APPENDIX D – STREAM CROSSINGS AND CONSTRUCTION PROCEDURES FOR PIPELINE

TVA anticipates construction activity to begin during Summer of 2002. The proposed facilities would be designed and constructed in accordance with the U.S. Department of Transportation (DOT) regulation 49 CFR 192, *Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards*; 18 CFR 2.69, *Guidelines to be Followed by Natural Gas Pipeline Companies in the Planning, Clearing, and Maintenance of Rights of Way and the Construction of Above Ground Facilities*.

The gas pipeline would be buried in accordance with DOT standards, which would result in a minimum 3 feet of cover over the pipeline. This depth provides security from pipeline failure that otherwise might result from the crossing of surface equipment (e.g., tractors, heavy equipment, etc.).

Construction in upland areas and next to streambeds would use measures in accordance with TVA's *Environmental Protection and Best Management Practices Guidelines for the Construction and Maintenance of Natural Gas Pipelines* (May 2000). All vegetation removed within the pipeline 50-foot ROW and temporary construction workspace would be cleared by chainsaws and bulldozers. The logs would be sold when possible and the stumps ground where practical. If this method of disposal would not be practical, the trees and stumps would be burned under a state-burning permit. After clearing, trenching equipment and pipe sections would be brought in, and the trench would be dug. The spoil would be placed on one side of the ditch, and the pipe would be welded and prepared for placement in the trench. The pipe welds would be X-rayed and evaluated. The pipe would then be placed in the trench, backfilled, compacted, and hydrostatically tested. The surface would be prepared for revegetation, seeded and mulched (Muncy 1992:107-140).

Prior to earth disturbance in the ROW, a crew would install erosion control devices, such as silt fences and temporary slope breakers (FERC, 1997). The method used to excavate the ditch would depend on soil conditions encountered. TVA expects to use a combination of backhoes and trenching machines, supplemented where required by mechanical rippers and excavators. The constructed trench would be approximately 3-feet wide and 5-feet deep.

Potential Transportation and Stream Crossings

Several roads and streams would be crossed by the proposed pipeline. The types of crossing for each of the roads were considered based on the traffic load, the quality of the road, and the ability to reroute traffic. Listed in Tables 1 and 2 are methods used in crossing roads and streams.

Name	Owner	Surface	Method of Crossing
Fiske Road	Roane County Road	Asphalt	Horizontal Bore
Swan Pond Circle N	Roane County Road	Asphalt	Horizontal Bore
Swan Pond Circle S	Roane County Road	Asphalt	Directional Drill (Included in water crossing)
Plant Entrance Road	TVA	Asphalt	Horizontal Bore
Plant Interior Road	TVA	Asphalt	Open Cut

River/Stream	Method of Crossing*
1. Emory River	Directional Drill
2. Unnamed tributary of Swan Pond	Open Cut
3. Swan Pond	Directional Drill
TOTALS	3

*In most cases, the flume crossing technique would be used where water is present; where water is not present, the dry stream crossing technique would be used.

Open Cut Road Crossing Technique

One of the KIF plant roads would be crossed using the open cut technique. The roadway would be trenched and the pipe installed. The trench would then be backfilled, compacted, and the road resurfaced to the original conditions. The pipeline trench would be bridged or traffic would be rerouted to limit disruption of travel.

Bore Crossing Technique

The bore crossing technique is a nonintrusive crossing technique for narrow water bodies as well as for roads and railroads. In this technique, both an entry pit and exit pit would be excavated. At the entry a hydraulic ram would be used to form a straight bore hole beneath the stream channel, road, or railroad to the exit pit. The bore hole may be cased and the pipeline then placed within the casing.

For road and railroad crossings where the entry and exit pits are not within 50 feet of a surface water body, upland erosion control measures would be used to
limit erosion and storm water transport of sediment from the entry and exit pits, as well as from the excavation spoils to surface water.

For stream crossings, prerequisites to excavation of the entry pit and exit pit would include:

1. Location of the entry pit and exit pit far enough from the stream bank and at a sufficient elevation to avoid inundation by storm flow stream levels and to minimize excessive migration of groundwater into the entry pit or exit pit.
2. Isolation of the proposed excavation for the entry pit and exit pit from the surface water by the use of silt fencing to avoid sediment transport by storm water.
3. Isolation of the spoils storage resulting from excavation of the entry pit by the use of silt fencing to avoid sediment transport by storm water.

Immediately upon completion of the bore, the following would be promptly undertaken and completed: proper disposal of excess spoils; backfilling and restoring the original contour of the entry pit and exit pit; then revegetation (Muncy 1992:111-140).

<u>Directional Drill Road Crossing Technique</u>

The south loop of Swan Pond Circle would be included in the directional drill of Swan Pond due to its close proximity to the water's edge.

<u>Railroad Crossing Technique</u>

The railroad, a spur line within the KIF plant property, would be crossed with a horizontal bore.

<u>Major Waterbody Crossing Technique</u>

The proposed route would cross the Emery River and Swan Pond in two separate locations during the installation of the 6" natural gas pipeline. The crossing of Emory River would be South of the proposed meter station and would be approximately 600 feet across. The crossing of Swan Pond would be North of the KIF plant and measures approximately 600 feet across.

Horizontal Directional Drilling (HDD) technology will be utilized to install the 6” natural gas pipeline under the riverbed. The pipe will be welded together and strung out ready to be pulled under the water body. After the hole is drilled, the 6” pipeline is pulled through the annulus under the river from one riverbank to the other side in one piece.

<u>Flume Stream Crossing Technique</u>

Where the pipeline crosses flowing streams, the flume stream crossing technique would be used. Prerequisites for construction of a flume crossing include:

1. Construction of an equipment crossing structure, if needed, either up or downstream of the proposed flume crossing would be in accordance with TVA’s *Environmental*

Protection and Best Management Practices Guidelines for the Construction and Maintenance of Natural Gas Pipelines (May 2000).

2. Construction of sandbag trench plugs upland of each stream bank in the pipeline trench to prevent storm water sediment transport from the upland trenches into the stream.
3. Installation of silt fences parallel to both stream banks and greater than 10 feet upland from the stream bank. These silt fences would be positioned to the extent necessary to isolate streamside disturbances, including spoil piles, from the stream.

In the flume crossing technique, the following construction steps would be implemented:

1. Flume pipe(s) would be installed in the streambed and aligned with the stream flow. These flume pipe(s) would be sized to pass a flow equal to 150 percent of existing flow to account for minor storm events.
2. A temporary dam would be built across the stream near the upstream end of the flume pipes. This diversion structure would direct all stream flow through the flume pipe(s). The dam would consist of clean rock fill or sand bags, both with plastic sheeting as necessary to reduce leakage through the dam.
3. The flume system would remain in place for all streambed trenching, pipe placement, bedding, and backfill. The backfill would be capped at original stream contour with local stream substrate removed during excavation or equivalent stone fill.
4. The flume system would be removed prior to reseeding of stream bank/streamside areas and prior to removal of other streamside protection measures (i.e., silt-fences).

Typically, the diversion of a stream through a flume crossing system would not exceed three days from start of construction through the removal of the flume. The intent of this time constraint is to minimize the risk of a storm event washing out the diversion structures or over-topping the diversion structures, resulting in the uncontrolled transport of sediment from the unprotected excavation to potentially sensitive perennial stream reaches downstream of the crossing. An equipment crossing bridge could be left in place for a longer period, if necessary for access to other parts of the construction corridor or if the stream-crossing schedule was delayed.

In the area between the silt fences and the stream, stream bank restoration to original contour and revegetation would be completed prior to removal of the crossing that would restore flow to the stream channel. Additionally, any conditions of COE permits and/or state permits would be followed. In this same area, streamside revegetation efforts should begin no later than at the time of the removal of the crossing. Prior to removal of the streamside silt fences, the appropriate revegetation by reseeding and mulching would be completed in the areas upland of the silt fences (Muncy 1992:111-140).

Unwatering of trenches and other work areas needs to be accomplished using BMPs to prevent sediment from reaching surface waters. Suggested BMPs include filter bags, basins, or other similar devices.

<u>Dry Stream Crossing Technique</u>

A stream without flow or a wet weather conveyance without flow at the time of the crossing would be crossed using the Dry Stream Crossing. The trench would be excavated using upland equipment and techniques. Special stream bank/streamside protection would not be necessary, with the exception of pipeline trench plugs which would be installed in the approach trenches (measures for erosion control described in TVA's *Environmental Protection and Best Management Practices Guidelines for the Construction and Maintenance of Natural Gas Pipelines* (May 2000), and figures in Appendix 2 would be adequate otherwise). However, the duration of use of a dry-stream crossing during normal conditions should not exceed two days from the start of construction of the crossing to completion. The intent of this time constraint is to avoid storm event sediment transport from the unprotected excavation to potentially sensitive perennial stream reaches downstream of the crossing. Restoration of stream banks to original contour and revegetation according to TVA's *Environmental Protection and Best Management Practices Guidelines for the Construction and Maintenance of Natural Gas Pipelines* (May 2000) would be promptly undertaken and completed.

Pipeline Reliability and Safety

All facilities proposed for the pipeline would be designed and constructed in accordance with DOT *Minimum Federal Safety Standards* as outlined in 49 C.F.R. Part 192. The proposed pipeline would be inspected annually to investigate for signs of failed pipe integrity. Any unusual situation or condition would be investigated immediately. Leak surveys are instrumental in early detection of leaks and can reduce the likelihood for pipeline failure.

The proposed pipeline would include features designed to increase overall safety and protect the public from potential failure. Such features may include but are not limited to: 100 percent X-rays on pipe welds, X-ray records maintained as long as pipe is in service, multiple intermediate emergency shut-off valves, overpressure vents, warning signs to discourage digging, and automatic shutoff valves at each end of the pipeline that close in the event of over/under pressure conditions.

There are potential hazards associated with natural gas, the primary component of which is methane, an odorless, colorless, and tasteless material. The fact that natural gas is lighter than air and would ascend into the atmosphere and not settle at ground level as does propane, reduces the potential for explosion. Natural gas is not toxic but is classified as a simple asphyxiate, possessing only a slight inhalation hazard. If breathed in high concentrations, resulting oxygen deficiency can result in serious injury or death.

TVA would operate and maintain the pipeline in a manner generally consistent with 49 C.F.R. Part 192 (minor variances that would not compromise safety occasionally may be appropriate given TVA's Federal agency status). In addition to the DOT standards, certain TVA standards, procedures, and specifications would be followed to help assure pipeline safety. Before placing the pipeline in service, TVA would prepare a procedural manual for operation and maintenance. An Emergency Plan with written procedures to minimize the hazards from a natural gas pipeline emergency also would be prepared. Some key elements of the plan would include procedures for:

1. Identifying and classifying emergency events—gas leaks, fires, explosions, and natural disasters.
2. Establishing and maintaining communications with local fire, police, and public officials, and coordinating emergency response.

3. Making personnel, equipment, tools, and materials available at the scene of an emergency.
4. Protecting people first and property second, and making them safe from actual or potential hazards.
5. Implementing emergency shutdown of system and safely restoring service.

Cathodic protection systems would be installed along the pipeline to mitigate pipeline corrosion. On unprotected pipelines, corrosion can be a major source of pipeline failure. The cathodic protection system imparts a current to the pipeline to offset natural soil and moisture corrosion potential. Cathodic protection systems would be inspected to ensure proper operating conditions for corrosion mitigation.

In summary, design criteria for safety would include but not be limited to the following.

- Inspected annually.
- X-rayed at welds to ensure integrity.
- Covered with no less than 3 feet of backfill, to meet cover requirements.
- Place surface markers to designate buried line.
- Develop emergency procedure in the event of failure.
- Install an emergency shutdown system.

With these measures and adherence to federal design and construction standards, potential hazards associated with the operation of the proposed pipeline would be minimal.

Hydrostatic Testing of the Pipe

Hydrostatic testing would be conducted prior to the pipeline being placed in service upon completion of the pipeline. Approximately 42,000 gallons of water would be required to hydrostatically test the pipeline. The final hydrostatic test discharge would be of a 2 hour duration and discharged through appropriate structures to minimize potential impacts to receiving stream, surrounding area, and bank surfaces. The test water would contain no chemical additives, and no chemicals would be used to dry the pipeline following the test. At the time of this test, the pipe would be new and uncontaminated, minimizing possible impacts to the receiving water.

Potential sources for hydrostatic test water would be from the KIF plant facilities or Swan Pond. In the event hydrostatic test water is needed at a remote location, it would be withdrawn from nearby sources and trucked to the site to be used for hydrostatic testing. Use of water from Swan Pond or other small creeks along the route would be determined by evaluating the amount of flow at the time of construction. Withdrawal of water from small streams, especially during low-flow periods, would be done at a rate such that the wetted surface is not changed. TVA would minimize the potential impact by limiting the withdrawals to less than 20 percent of existing flow, so that no significant change to wetted surface of streams occurs. In addition, no withdrawal would be allowed to reduce the flow in a stream below its calculated September median flow.

Test water would be discharged through a discharge structure to prevent erosion of the stream banks. In extreme cases where the local drainage could not support the discharge volume, the water would be trucked back to the site and released there in a controlled manner. Any installed discharge structures would be removed when all testing is complete.