluvium phase	4.08-4.13	227.25	Slight	Not rated or not available	All areas are prime farmland	Yes	> 79 inches	No	Moderately well drained
TcD3	Talbott silty clay, severely eroded moderately steep phase	4.13-4.17	239.32	Moderate	Not rated or not available	Not prime farmland	No	40 inches	Yes	Well drained
SkC2	Sequoia silty clay loam, eroded sloping phase	4.17-4.20	116.43	Slight	Not rated or not available	Not prime farmland	No	34 inches	Yes	Well drained

Soils Crossed by the Loudon Expansion Project										
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SkD2	Sequoia silty clay loam, eroded moderately steep phase	4.20-4.23	170.40	Moderate	Not rated or not available	Not prime farmland	No	34 inches	Yes	Well drained
LeB	Leadvale silt loam, gently sloping phase	4.23-4.25	102.57	Slight	Not rated or not available	All areas are prime farmland	No	48 inches	Yes	Moderately well drained
TcD3	Talbott silty clay, severely eroded moderately steep phase	4.25-4.32	396.13	Moderate	Not rated or not available	Not prime farmland	No	40 inches	Yes	Well drained
Td	Talbott and Colbert very rocky soils, 5 to 25 percent slopes	4.32-4.58	1366.17	Moderate	Not rated or not available	Not prime farmland	No	20 inches	Yes	Well drained
CmD2	Cumberland silty clay loam, eroded moderately steep phase	4.64-4.70	342.29	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
CmC2	Cumberland silty clay loam, eroded sloping phase	4.70-4.77	375.90	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
CmD2	Cumberland silty clay loam, eroded moderately steep phase	4.77-4.79	83.23	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
Td	Talbott and Colbert very rocky soils, 5 to 25 percent slopes	4.79-4.89	520.35	Moderate	Not rated or not available	Not prime farmland	No	20 inches	Yes	Well drained
CmD3	Cumberland silty clay loam, severely eroded moderately steep phase	4.89-4.93	242.17	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
CmD2	Cumberland silty clay loam, eroded moderately steep phase	4.93-5.01	381.84	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
CmC2	Cumberland silty clay loam, eroded sloping phase	5.01-5.11	577.42	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
CmD2	Cumberland silty clay loam, eroded moderately steep phase	5.11-5.15	167.75	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
Em	Emory silt loam, 0 to 4 percent slopes, occasionally flooded	5.15-5.16	79.77	Slight	6	All areas are prime farmland	Yes	> 79 inches	No	Well drained
Gl	Gullied land, limestone materials	5.16-5.20	187.18	Not rated	Not rated or not available	Not prime farmland	No	> 79 inches	No	
FcC	Fullerton cherty silt loam, sloping phase	5.20-5.24	237.06	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FcD	Fullerton cherty silt loam, moderately steep phase	5.24-5.25	65.99	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained

Soils Crossed by the Loudon Expansion Project										
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FcC	Fullerton cherty silt loam, sloping phase	5.25-5.29	195.08	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FcD	Fullerton cherty silt loam, moderately steep phase	5.29-5.31	97.53	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
HeC2	Hermitage silt loam, eroded sloping phase (etowah)	5.31-5.33	85.05	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FcD	Fullerton cherty silt loam, moderately steep phase	5.33-5.40	378.39	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FsD	Fullerton silt loam, moderately steep phase (dewey)	5.40-5.43	185.09	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
Em	Emory silt loam, 0 to 4 percent slopes, occasionally flooded	5.43-5.48	260.77	Slight	6	All areas are prime farmland	Yes	> 79 inches	No	Well drained
FcC	Fullerton cherty silt loam, sloping phase	5.48-5.50	87.01	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FsD	Fullerton silt loam, moderately steep phase (dewey)	5.50-5.54	197.31	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FcC	Fullerton cherty silt loam, sloping phase	5.54-5.69	798.06	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FcD	Fullerton cherty silt loam, moderately steep phase	5.69-5.92	1230.47	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
Ge	Greendale silt loam	5.92-5.95	178.67	Slight	Not rated or not available	All areas are prime farmland	No	> 79 inches	No	Well drained
FsE	Fullerton silt loam, steep phase (dewey)	5.95-5.97	89.25	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
WlC2	Waynesboro loam, eroded sloping phase	5.97-6.00	154.17	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FsC	Fullerton silt loam, sloping phase (dewey)	6.00-6.09	462.40	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FtD3	Fullerton silty clay loam, severely eroded moderately steep phase (dewey)	6.09-6.12	196.16	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FsD	Fullerton silt loam, moderately steep phase (dewey)	6.12-6.13	30.12	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained

Soils Crossed by the Loudon Expansion Project										
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WlC2	Waynesboro loam, eroded sloping phase	6.13-6.26	666.81	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FsD	Fullerton silt loam, moderately steep phase (dewey)	6.26-6.27	85.59	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FcC	Fullerton cherty silt loam, sloping phase	6.27-6.38	577.00	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FcD	Fullerton cherty silt loam, moderately steep phase	6.38-6.52	727.93	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
MrC2	Minvale cherty silt loam, eroded sloping phase	6.52-6.55	177.77	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
MsC2	Minvale silt loam, eroded sloping phase	6.55-6.56	10.58	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
Me	Melvin silt loam	6.56-6.59	167.46	Slight	Not rated or not available	Not prime farmland	Yes	> 79 inches	No	Poorly drained
Lu	Lobelville cherty silt loam	6.59-6.62	163.43	Slight	Not rated or not available	All areas are prime farmland	Yes	> 79 inches	No	Moderately well drained
Ln	Lindside silt loam	6.62-6.65	186.51	Slight	Not rated or not available	All areas are prime farmland	Yes	> 79 inches	No	Moderately well drained
MrC2	Minvale cherty silt loam, eroded sloping phase	6.65-6.68	135.61	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FtD3	Fullerton silty clay loam, severely eroded moderately steep phase (dewey)	6.68-6.73	251.91	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FcC	Fullerton cherty silt loam, sloping phase	6.73-6.79	337.83	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FsC	Fullerton silt loam, sloping phase (dewey)	6.79-6.82	144.93	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FtD3	Fullerton silty clay loam, severely eroded moderately steep phase (dewey)	6.82-6.85	155.43	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FsC	Fullerton silt loam, sloping phase (dewey)	6.85-6.91	325.26	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FdD3	Fullerton cherty silty clay loam, severely eroded moderately steep phase	6.91-6.91	1.34	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained

Soils Crossed by the Loudon Expansion Project										
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FcD	Fullerton cherty silt loam, moderately steep phase	6.91-6.94	166.29	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
Ge	Greendale silt loam	6.94-6.98	178.09	Slight	Not rated or not available	All areas are prime farmland	No	> 79 inches	No	Well drained
FsC	Fullerton silt loam, sloping phase (dewey)	6.98-6.99	65.57	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
Lo	Lindside silt loam, local alluvium phase	6.99-7.00	49.42	Slight	Not rated or not available	All areas are prime farmland	Yes	> 79 inches	No	Moderately well drained
FsC	Fullerton silt loam, sloping phase (dewey)	7.00-7.04	214.34	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
DeC2	Dewey silty clay loam, eroded sloping phase	7.04-7.07	155.09	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FcC	Fullerton cherty silt loam, sloping phase	7.07-7.13	333.15	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FcD	Fullerton cherty silt loam, moderately steep phase	7.13-7.26	665.77	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FsC	Fullerton silt loam, sloping phase (dewey)	7.26-7.27	64.79	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
HeB	Hermitage silt loam, gently sloping phase (etowah)	7.27-7.28	84.26	Slight	Not rated or not available	All areas are prime farmland	No	> 79 inches	No	Well drained
FsC	Fullerton silt loam, sloping phase (dewey)	7.28-7.33	250.13	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
BoD2	Bolton silt loam, eroded moderately steep phase	7.33-7.44	564.02	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
HeC2	Hermitage silt loam, eroded sloping phase (etowah)	7.44-7.44	34.30	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
Ge	Greendale silt loam	7.44-7.47	134.14	Slight	Not rated or not available	All areas are prime farmland	No	> 79 inches	No	Well drained
FsC	Fullerton silt loam, sloping phase (dewey)	7.47-7.54	344.07	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
Lo	Lindside silt loam, local alluvium phase	7.54-7.57	161.71	Slight	Not rated or not available	All areas are prime farmland	Yes	> 79 inches	No	Moderately well drained

Soils Crossed by the Loudon Expansion Project										
Map Unit Symbol	**Map Unit Name**	**Milepost Range**	**Approximate Crossing Length (ft)**	**Soil Erosion Hazard**	**Wind Erodibility Group ("WEG")**	**USDA Farmland Designation**	**Hydric (Yes/No)**	**Depth to Bedrock (in)**	**Potential Blasting (Yes/No)**	**Drainage Class**
FcD	Fullerton cherty silt loam, moderately steep phase	7.57-7.60	173.27	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FsC	Fullerton silt loam, sloping phase (dewey)	7.60-7.72	616.08	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FcD	Fullerton cherty silt loam, moderately steep phase	7.72-7.79	367.33	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
CmC3	Cumberland silty clay loam, severely eroded sloping phase	7.79-7.82	186.03	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
CrE3	Cumberland and Decatur silty clay loams, severely eroded steep phases	7.82-7.88	298.64	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
CmC3	Cumberland silty clay loam, severely eroded sloping phase	7.88-7.91	197.39	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FsC	Fullerton silt loam, sloping phase (dewey)	7.91-8.06	751.10	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FsD	Fullerton silt loam, moderately steep phase (dewey)	8.06-8.18	633.99	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
Lo	Lindside silt loam, local alluvium phase	8.18-8.20	140.34	Slight	Not rated or not available	All areas are prime farmland	Yes	> 79 inches	No	Moderately well drained
MsC2	Minvale silt loam, eroded sloping phase	8.20-8.30	502.12	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FsC	Fullerton silt loam, sloping phase (dewey)	8.30-8.38	423.15	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FdE3	Fullerton cherty silty clay loam, severely eroded steep phase	8.38-8.45	374.50	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FcC	Fullerton cherty silt loam, sloping phase	8.45-8.52	384.92	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FcE	Fullerton cherty silt loam, steep phase	8.52-8.65	689.73	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
Gc	Greendale cherty silt loam	8.65-8.68	140.33	Slight	Not rated or not available	All areas are prime farmland	No	> 79 inches	No	Well drained
FcE	Fullerton cherty silt loam, steep phase	8.68-8.73	244.16	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained

Soils Crossed by the Loudon Expansion Project										
Map Unit Symbol	**Map Unit Name**	**Milepost Range**	**Approximate Crossing Length (ft)**	**Soil Erosion Hazard**	**Wind Erodibility Group ("WEG")**	**USDA Farmland Designation**	**Hydric (Yes/No)**	**Depth to Bedrock (in)**	**Potential Blasting (Yes/No)**	**Drainage Class**
FcC	Fullerton cherty silt loam, sloping phase	8.73-8.75	149.44	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FcE	Fullerton cherty silt loam, steep phase	8.75-8.77	82.72	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
Gc	Greendale cherty silt loam	8.77-8.79	111.26	Slight	Not rated or not available	All areas are prime farmland	No	> 79 inches	No	Well drained
FcE	Fullerton cherty silt loam, steep phase	8.79-8.82	159.07	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FcC	Fullerton cherty silt loam, sloping phase	8.82-8.86	181.48	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FcE	Fullerton cherty silt loam, steep phase	8.86-8.94	468.38	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FcC	Fullerton cherty silt loam, sloping phase	8.94-9.02	425.39	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
HcC	Hermitage cherty silt loam, sloping phase (etowah)	9.02-9.04	57.28	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FcC	Fullerton cherty silt loam, sloping phase	9.04-9.05	93.86	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FcE	Fullerton cherty silt loam, steep phase	9.05-9.18	693.97	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FcC	Fullerton cherty silt loam, sloping phase	9.18-9.21	140.36	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FcE	Fullerton cherty silt loam, steep phase	9.21-9.25	211.17	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
Ge	Greendale silt loam	9.25-9.31	306.67	Slight	Not rated or not available	All areas are prime farmland	No	> 79 inches	No	Well drained
FcD	Fullerton cherty silt loam, moderately steep phase	9.31-9.34	170.30	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FcE	Fullerton cherty silt loam, steep phase	9.34-9.41	344.69	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FcC	Fullerton cherty silt loam, sloping phase	9.41-9.45	236.96	Slight	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained

Soils Crossed by the Loudon Expansion Project										
Map Unit Symbol	**Map Unit Name**	**Milepost Range**	**Approximate Crossing Length (ft)**	**Soil Erosion Hazard**	**Wind Erodibility Group ("WEG")**	**USDA Farmland Designation**	**Hydric (Yes/No)**	**Depth to Bedrock (in)**	**Potential Blasting (Yes/No)**	**Drainage Class**
FcE	Fullerton cherty silt loam, steep phase	9.45-9.55	517.79	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FcD	Fullerton cherty silt loam, moderately steep phase	9.55-9.86	1654.28	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FcE	Fullerton cherty silt loam, steep phase	9.86-9.95	451.13	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
CmD3	Cumberland silty clay loam, severely eroded moderately steep phase	9.95-9.99	234.33	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
FcE	Fullerton cherty silt loam, steep phase	9.99-10.02	151.31	Moderate	Not rated or not available	Not prime farmland	No	> 79 inches	No	Well drained
HnC	Huntington loam, sloping phase	10.12-10.16	202.28	Slight	Not rated or not available	All areas are prime farmland	No	> 79 inches	No	Well drained
HnA	Huntington loam, nearly level phase	10.16-10.20	234.58	Slight	Not rated or not available	All areas are prime farmland	No	> 79 inches	No	Well drained
ScC	Sequatchie loam, sloping phase	10.20-10.21	64.72	Slight	Not rated or not available	All areas are prime farmland	No	> 79 inches	No	Well drained

Appendix I

Seeding and Soil Amendment Requirements Plan

Seeding and Soil Amendment Requirements Plan

Loudon Expansion Project

Following are the conservation seed mixes and typical soil amendment requirements for the Loudon Expansion Project. Prior to the application of any soil amendments, but as close to rough and/or final grading as possible soil test samples are to be taken along the right of way by representatives from Pennington Seed. Soil test samples will be submitted for laboratory analysis. One soil test sample shall consist of a minimum of 8-12 soil cores extracted from a depth of 4” – 6” and mixed together to form a representative sample of the soil composition, nutrient level, and pH for each of the designated areas. Actual fertilizer and lime application rates shall be based upon the results of the soil test as recommended by Pennington Seed upon final approval by the Company Representative.

All seed utilized during restoration of the Loudon Expansion Project is to be provided by Pennington seed via the Pennington Seed representative provided below. All seed is to be inoculated with MYCO Advantage® and Germax® (Rhizokote XL and Apron XL) seed coating by Pennington Seed, Inc. Seed shall be pre-mixed at the specified rates and inoculated by Pennington Seed, Inc, and delivered to the project in labeled bags that clearly state the manufacturer, mix percentages, purity, and germination rate of the seed.

As recommended by the USFWS, ETNG has incorporated several warm season grasses including Big Bluestem and Little Bluestem into the Loudon Expansion Project conservation seed mixes.

LOUDON EXPANSION PROJECT
SEED MIX RECOMMENDATIONS
UPLAND AREAS

Lime: Pelletized or Ag. Lime 2.0 tons/acre and Pennington Fast Acting Lime® 120 lbs/acre

Note: NeutraLime Dry® shall be applied at 80 lbs/acre in addition to the Pelletized or Ag. Lime rate above during hydro seeding operations.

Fertilizer: 750 lbs/acre 10-20-20; 500 lbs/acre (19-19-19); 500 lbs/acre (14-14-14) slow release nitrogen**

Mulch – Clean Straw Only 2.0 tons/acre (Oats, Wheat, or Rye)

Forest Mix*	**Total 180 lbs/acre**
Species	**Pounds/acre**
Durana® White Clover	10
Red Clover	5
Birdsfoot Trefoil	5
Max Q Tall Fescue	40
Perennial Ryegrass	25
Orchardgrass	25
Timothy	10
Redtop	5
Weeping Lovegrass	5
Little Bluestem	10
Big Bluestem	10
Annual Ryegrass	10
German or Brown Top Millet (April 1 - August 15)	10
Rye Grain (August 16 - March 31)	10

Pasture Mix*	**Total 155 lbs/acre**
Species	**Pounds/acre**
Durana® White Clover	5
Red Clover	5
Perennial Ryegrass	15
MaxQ Tall Fescue	25
Orchardgrass	25
Timothy	10
Kentucky Bluegrass	20
Little Bluestem	10
Big Bluestem	10
Annual Ryegrass	10
Brown Top Millet (April 1 - August 15)	10
Rye Grain (August 16 - March 31)	10

Recommended seeding dates
Spring/Summer/Fall: March - November**:**

In the event that weather conditions continue to be unfavorable and prohibit final cleanup activities (i.e. establishment of final grade, restoration of cuts and topsoil); installation of permanent erosion controls, and subsequent final seeding and mulching will begin the winter stabilization process.

WINTER STABILIZATION

Seed the ROW with 1.5 bushels (2.0 bushels in mountainous terrain) per acre of cereal rye or similar variety of rye as requested by the landowner (as necessary) when winter stabilization procedures have been implemented.

*SEED INOCULATION

All seed is to be inoculated with MYCO Advantage® and Germax® (Rhizokote XL and Apron XL) seed coating by Pennington Seed, Inc. Seed shall be pre-mixed at the specified rates and inoculated by Pennington Seed, Inc, and delivered to the project in labeled bags that clearly state the manufacturer, mix percentages, purity, and germination rate of the seed.

**FERTILIZATION

14-14-14 Slow Release Nitrogen - Must have at least 60% of Nitrogen as Slowly Available from Urea-Formalydehyde, 40% of Nitrogen from Diammonium Phosphate, 100% of Potassium as Sulfate of Potash with an added Trace Micronutrients Package

WETLAND AREAS

Do not use lime or fertilizer!

- Annual Rye (Aug 16 thru May 15) 40 lbs/acre PLS
- Foxtail/German Millet (May 16 thru Aug 15) 25 lbs/acre PLS

Appendix J

Federal Listed Species Potentially Occurring within the Loudon Expansion Project Area

Federal Listed Species Potentially Occurring within the Loudon Expansion Project Area				
Common Name/ Scientific Name	**Status (FEDERAL/STATE)**	**TN County**	**Habitat Information**	**Effects Determination**
AQUATIC INVERTEBRATES				
Anthony's riversnail (*Anthearnia anthonyi*)	LE, NEP / E	Loudon, Monroe	Found in large rivers on cobble and boulder substrate in riffle habitat. TDEC records indicate that this species was found within 4 miles of the Project area. Habitat for this species was observed during field surveys, so individuals may occur in the Project area.	May effect, but not likely to adversely affect
Appalachian monkeyface (*Quadrula sparsa*)	LE, NEP / E	Loudon, Monroe	It is usually found in fast flowing water on gravel and sandy bottoms that are low in silt content. TDEC has no records of this species occurring within four miles of the project area; habitat for this species was not observed during field surveys.	May effect, but not likely to adversely affect
Cumberland monkeyface (*Quadrula intermedia*)	LE / E	Monroe	Has a very small distribution and is only found in the Clinch, Powell, and Tellico Rivers in Virginia and Tennessee; however, it was once widespread throughout much of the Tennessee River drainage. It is presumed extirpated in Alabama. According to TDEC records this species has not been recorded within four miles of the project. No suitable habitat was observed.	No effect
Dromedary pearlymussel (*Dromus dromas*)	LE,NEP / E	Loudon, Monroe	Found in small to medium sized streams with low turbidity and is commonly found in riffles on sand or gravel substrates. TDEC has no records of this species occurring within four miles of the project area. No suitable habitat was observed.	No effect
Fanshell mussel (*Cyprogenia stegaria*)	LE / E	Loudon	It was distributed in the Ohio, Wabash, Cumberland, and Tennessee Rivers and their larger tributaries. It has been reported primarily from relatively deep water in gravelly substrate with moderate current.	May effect, but not likely to adversely affect
Finerayed pigtoe (*Fusconaia cuneolus*)	LE, NEP / E	Loudon, Monroe	Found in moderate to high gradient streams with gravel and/or cobble substrate. TDEC has no records of this species occurring within four miles of the project area. No suitable habitat was observed.	No effect

Federal Listed Species Potentially Occurring within the Loudon Expansion Project Area				
Common Name/ Scientific Name	**Status (FEDERAL/STATE)**	**TN County**	**Habitat Information**	**Effects Determination**
Orangefoot pimpleback (*Plethobasus cooperianus*)	LE / E	Loudon, Monroe	Typically found in medium to large rivers with sand and gravel substrates and can occur in both shallow riffles and deep pools with steady currents. TDEC records indicate that this species was recorded within four miles of the project area. Habitat for this species was observed during field surveys, so individuals may occur in the project area.	May effect, but not likely to adversely affect
Pink mucket (*Lampsilis abrupta*)	LE / E	Loudon, Monroe	Found buried in mud and sand in shallow riffles of major rivers and tributaries. TDEC records indicate that this species was found within one mile of the project area. Habitat for this species was observed during field surveys, so individuals may occur in the project area.	May effect, but not likely to adversely affect
Ring pink (*Obovaria retusa*)	LE / E	Loudon	Typical habitat for this mussel is shallow water with silt-free sand and gravel bottoms in rivers and streams. The ring pink was once found throughout the Ohio River system, but now only occurs in small stretched of the Tennessee, Cumberland, and Green Rivers. No suitable habitat was observed.	No effect
Sheepnose mussel (*Plethobasus cyphyus*)	LE / NL	Loudon	Sheepnose mussels live in larger rivers and streams where they are usually found in shallow areas with moderate to swift currents that flow over coarse sand and gravel. However, they have also been found in areas of mud, cobble and boulders, and in large rivers they may be found in deep runs.	May effect, but not likely to adversely affect
FISH				
Citico darter (*Etheostoma sitikuense*)	LE, NEP / E	Monroe	Habitat includes gravel, slabrock pools of runs and creeks, and rubble in moderately sized streams. Slabrock habitat is important during breeding and nesting. Threats to populations include agricultural runoff, sedimentation, and poor water quality. According to TDEC records this species has not been recorded within four miles of the project. No suitable habitat was observed in the Study Area	No effect

Federal Listed Species Potentially Occurring within the Loudon Expansion Project Area				
Common Name/ Scientific Name	**Status (FEDERAL/STATE)**	**TN County**	**Habitat Information**	**Effects Determination**
Duskytail darter (*Etheostoma percnurum*)	LE / E	Loudon, Monroe	Commonly found in gently flowing pools and runs near rocky areas. TDEC has no records of this species occurring within four miles of the project area. No suitable habitat was observed.	No effect
Laurel dace (*Chrosomus saylori*)	LE / E	Loudon, Monroe	Found beneath undercut banks or under boulders in large stream reaches with cobble/rubble substrate. TDEC has no records of this species occurring within four miles of the project area.	May effect, but not likely to adversely affect
Smoky madtom (*Noturus baileyi*)	LE, NEP / E	Monroe	Typical habitat includes clear, cool, rocky riffles, runs, and flowing pools in creeks and small streams. Madtoms are often found near boulder and cobble substrate and they often nest under large rocks in stream pools. According to TDEC records this species has not been recorded within four miles of the project. No suitable habitat was observed.	No effect
Snail darter (*Percina tanasi*)	LT / T	Loudon, Monroe	Found in shallow gravel shoals with moderate current and in deep pools of large rivers. TDEC records indicate that this species may be found within four miles of the project area.	May effect, but not likely to adversely affect
Spotfin chub (*Erimonax monachus*)	LT, NEP, PXN / T	Monroe	Found in river reaches that have gravel, boulder, and bedrock substrates. TDEC has no records of this species occurring within four miles of the project area and no habitat for this species was observed during field surveys.	No effect
Yellowfin madtom (*Noturus flavipinnis*)	LT, NEP / E	Monroe	Typical habitat includes medium to large creeks and small rivers with high water quality. This fish is most commonly found in slow pools and backwaters and very rarely found in runs. It prefers habitat with plenty of cover. According to TDEC records this species has not been recorded within four miles of the project. No suitable habitat was observed.	No effect

Federal Listed Species Potentially Occurring within the Loudon Expansion Project Area				
Common Name/ Scientific Name	**Status (FEDERAL/STATE)**	**TN County**	**Habitat Information**	**Effects Determination**
MAMMALS				
Carolina northern flying squirrel (*Glaucomys sabrinus coloratus*)	LE / E	Monroe	This squirrel can be found in tree cavities (in mature trees), leaf nests, and underground burrows. According to TDEC records, this species has not been recorded within four miles of the Project area. Consultations with the FWS Cookeville Field Office indicated that the project is below the required elevation (2,000 ft.) of this species and habitat will not be present.	No effect
Indiana bat (*Myotis sodalis*)	LE / E	Loudon, Monroe	They hibernate in caves during the winter and roost under peeling bark in the summer. Indiana bats may also be found in abandoned mines. Based upon previous communications with the TNHP, there are no records of the Indiana bat occurring within one mile of the project area. Potential summer habitat was observed during field surveys, so this species may occur in the project area.	May affect, likely to adversely affect
Northern long-eared bat (*Myotis septentrionalis*)	LT / NL	Loudon, Monroe	They hibernate in caves during the winter and roost under peeling bark in the summer. Long-eared bats may also be found in abandoned mines. Potential summer habitat was observed during field surveys, so this species may occur in the project area. Based upon previous communications with the TNHP, there are no records of the northern long-eared Bat occurring within one mile of the project area in Loudon and Monroe Counties.	May affect, likely to adversely affect

Federal Listed Species Potentially Occurring within the Loudon Expansion Project Area				
Common Name/ Scientific Name	**Status (FEDERAL/STATE)**	**TN County**	**Habitat Information**	**Effects Determination**
PLANTS				
White fringeless orchid (*Platanthera integrilabia*)	C / NL	Loudon, Monroe	Grows in boggy areas at the heads of streams and is often associated with shade and Sphagnum moss. TDEC has no records of this species occurring within four miles of the project area. No suitable habitat was observed.	No effect
NOTES: **LE**: Federal Listed Endangered; **LT**: Federal Listed Threatened; **D**: State deemed in need of management; **C:** Federal candidate; **T:** State Threatened; **E:** State Endangered; **NL**: Not Listed; **NEP**: Nonessential Experimental population; **PXN:** Proposed Experimental Population; **S**: State species of special Concern				

Appendix K

State Listed Species Potentially Occurring within the Loudon Expansion Project Area

State Listed Species Potentially Occurring within the Loudon Expansion Project Area			
Common Name/ Scientific Name	**Status**	**TN County**	**Habitat Information**
FISH			
Blue sucker (*Cycleptus elongates*)	T	Loudon, Monroe	Medium to large rivers in pool and riffle habitat and may also be found in lacustrine habitat (impoundments). It migrates upstream to riffles for spawning, so habitat with shallow riffles and cobble-bedrock substrate is important for this species. According to TDEC records, this species has been recorded within four miles of the Project area. The only large rivers or impoundments crossed by the project that are large enough to support the Blue sucker are the Tennessee River and Tellico Lake.
Blotchside logperch (*Percina burtoni*)	D	Loudon, Monroe	Streams with low turbidity and gravel-cobble substrates; Tennessee & Cumberland River watersheds. According to TDEC records, this species was recorded within four miles of the proposed project area. No suitable habitat was observed in the Study Area.
Flame chub (*Hemitremia flammea*)	D	Loudon	Springs and spring fed streams in the Tennessee and middle Cumberland River drainages with aquatic vegetation. According to TDEC records, this species has not been recorded within one mile of the Project area. No suitable habitat was observed in the Study Area.
Smoky dace (*Clinostomus funduloides* ssp.)	D	Monroe	Found in upland tributaries of the Little Tennessee River and in the Savannah River headwaters. However, distribution data is incomplete and the range may be larger than currently known. Typical habitat for the smoky dace includes streams with alternating riffles, runs, and pools and gravel-cobble substrate. According to TDEC records this species has not been recorded within four miles of the project. No suitable habitat was observed.
Tangerine darter (*Percina aurantiaca*)	D	Loudon	Large to moderate size tributaries of the Tennessee River in clear, rocky pools and riffles. According to TDEC records, this species has not been recorded within one mile of the Project area. No suitable habitat was observed in the Study Area
Tennessee Dace (*Chrosomus tennesseensis*)	D	Monroe	Only found in the upper Tennessee River drainage in Virginia and Tennessee and the extreme northwestern portion of Georgia. It is abundant in the East Fork Poplar Creek system in Tennessee. Typical habitat includes small streams of moderate gradient with alternating pools and riffles. It prefers habitat with gravel, sand, and silt bottomed pools and requires clean gravel riffles for spawning. According to TDEC records this species has not been recorded within four miles of the project. No suitable habitat was observed.

State Listed Species Potentially Occurring within the Loudon Expansion Project Area			
Common Name/ Scientific Name	**Status**	**TN County**	**Habitat Information**
Tuckasegee darter (*Etheostoma gutselli*)	E	Monroe	Found in the Headwaters of the Little Tennessee River and Tributaries to the Pigeon River. Habitat for the tuckasegee Darter includes fast rocky riffles of small rivers and creeks. No suitable habitat was observed in the Study Area for the tuckasegee darter. According to TDEC records this species has not been recorded within four miles of the project.
AMPHIBIANS			
Four-toed salamander (*Hemidactylium scutatum*)	D	Monroe	Widely distributed throughout much of the Eastern U.S. and populations are generally thought to be secure. Typical habitat for adult salamanders includes swamps, boggy streams, and wet wooded areas near ponds. Adults are typically found under objects or hiding among mosses. Eggs are laid in moss or protected sites close to pools. According to TDEC records this species has not been recorded within four miles of the project. No suitable habitat was observed.
Hellbender (*Cryptobranchus alleganiensis*)	D	Loudon, Monroe	Rocky, clear creeks and rivers with large shelter rocks. According to TDEC records, this species was recorded within four miles of the proposed project area. No suitable habitat was observed in the Study Area
Junaluska salamander (*Eurycea junaluska*)	D	Monroe	Found hidden under fallen logs, under rocks or other debris. Occasionally, they may be found active on rainy nights or in the summer. No individuals were observed during surveys. According to TDEC records, this species was not recorded within four miles of the proposed project area.
Seepage salamander (*Desmognathus aeneus*)	D	Monroe	Inhabit leaf litter or surface debris on the floors of mixed hardwood forests near small creeks, springs, and seepage areas. They also occur in damp shaded ravines. No individuals were observed during surveys. According to TDEC records, this species was not recorded within four miles of the proposed project area.
REPTILES			
Eastern slender glass lizard (*Ophisaurus attenuates longicaudus*)	D	Loudon, Monroe	Associated with grassy areas when found in urban/suburban areas and farms, and winters underground. According to TDEC records, this species has not been recorded within four miles of the Project area. Potentially suitable habitat does exist in the project area.

State Listed Species Potentially Occurring within the Loudon Expansion Project Area			
Common Name/ Scientific Name	**Status**	**TN County**	**Habitat Information**
Northern pine snake (*Pituophis melanoleucus melanoleucus*)	T	Loudon, Monroe	Found across the Southeast, but their range is patchy. They are often associated with pocket gophers and gopher tortoises. Infertile, sandy soils are important habitat for pine snakes because they dig both hibernacula and summer dens. No suitable habitat or individuals were observed during the field survey. According to TDEC records, this species has not been recorded within four miles of the Project area.
BIRDS			
Common raven (*Corvus corax*)	T	Loudon, Monroe	Has a wide distribution in the United States and Canada, though it may be locally rare in some territories. The common raven can occupy several habitats: lowlands, mountains, open country, hardwood forests, and deserts. It nests on cliff ledges, coniferous trees, or man-made structures (common structures include billboards and highway overpasses). According to TDEC records this species has not been recorded within four miles of the project. Although suitable habitat was observed in the project area, no individuals were observed.
MAMMALS			
American water shrew (*Sorex palustris*)	D	Monroe	Has a large range and is found throughout the boreal and montane regions of North America. In the northern extent of its range it is abundant and common; however, in the southern extent habitat fragmentation has resulted in unstable populations (with some populations vulnerable to extirpation). These shrews are commonly found along small streams with robust riparian corridors. They are also found near marshes, bogs, and any other wooded habitat near water. Nest sites are always in underground burrows. According to TDEC records this species has not been recorded within four miles of the project. Although suitable habitat was observed in the project area, no individuals were observed.
Cinereus shrew (*Sorex cinereus*)	D	Monroe	These shrews occupy most terrestrial habitats except for areas with little or no vegetation. Individuals prefer habitat with thick leaf litter and damp soils and nest sites are usually in burrows or above ground logs and stumps. According to TDEC records this species has not been recorded within four miles of the project. Although suitable habitat was observed in the project area, no individuals were observed.

State Listed Species Potentially Occurring within the Loudon Expansion Project Area			
Common Name/ Scientific Name	**Status**	**TN County**	**Habitat Information**
Eastern small-footed myotis (*Myotis leibii*)	D	Monroe	Habitat is mostly in mountainous or hilly areas near forests or open farmlands. Warm-season roosts may include buildings, bridges, hollow trees, and spaces beneath loose tree bark. In winter, bats hibernate in caves and mine tunnels. Foraging is typically done over ponds and streams. According to TDEC records this species has not been recorded within four miles of the project. Although suitable habitat was observed in the project area, no individuals were observed.
Long-tailed shrew (*Sorex dispar*)	D	Loudon	Found in mountainous areas in hardwood and mixed forest communities. Little is known about the long-tailed shrew due to the fact that much of its time is spent subterranean, about 1 foot deep. According to TDEC records, this species has not been recorded within four miles of the Project area. Suitable habitat does exist in the project area.
Meadow jumping mouse (*Zapus hudsonius*)	D	Monroe	Found in moist lowland habitats; prefers relatively thick vegetation of open grassy and brushy areas of marshes, meadows, swamps, and along streams. According to TDEC records, this species has not been recorded within four miles of the Project area. Habitat does exist in the project area.
Rafinesque's big-eared bat (*Corynorhinus rafinesquii*)	D	Monroe	Habitat is mostly in mountainous or hilly areas near forests or open farmlands. Warm-season roosts may include buildings, bridges, hollow trees, and spaces beneath loose tree bark. In winter, bats hibernate in caves and mine tunnels. In some southern states, these bats may also be found in cisterns and wells. Foraging is typically done over ponds and streams. According to TDEC records this species has not been recorded within four miles of the project. Although suitable habitat was observed in the project area, no individuals were observed.
Smoky shrew (*Sorex fumeus*)	D	Loudon, Monroe	Found throughout the northeastern United States and adjacent Canada, south in the Appalachian Mountains to northern Georgia, and west to central Ohio and Kentucky. It is found near streams in cool damp hardwood and mixed forest communities. Its range extends further south along the Appalachian Mountains. According to TDEC records, this species has not been recorded within four miles of the Project area. Potentially suitable habitat for the smoky shrew is present within the Study Area
Southern Appalachian woodrat (*Neotoma floridana haematoreia*)	D	Monroe	Distribution data for this species is generally unknown but the current range is thought to include Georgia, North Carolina, South Carolina, and Tennessee. The range is not thought to extend beyond the Coastal Plain. Typical habitat includes floodplains and moist hardwood forests. According to TDEC records this species has not been recorded within four miles of the project. No suitable habitat was observed.

State Listed Species Potentially Occurring within the Loudon Expansion Project Area			
Common Name/ Scientific Name	**Status**	**TN County**	**Habitat Information**
Southern bog lemming (*Synaptomys cooperi*)	D	Monroe	Common in deciduous and mixed coniferous- deciduous forests, grassy openings and edges of these forests, especially where sedges, ferns, and shrubs grow, and where the soil is loose and crumbly. It prefers to be near a wetland, bog or swamp. Potentially suitable habitat exists within the project area. According to TDEC records, this species has not been recorded within four miles of the Project area.
Southeastern shrew (*Sorex longirostris*)	D	Monroe	The southeastern shrew can occupy several habitat types ranging from bogs and damp woods to upland scrub-shrub. It seems to prefer moist or wet areas and generally resides underground or under ground cover. According to TDEC records this species has not been recorded within four miles of the project. Although suitable habitat was observed in the project area, no individuals were observed.
Star-nosed mole (*Condylura cristata*)	D	Monroe	These moles are rarely far from water and typical habitat includes wet soils in flooded plains, swamps, meadows, and other open lands. The Star-nosed mole is a proficient swimmer and diver. Tunnels differ in depth and may open at the surface or under water. Nests are usually constructed under stumps or logs and in areas near streams. According to TDEC records this species has not been recorded within four miles of the project. Although suitable habitat was observed in the project area, no individuals were observed.
Woodland jumping mouse (*Napaeozapus insignis*)	D	Monroe	Found primarily in wooded habitats. It prefers relatively cool, moist areas with dense vegetation, particularly in spruce-fir and hemlock-hardwood forests. It is often found along streams or around bogs or swamps. In the southern parts of its range, the woodland jumping mouse is often restricted to mountain peaks. According to TDEC records, this species has not been recorded within four miles of the Project area. Potential habitat does exist in the project area.
PLANTS			
Alabama grapefern (*Botrychium matricariifolium*)	T	Monroe	Alabama grapefern is found in sandy soils in woodlands and meadows. Although suitable habitat for this species was observed, no individuals were observed. According to TDEC records this species has not been recorded within four miles of the project
American barberry (*Berberis canadensis*)	S	Loudon	Found in rocky woods and on river bars. According to TDEC records, this species was recorded within one mile of the proposed project area. Only a limited amount of suitable open wood habitat was observed during the field survey.

State Listed Species Potentially Occurring within the Loudon Expansion Project Area			
Common Name/ Scientific Name	**Status**	**TN County**	**Habitat Information**
American ginseng (*Panax quinquefolius*)	S-CE	Monroe	American Ginseng in an herbaceous perennial found in hardwood forests, forest edges, and forested wetlands. Although suitable habitat for this species was observed, no individuals were observed. According to TDEC records this species has not been recorded within four miles of the project.
Appalachian bugbane (*Cimicifuga rubifolia*)	T	Monroe	Typical habitat for this perennial forb includes north facing slopes on talus and rocky soils high in calcium. Appalachian bugbane also occurs in rich, damp, mixed mesic forests. No suitable habitat was observed. According to TDEC records this species has not been recorded within four miles of the project.
Appalachian waterleaf (*Hydrophyllum virginianum*)	T	Monroe	Although it is common, land use conversion and habitat fragmentation may threaten some populations. Typical habitat includes forests, shady floodplains, and clearings. Although suitable habitat was observed in the project area, no individuals were observed. According to TDEC records this species has not been recorded within four miles of the project.
Ash-leaved bush-pea (*Thermopsis fraxinifolia*)	T	Monroe	This perennial forb is a Southern Appalachian endemic and is only found in Tennessee, North Carolina, South Carolina, Georgia, and Alabama. Only three to five occurrences are known in Tennessee. Typical habitat includes dry slopes and ridges. Although suitable habitat was observed in the project area, no individuals were observed. According to TDEC records this species has not been recorded within four miles of the project.
Blue ridge St. John's-wort (*Hypericum mitchellianum*)	T	Monroe	Perennial forb that grows in upland grassy balds, grassy openings, forests, and seepages. Although suitable habitat for this species was observed, no individuals were observed. According to TDEC records this species has not been recorded within four miles of the project.
Branching whitlow-grass (*Draba ramosissima*)	S	Monroe	Branching whitlow-grass is a perennial forb that grows on limestone cliffs and outcrops, shale barrens, and rocky wooded areas. No suitable habitat was observed in the Study Area. According to TDEC records this species has not been recorded within four miles of the project.
Bristle-fern (*Trichomanes boschianum*)	T	Monroe	It is a perennial forb that grows on rocky seeps and is considered a wetland plant. No suitable habitat was observed in the Study Area. According to TDEC records this species has not been recorded within four miles of the project.

State Listed Species Potentially Occurring within the Loudon Expansion Project Area			
Common Name/ Scientific Name	**Status**	**TN County**	**Habitat Information**
Bristly sedge (*Carex comosa*)	T	Monroe	It is found throughout the United States and Canada, though altered hydrologic regimes and habitat loss are threats to populations. Typical habitat includes marshes, lakeshores, and wet meadows. Although suitable habitat was observed in the project area, no individuals were observed. According to TDEC records this species has not been recorded within four miles of the project.
Broadleaf bunchflower (*Melanthium latifolium*)	E	Monroe	Flowers during the summer and grows in mesic to dry, rocky, wooded slopes. Dry wooded slopes were observed during field surveys, but no individuals were observed. According to TDEC records this species has not been recorded within four miles of the project.
Broad-leaved tickseed (*Coreopsis latifolia*)	E	Monroe	Broad-leaved tickseed is a perennial forb that grows on shaded slopes in wooded areas. Although suitable habitat for this species was observed, no individuals were observed. According to TDEC records this species has not been recorded within four miles of the project.
Butternut (*Juglans cinerea*)	T	Monroe	This perennial tree is found throughout the mid-western and eastern United States. Typical habitat includes mixed woodlands, ravines, slopes, bottomlands, and floodplain forests. In Tennessee it is associated with creek bottoms and mesic forests. Although suitable habitat was observed in the project area, no individuals were observed. According to TDEC records this species has not been recorded within four miles of the project.
Canada frostweed (*Helianthemum canadense*)	E	Monroe	Perennial forb found on dry, open ridges. Although suitable habitat for this species was observed, no individuals were observed. According to TDEC records this species has not been recorded within four miles of the project.
Canada lily (*Lilium canadense*)	T	Monroe	Found throughout the eastern United States and Canada. The Canada lily is a perennial forb that flowers in the summer and typically grows in wet meadows, bogs, marshes, swamps, and along wet roadsides and railroads. No suitable habitat was observed. According to TDEC records this species has not been recorded within four miles of the project.
Carolina mnium (*Plagiomnium carolinianum*)	S	Monroe	Carolina mnium is a nonvascular moss that grows in shaded, wet habitat and is commonly found in seepage areas. No suitable habitat was observed in the Study Area. According to TDEC records this species has not been recorded within four miles of the project

State Listed Species Potentially Occurring within the Loudon Expansion Project Area			
Common Name/ Scientific Name	**Status**	**TN County**	**Habitat Information**
Chamomile grapefern (*Botrychium matricariifolium*)	S	Monroe	Upland plant found in sandy soils in woodlands and meadows. Although suitable habitat for this species was observed, no individuals were observed. According to TDEC records this species has not been recorded within four miles of the project.
Choke cherry (*Prunus virginiana*)	S	Monroe	Typical habitat includes moist woods, stream banks, prairie hillsides, and roadsides. It is a shade tolerant plant and can adapt to several different growing conditions. Although suitable habitat was observed in the project area, no individuals were observed. According to TDEC records this species has not been recorded within four miles of the project.
Climbing fumitory (*Adlumia fungosa*)	T	Monroe	It flowers in summer and early fall. Typical habitat includes moist coves, rocky woods, ledges, alluvial slopes, and thickets. Although suitable habitat was observed in the project area, no individuals were observed. According to TDEC records this species has not been recorded within four miles of the project.
Clingman's hedge-nettle (*Stachys clingmanii*)	T	Monroe	Typical habitat includes forest edges, hardwood forests, grasslands, forest meadows, and boulderfields. Soils associated with this plant are often calcareous. Although suitable habitat was observed in the project area, no individuals were observed. According to TDEC records this species has not been recorded within four miles of the project.
Cow-parsnip (*Heracleum maximum*)	S	Monroe	This is a tall perennial herb (the largest species of the carrot family found in North America), that grows in moist, partially shaded habitat up to 2,700 m in elevation. No suitable habitat was observed in the Study Area. According to TDEC records this species has not been recorded within four miles of the project.
Dwarf filmy-fern (*Trichomanes petersii*)	T	Monroe	This plant is found growing on tree trunks and on noncalcerous rocks in deep gorges. They have a growth pattern similar to bryophytes and will often form dense mats which prevent other vegetation from growing. Although suitable habitat for this species was observed, no individuals were observed. According to TDEC records this species has not been recorded within four miles of the project.
Eastern turkeybeard (*Xerophyllum asphodeloides*)	T	Monroe	Eastern turkeybeard occurs in dry oak-hickory woods, mountain woods, and in sandy pine lowlands. Although suitable habitat for this species was observed, no individuals were observed. According to TDEC records this species has not been recorded within four miles of the project.

State Listed Species Potentially Occurring within the Loudon Expansion Project Area			
Common Name/ Scientific Name	**Status**	**TN County**	**Habitat Information**
Fowl bluegrass (*Poa palustris*)	E	Monroe	Perennial grass found in marshes, meadows, fields, swamps, and along wetland edges. Although usually found it wetlands it may occasionally be found in upland habitat. Although suitable habitat for this species was observed, no individuals were observed. According to TDEC records this species has not been recorded within four miles of the project.
Fraser fir (*Abies fraseri*)	T	Monroe	It is endemic to some of the Southern Appalachian region, but not native to West Virginia or Georgia. It is threatened over its limited range due to the balsam woolly adelgid, a parasite that causes mortality in adult fir trees. Habitat alteration by logging has also decreased fir populations. It is typically found on high elevation peaks (>1500 m) and on exposed high elevation ridges. No suitable habitat was observed. According to TDEC records this species has not been recorded within four miles of the project.
Fraser's sedge (*Cymophyllus fraserianus*)	S	Monroe	Fraser's sedge fruits in early summer and is typically found on mesic slopes and shaded banks in deciduous forests. Although suitable habitat was observed in the project area, no individuals were observed. According to TDEC records this species has not been recorded within four miles of the project.
Hiwassee quillwort (*Isoetes tennesseensis*)	E	Monroe	Obligate aquatic species and individuals are constantly submerged. According to TDEC records, this species has been recorded within four miles of the Project area
Horse-sugar (*Symplocos tinctoria*)	S	Monroe	Typical habitat includes mixed-deciduous hardwood forests, dry pine-oak woods, rocky summits, ravines, wet pine barrens, and bottomlands. Although suitable habitat was observed in the project area, no individuals were observed. According to TDEC records this species has not been recorded within four miles of the project.
Large-leaf pondweed (*Potamogeton amplifolius*)	T	Loudon, Monroe	Obligate aquatic species found in lakes and streams. According to TDEC records, this species has been recorded within four miles of the Project area. Any potential populations in the Tennessee River or Tellico Lake will be avoided since HDD crossing methods will be used.
Liverwort species (*Pellia appalachiana*)	S	Monroe	It is commonly found on soil along shaded creek banks but it may occur on several different damp habitats. No suitable habitat was observed in the Study Area. According to TDEC records this species has not been recorded within four miles of the project
Liverwort species (*Lophocolea appalachiana*)	S	Monroe	It occurs on wet noncalcerous rock in deeply shaded montane habitat. No suitable habitat was observed in the Study Area. According to TDEC records this species has not been recorded within four miles of the project

State Listed Species Potentially Occurring within the Loudon Expansion Project Area			
Common Name/ Scientific Name	**Status**	**TN County**	**Habitat Information**
Liverwort species (*Jungermannia fossombronioides*)	S	Monroe	Found in moist habitats. Although suitable habitat for this species was observed, no individuals were observed. According to TDEC records this species has not been recorded within four miles of the project.
Appalachian Threadwort (*Drepanolejeunea appalachiana*)	S	Monroe	Only found in habitat near water and grows mostly on tree bark. Although suitable habitat for this species was observed, no individuals were observed. According to TDEC records this species has not been recorded within four miles of the project.
Marsh pea (*Lathyrus palustris*)	S	Monroe	This perennial vine is widely distributed throughout the United States and Canada though it is rarer in the Appalachian region due to land use conversion and habitat fragmentation. Typical habitat includes wet meadows and marshes. No suitable habitat was observed. According to TDEC records this species has not been recorded within four miles of the project.
Manhart's sedge (*Carex manhartii*)	E	Monroe	Typical habitat includes moist sites that are not associated with limestone, steep slopes, stream banks, and mesic hardwood forests. Although suitable habitat was observed in the project area, no individuals were observed. According to TDEC records this species has not been recorded within four miles of the project.
Megaceros (*Megaceros aenigmaticus*)	S	Monroe	Typically found in forested wetlands and required shaded rocks in streams, springs or waterfall spray zones. No suitable habitat was observed. According to TDEC records this species has not been recorded within four miles of the project.
Minniebush (*Menziesia pilosa*)	S	Monroe	Only found in Pennsylvania, Maryland, West Virginia, North Carolina, Tennessee, and Georgia. Although it can be common at higher elevations, overall it is a rare plant. This plant flowers during May-July and is typically found in bogs, rocky woodlands, and mountains. No suitable habitat was observed. According to TDEC records this species has not been recorded within four miles of the project.
Mountain bittercress (*Cardamine clematitis)*	T	Monroe	Mountain bittercress is a perennial forb commonly found in wet habitats such as springs and moist slopes. No suitable habitat was observed in the Study Area. According to TDEC records this species has not been recorded within four miles of the project.
Mountain honeysuckle (*Lonicera dioica*)	S	Loudon	Mountain woods and thickets. Habitat potentially suitable for mountain honeysuckle is present within the Study Area, but no individuals were observed during the field surveys. According to TDEC records, this species was recorded within one mile of the proposed project area.

State Listed Species Potentially Occurring within the Loudon Expansion Project Area			
Common Name/ Scientific Name	**Status**	**TN County**	**Habitat Information**
Northern mannagrass (*Glyceria laxa*)	S	Monroe	This is a perennial wetland plant species commonly found near ponds and in bogs. No suitable habitat was observed in the project area. According to TDEC records this species has not been recorded within four miles of the project.
Nuttall's pondweed (*Potamogeton epihydrus*)	S	Loudon, Monroe	Submerged obligate perennial herb found in lakes and streams. No individuals were observed during the field survey. According to TDEC records, this species has been recorded within four miles of the Project area.
Plains frostweed (*Helianthemum bicknelli*)	E	Monroe	Perennial forb found on dry, open ridges. Although suitable habitat for this species was observed, no individuals were observed. According to TDEC records this species has not been recorded within four miles of the project.
Porter's reedgrass (*Calamagrostis porter*)	E	Monroe	Its range extends north and east to Ohio and New York, south to Georgia and west to Arkansas (though this species may be extirpated in Arkansas). This perennial grass is an upland plant found in woodlands. Although suitable habitat for this species was observed, no individuals were observed. According to TDEC records this species has not been recorded within four miles of the project.
Ramp (*Allium tricoccum*)	S-CE	Monroe	Typically occurs in deciduous upland woods and floodplain woods. It grows best in habitats with little shade. Although suitable habitat was observed in the project area, no individuals were observed. According to TDEC records this species has not been recorded within four miles of the project.
Rosy twisted-stalk (*Streptopus roseus*)	S	Monroe	Found in upland mountain woods. Although suitable habitat for this species was observed, no individuals were observed. According to TDEC records this species has not been recorded within four miles of the Project.
Ruth's sedge (*Carex ruthii*)	T	Monroe	Although it is widespread within its range, losses of wetland habitat and wetland alteration threaten populations. Typical habitat includes seepage areas in hardwood forests and open wet fields. No suitable habitat was observed. According to TDEC records this species has not been recorded within four miles of the project.
Schreber's aster (*Eurybia schreberi*)	S	Loudon	Found in mesic woods and on seepage slopes. According to TDEC records, this species has not been recorded within four miles of the Project area. No individuals were observed during the field surveys; however, oak species associated with Schreber's aster were observed.

State Listed Species Potentially Occurring within the Loudon Expansion Project Area			
Common Name/ Scientific Name	**Status**	**TN County**	**Habitat Information**
Small purple fringed orchid (*Platanthera psycodes*)	S	Monroe	Perennial forb found in sandy soils in woodlands, fields, wet meadows, swamps, and marshes. No suitable habitat was observed in the Study Area. According to TDEC records this species has not been recorded within four miles of the project.
Southern lobelia (*Lobelia amoena*)	T	Monroe	Perennial forb found in wet mountain floodplains, seepage slopes, marshes and pools. No suitable habitat was observed in the Study Area. According to TDEC records this species has not been recorded within four miles of the project.
Spreading false-foxglove (*Aureolaria patula*)	S	Loudon, Monroe	Oak woods and edges. No suitable habitat was observed during surveys. According to TDEC records, this species was recorded within one mile of the proposed project area.
Sweet pinesap (*Monotropsis odorata*)	T	Monroe	Sweet pinesap is a perennial forb with a narrow distribution and specific criteria for growing conditions. These conditions include leaf litter depth, light amount and soil moisture content. Its current range includes the mid-Atlantic coastal states from Delaware down south to Florida and Kentucky and Tennessee. It flowers in late spring and early summer and is typically found in mixed deciduous or coniferous forests. Although suitable habitat was observed in the project area, no individuals were observed. According to TDEC records this species has not been recorded within four miles of the project.
Tennessee pondweed (*Potamogeton tennesseensis*)	T	Monroe	It is a perennial forb that grows in slow streams. Although suitable habitat for this species was observed, no individuals were observed. According to TDEC records this species has not been recorded within four miles of the project.
Watauga porella (*Porella wataugensis*	T	Monroe	Found on shaded rocks near water. No suitable habitat was observed in the Study Area. According to TDEC records this species has not been recorded within four miles of the project

NOTES: **D**, Tennessee State Deemed in Need of Management; **T,** Tennessee State Threatened; **E,** Tennessee State Endangered **S,** Tennessee State Species of Special Concern; **S-CE,** Species of Special Concern- Commercially Exploited

Appendix L

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APPENDIX L
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Appendix M

List of Preparers

APPENDIX M
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