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DRAFT ENVIRONMENTAL ASSESSMENT

# INSTALLATION OF FLUE GAS DESULFURIZATION SYSTEM ON COLBERT FOSSIL PLANT UNIT 5

**Colbert County, Alabama**

TENNESSEE VALLEY AUTHORITY

FEBRUARY 2004

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**Draft Environmental Assessment** **February 2004**

**Proposed project:** Installation of Flue Gas Desulfurization (Scrubber) System on Colbert Fossil Plant Unit 5
Colbert County, Alabama

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**Abstract:** The Tennessee Valley Authority (TVA) has prepared a Draft Environmental Assessment (DEA) of a proposal to reduce sulfur dioxide ($SO_2$) emissions from Unit 5 at Colbert Fossil Plant (COF) by installing flue gas desulfurization equipment that employs the wet limestone forced oxidation technology. TVA needs to reduce $SO_2$ emissions at COF to meet requirements under the 1990 Clean Air Act amendments. This DEA considers the impacts of the No Action Alternative and several Action Alternatives.

Issue areas identified in scoping of potential environmental impacts and subsequently analyzed in the EA were air quality; vegetation, wildlife, and natural areas; protected and sensitive species; wetlands and floodplains; land use, visual aesthetics, and noise; cultural resources; coal combustion byproduct generation, handling, and disposal; surface water and wastewater; groundwater quality; aquatic ecology; socioeconomics; and transportation.

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# CONTENTS

**1. PURPOSE, NEED, BACKGROUND, AND SCOPING ..... 1**

1.1. Purpose and Need for the Proposed Action ..... 1
1.2. Background ..... 1
1.3. The Scoping Process ..... 6
1.4. Related National Environmental Policy Act (NEPA) Documents ..... 7
1.5. Public and Agency Involvement ..... 7

**2. ALTERNATIVES INCLUDING THE PROPOSED ACTION ..... 9**

2.1. The Proposed Action ..... 9
2.1.1. The Absorber ..... 10
2.1.2. The Limestone Reagent Preparation System ..... 13
2.1.3. Limestone Purchase and Transport ..... 13
2.1.4. Gypsum Slurry Dewatering, Transfer, and Storage System ..... 17
2.1.5. Utility Connections and Laydown Areas ..... 23
2.1.6. Staffing and Workforce Management ..... 27
2.2. Alternatives to the Proposed Action ..... 28
2.3. Comparison of Alternatives ..... 28
2.4. Summary of TVA Commitments and Proposed Mitigation Measures ..... 31
2.5. Environmental Permits and Applicable Regulations ..... 31

**3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES ..... 33**

3.1. Air Quality ..... 33
3.1.1. Affected Environment ..... 33
3.1.2. Environmental Consequences ..... 36
3.2. Surface Water and Wastewater ..... 40
3.2.1. Affected Environment and Existing Wastewater Treatment Systems ..... 40
3.2.2. Environmental Consequences ..... 44
3.3. Solid and Hazardous Waste and Gypsum Marketing ..... 47
3.3.1. Affected Environment ..... 47
3.3.2. Environmental Consequences ..... 48
3.4. Aquatic Ecology ..... 50
3.4.1. Affected Environment ..... 50
3.4.2. Environmental Consequences ..... 52
3.5. Managed Areas and Ecologically Significant Sites ..... 52
3.5.1. Affected Environment ..... 52
3.5.2. Environmental Consequences ..... 53
3.6. Transportation ..... 53
3.6.1. Affected Environment ..... 53
3.6.2. Environmental Consequences ..... 54
3.7. Visual Resources ..... 55
3.7.1. Affected Environment ..... 55
3.7.2 Environmental Consequences ..... 55
3.8. Terrestrial Ecology Plants and Animals ..... 57
3.8.1. Affected Environment ..... 57

3.8.2. Environmental Consequences ..... 58
3.9. Protected and Sensitive Species ..... 58
3.9.1. Affected Environment ..... 58
3.9.2. Environmental Consequences ..... 62
3.10. Groundwater ..... 63
3.10.1. Affected Environment ..... 63
3.10.2. Environmental Consequences ..... 64
3.11. Wetlands ..... 67
3.11.1. Affected Environment ..... 67
3.11.2. Environmental Consequences ..... 69
3.12. Socioeconomics ..... 71
3.12.1. Affected Environment ..... 71
3.12.2. Environmental Consequences ..... 72
3.13. Noise ..... 73
3.13.1. Affected Environment ..... 73
3.13.2. Environmental Consequences ..... 74
3.14. Cultural Resources ..... 76
3.14.1. Affected Environment ..... 76
3.14.2. Environmental Consequences ..... 77

**4. LIST OF PREPARERS ..... 79**

**5. LIST OF AGENCIES AND PERSONS CONSULTED ..... 81**

**6. SUPPORTING INFORMATION ..... 83**

6.1. Literature Cited ..... 83
6.2. Acronyms, Symbols, and Abbreviations ..... 84

# LIST OF APPENDICES

APPENDIX A - FGD TECHNOLOGIES AND RATIONALE FOR SCREENING AND SELECTION OF TECHNOLOGIES FOR COLBERT FOSSIL PLANT UNIT 5

APPENDIX B - PROJECT DRAWINGS AND DIAGRAMS

APPENDIX C - DETAILS OF NOISE ASSESSMENT CALCULATIONS

APPENDIX D - COF U5 FGD COOLING AND PROCESS WATER SUPPLY OPTIONS

APPENDIX E - WETLAND DETERMINATION DATA FORMS

# LIST OF TABLES


Table 2-1. Typical Process Water Balance ..... 23

Table 2-2. Projected Operating Power Demand ..... 25

Table 2-3. Summary and Comparison of Alternatives By Resource Area ..... 28

Table 3-1. National Ambient Air Quality Standards ..... 34

Table 3-2. Ambient Concentrations of Criteria Air Pollutants Near COF Compared With Air Quality Standards ..... 35

Table 3-3. Stack Locations and Physical Dimensions for Each Modeling Case ..... 38

Table 3-4. $SO_2$ Emissions Used in Modeling ..... 38

Table 3-5. $SO_2$ Modeling Results ..... 39

Table 3-6. Flow Sources From Ash Pond 5 ..... 43

Table 3-7. Inflow Sources to Ash Pond 4 ..... 43

Table 3-8. DSN 001 and DSN 001b Discharge Requirements ..... 44

Table 3-9. Average Annual Daily Traffic Counts* ..... 53

Table 3-10. State-Listed Plant Species Reported From Within Five Miles of COF, and Federally Listed Plant Species Reported in Colbert County and Limestone County, Alabama ..... 59

Table 3-11. Federally Protected Terrestrial Animals Known From the Vicinity of Colbert Fossil Plant ..... 59

Table 3-12. State- and Federally Listed Aquatic Animal Species Reported From the Tennessee River (Pickwick Reservoir) and its Tributaries Downstream of Colbert Fossil Plant ..... 60

Table 3-13. State- and Federally Listed Aquatic Animal Species Reported From the Tennessee River (Wilson Reservoir Tailwater) and its Tributaries Upstream of COF ..... 61

Table 3-14. Well Inventory in Plant Vicinity ..... 64

Table 3-15. Estimated COC Concentration Increases in Tennessee River Due to Gypsum Leachate Seepage ..... 67

Table 3-16. Minority, Low Income, and Total Population Levels for Areas Surrounding Colbert Fossil Plant ..... 73

Table 3-17. Average and Maximum Noise Levels ..... 74

Table 3-18. Predicted Noise For Alternatives A, B, and C ..... 76

# LIST OF APPENDIX TABLES

Table A-1. Coal-Fired Electrical Generation Capacity (MW) Equipped with FGD Technology (1998) ..... A-2
Table A-2. Total Capacity (MW) Equipped with Wet FGD Technology (1998) ..... A-2
Table A-3. Total Capacity (MW) Equipped with Dry FGD Technology (1998) ..... A-2
Table A-4. Initial Screening of FGD Technologies ..... A-6
Table A-5. Technology Screening for Colbert Fossil Plant Unit 5 ..... A-6

# LIST OF FIGURES

Figure 1-1. Location of Colbert Fossil Plant ..... 2
Figure 1-2. Historic Colbert NOx Emissions ..... 4
Figure 1-3. Historic Colbert $SO_2$ Emissions ..... 6
Figure 2-1. Generalized Footprint of Unit 5 FGD Project at Colbert Fossil Plant ..... 11
Figure 2-2. General Arrangement of Unit 5 FGD System ..... 12
Figure 2-3. Nearby Limestone Quarry Locations and Transportation Routes ..... 14
Figure 2-4. Plant Entrance and Rail Bed Crossing ..... 17
Figure 2-5. Location of Fly Ash and Gypsum Handling/Storage Facilities ..... 19
Figure 2-6. Colbert Fly Ash and Gypsum Dry Storage Areas ..... 20
Figure 2-7. Gypsum Drying Facility ..... 21
Figure 2-8. Initial Surface Water Flow Scheme ..... 22
Figure 2-9. Final Surface Water Flow Scheme ..... 22
Figure 2-10. Contractor Parking and Laydown Areas ..... 26
Figure 2-11. COF Unit 5 Construction Staffing ..... 27
Figure 3-1. Groundwater Levels and Movement in Tuscumbia Limestone Aquifer (April 2002) ..... 65
Figure 3-2. Wetland Areas ..... 68

# LIST OF APPENDIX FIGURES

Figure A-1. Flue Gas Desulfurization Technologies ..... A-1
Figure A-2. Ninety Percent Removal Cost ..... A-8
Figure A-3. Ninety-Eight Percent Removal Cost ..... A-8
Figure B-1. Site Arrangement for Colbert 5 Scrubber Project ..... B-1
Figure B-2a. General Arrangement Plan Limestone Area ..... B-2
Figure B-2b. General Arrangement Elevation Limestone Area ..... B-3
Figure B-3. Twin Tower Scrubber Flow Diagram ..... B-4
Figure B-4. 3-Dimensional View of Scrubber Project ..... B-5
Figure B-5. Limestone Truck Haul Road ..... B-6
Figure B-6. Cane Creek Bridge Modifications ..... B-7
Figure B-7. Detailed Laydown/Parking Plan for Construction Activities ..... B-8
Figure D-1. COF Raw Water System Diagram ..... D-3

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# CHAPTER 1

# 1. PURPOSE, NEED, BACKGROUND, AND SCOPING

## 1.1. Purpose and Need for the Proposed Action

The purpose of the proposed project is to reduce sulfur dioxide ($SO_2$) emissions from Unit 5 at Colbert Fossil Plant (COF) by installing flue gas desulfurization (FGD) equipment that employs the wet limestone forced oxidation (LSFO) technology. The Tennessee Valley Authority (TVA) needs to reduce $SO_2$ emissions at COF to meet requirements under the 1990 Clean Air Act amendments.

The scrubber will assist TVA in maintaining compliance with the Environmental Protection Agency's (EPA) Title IV regulations for the Acid Rain Program. The Title IV regulations require reductions and caps for utility industry sulfur dioxide ($SO_2$) emissions. Compliance with the regulations is based on emission allowances. Currently TVA is allocated 430,000 tons of $SO_2$ allowances per year. In 2002, TVA's emissions were 547,000 tons and compliance was maintained by utilizing existing $SO_2$ emission allowances. TVA has a self-reliant strategy for maintaining compliance with $SO_2$ allowances meaning TVA does not anticipate purchasing $SO_2$ credits to maintain compliance.

## 1.2. Background

In TVA's continuing efforts to improve air quality in the Tennessee Valley and to comply with the Clean Air Act, TVA plans to design, build, and operate five FGD systems to reduce $SO_2$ emissions from TVA's coal-fired power plants. TVA is currently installing an FGD system on Paradise Fossil Plant Unit 3 in Kentucky. Additionally, TVA is contemplating the installation of scrubbers at Bull Run Fossil Plant (BRF), which has one unit, and control emissions from all nine units at Kingston Fossil Plant (KIF) in Tennessee (all units at KIF can be controlled by two FGD systems). These five FGD systems will cost approximately $1.5 billion and will collectively reduce emissions of $SO_2$ by more than 200,000 tons per year, bringing TVA's total emissions down by 85 percent since 1977. The locations of the systems are expected to provide the greatest environmental benefit for the investment in dollars and to improve air quality regionally.

This Environmental Assessment (EA) describes the impacts of constructing and operating an FGD system to serve Unit 5. Should the installation of similar equipment be considered for installation on other units at Colbert in the future, a separate environmental review would be completed. The dates and order of the FGD systems on the other plants will be determined through engineering studies that will be completed over the next several months. As pollution control technology improves in the future, TVA may shift to other technology. In any event, financial and environmental reviews will be prepared for the FGD projects at BRF and KIF as engineering design and technology information for those plants becomes sufficiently detailed to support an accurate and complete environmental review.

**Colbert Fossil Plant**

COF is located in Colbert County, Alabama, about 10 miles west of downtown Tuscumbia and 3 miles east of Cherokee (Figure 1-1). The plant site is located on the south side of TVA's Pickwick Reservoir at Tennessee River Mile (TRM) 245. The plant and its reservation lie north of U.S. Highway 72. The plant is located on a 1,354-acre

(548-hectare) reservation. Most nearby land is agricultural, but residential and recreational areas are in close proximity. The closest residences are within 0.5 mile from the power plant.

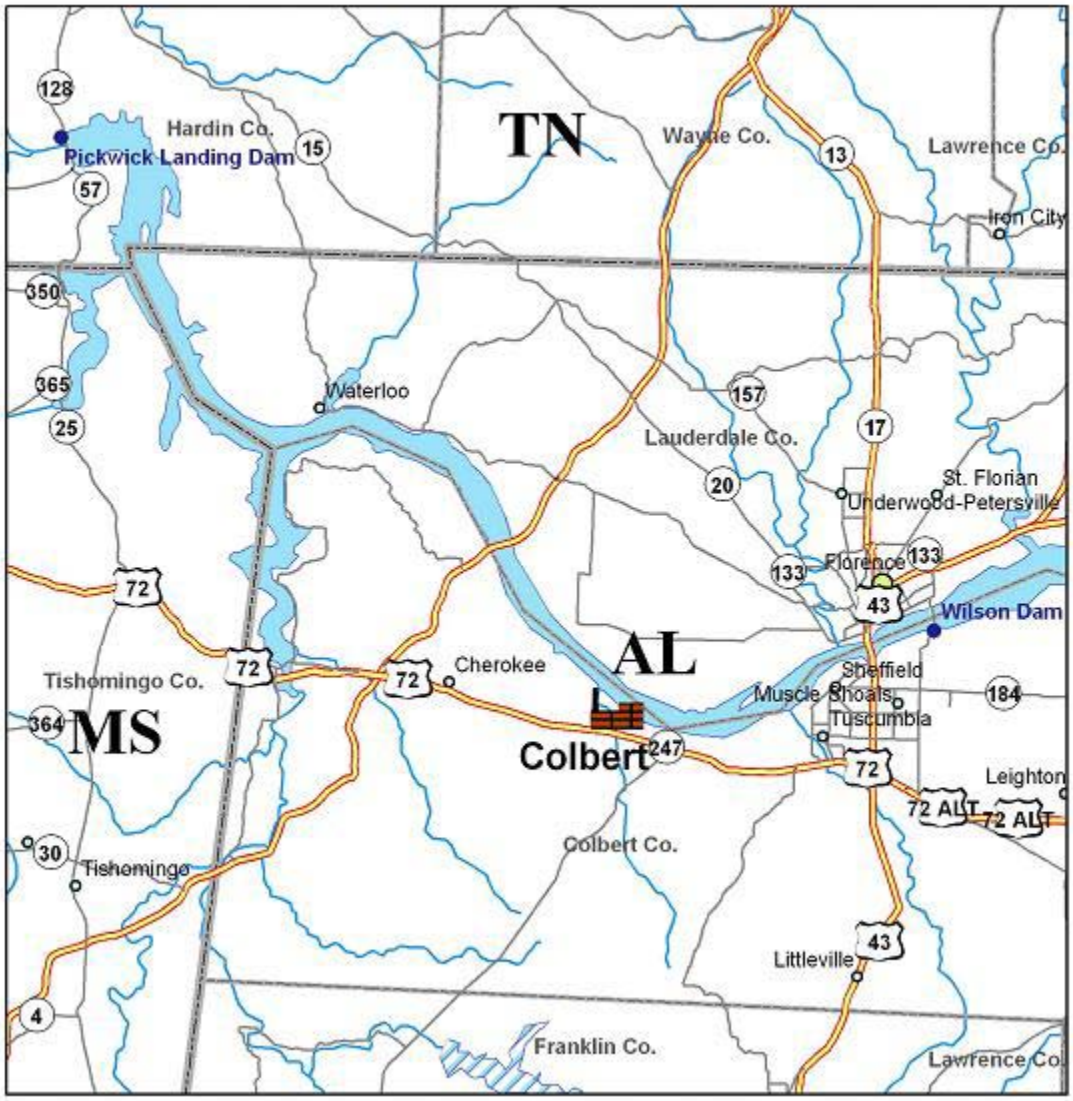


**Figure 1-1. Location of Colbert Fossil Plant**

Unit 5 at COF consists of a single-furnace, wall-fired, dry-bottom, pulverized-coal-fired boiler. The boiler was manufactured by Babcock & Wilcox. Unit 5 was constructed between 1960 and 1965 and began commercial operation in November 1965. Unit 5 has a nameplate generating capacity of 550 MW and a winter net dependable generating capacity of about 500 MW. Gaseous emissions from burning coal in Unit 5 are currently dispersed through a 500-foot stack.

Units 1 through 4 at the plant, which have similar boilers, were built between 1951 and 1955. First commercial operation began in January 1955. Nameplate generating capacity

for Units 1 through 4 is 200 MW per unit. Gaseous emissions from burning coal in Units 1 through 4 are dispersed through a 600-foot stack.

In addition to the five coal-fired units, TVA completed the installation of eight gas turbine power-generating units at the COF site in May 1972. COF generates about 7.8 billion kilowatt-hours of electricity in a typical year, or enough energy to meet the needs of 550,000 homes.

Coal consumption for Colbert Units 1 through 5 is approximately 3.2 million tons per year. The coal combustion process produces sulfur oxides, nitrogen oxides ($NO_X$) and ash particles (called fly ash or particulate). Large concentrations of these pollutants may adversely affect human health, vegetation, and wildlife. To remove fly ash and reduce stack opacity, high-efficiency electrostatic precipitators or ESPs (which are more than 99 percent efficient) were installed on Units 1 through 4 in 1988. The state of Alabama's limit (excluding allowances for start-up, shutdown, and load changes) for opacity at Colbert is 20 percent as measured by EPA Method 9.

Prior to 1990, Units 1 through 5 burned Illinois Basin coal. Then between 1990 and 1996, Units 1 through 4 switched to low-sulfur coal from eastern Kentucky/Tennessee, but Unit 5 remained with Illinois Basin coal. During 1996, Units 1 through 4 switched to an even lower sulfur coal (Colorado/Powder River Basin blend coal) and Unit 5 continued to burn Illinois Basin coal. In 2002, Colbert 1-4 burned 1,940,136 tons of coal, of which 85 percent was Colorado coal and 15 percent was Powder River Basin coal. These coals were 0.5 percent and 0.3 percent sulfur by weight, respectively. In that same year, Unit 5 burned 946,385 tons of coal, split 70/30 between Illinois Basin and Colorado coals. The Illinois Basin coal has a sulfur content of 1.5 percent.

Low NOx burners were installed in Units 1-5 in the mid-1990s, which reduced NOx emissions by approximately 50 percent as depicted in Figure 1-2. Selective Catalytic Reduction (SCR) systems are being installed on Unit 5, and NOx-Star systems are proposed for installation on Units 1-4 to reduce nitrogen oxides (NOx) emissions further, by up to 90 percent. SCR uses a catalyst to promote the chemical reaction between NOx and a nitrogenous compound, generally ammonia, to produce molecular nitrogen and water. NOx emissions levels are expected to be reduced by 90 percent or better when operational in April 2004 (projected to be approximately 0.1 lb/mmBtu for Unit 5). NOx Star, which is being considered for installation on Units 1-4 after 2004, is a proprietary technology that involves inhibiting the formation of NOx during the combustion process within the boiler. The use of NOx Star is expected to reduce NOx emissions by 20 to 50 percent.

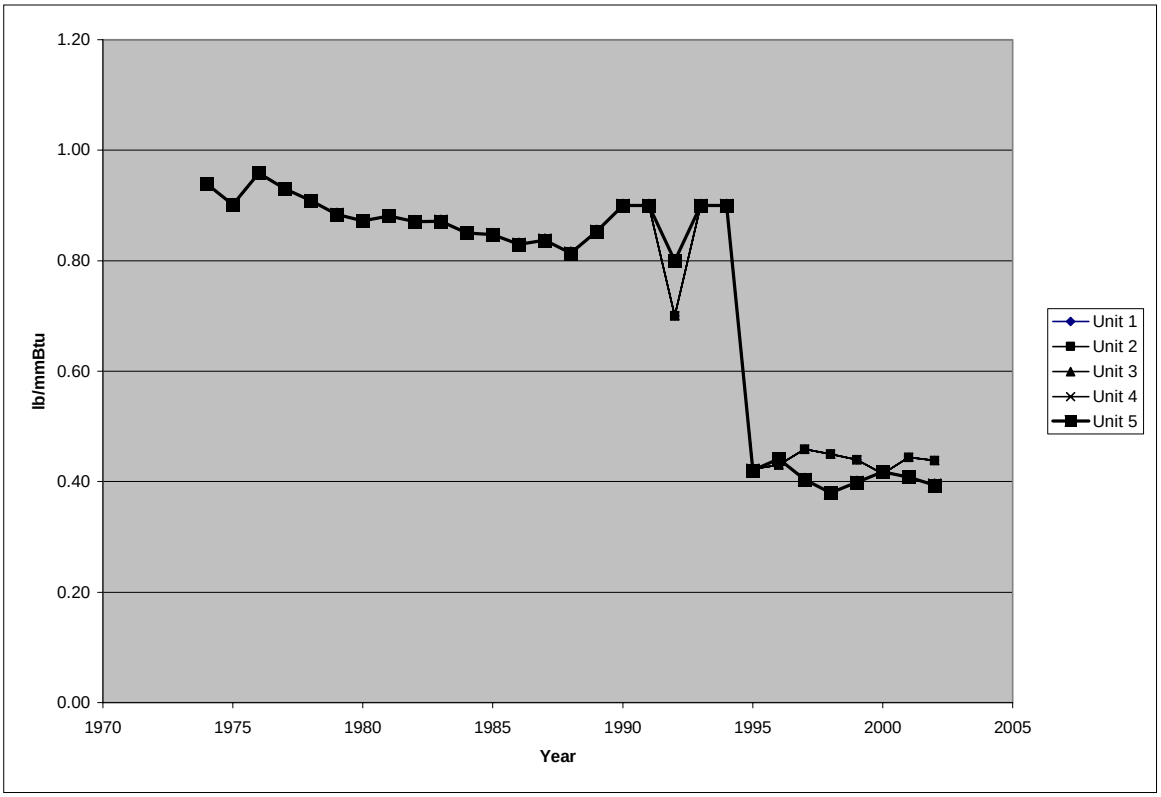


**Figure 1-2. Historic Colbert NOx Emissions**

**$SO_2$ Emissions and Control Technologies**

Sulfur is present in coal as an impurity and reacts with oxygen to form $SO_2$ when the coal is burned to generate electricity. Reduction of $SO_2$ emissions has typically been achieved through one or a combination of the following:

- Use of fuel desulfurization methods
- Switching to lower-sulfur fuels
- Use of FGD systems

TVA utilizes all of these techniques in meeting regulatory requirements at its 11 coal-fired plants. Each of these options has its own costs and benefits; however, there is no single universal solution. Fuel desulfurization occurs through the washing of coal before it is burned. Coal washing is effective in reducing pyrite content (small, discrete iron sulfide particles in the coal), but is not effective for removing the organic sulfur from the coal matrix. Organic sulfur accounts for 35 to 75 percent of the total sulfur content in Illinois Basin coals burned in many TVA power plants.

The current strategy for maintaining compliance at COF involves the use of low-sulfur fuel. The use of lower sulfur coal was initiated at COF Unit 1-5 in 1979-80, resulting in a drop in

$SO_2$ emissions from about 6.5 pounds $SO_2$/millions of British thermal units (lb/mmBtu) to about 3.8 lb/mmBtu (Figure 1-3). Another emissions reduction took place in 1990-92 for Units 1-4, to about 1.5 lb/mmBtu. Emissions from Unit 5 fluctuated somewhat during this time frame, settling at about 3.0 to 3.5 lb/mmBtu mainly because this corresponded to the lowest fuel sulfur content for which efficient and dependable operation of the unit was possible. Due to the use of lower sulfur coal, Unit 5 $SO_2$ emissions dropped to 2.42 lbs/mmBtu in 2002. In the winter of 2004, Unit 5 was transitioned to a high Btu, low-sulfur western coal to reduce $SO_2$ emissions to approximately 1.0 lb/mmBtu. However, flue gas conditioning, which involves the injection of small amounts of sulfur trioxide and ammonia into the flue gas, will be required to maintain precipitator efficiency and compliance with particulate standards.

The current State Implementation Plan (SIP) $SO_2$ limits for Colbert units are 2.2 lbs/mmBtu and 4.0 lbs/mmBtu for Units 1-4 and Unit 5, respectively. Because of its size and the time of its commencement of operation (1965), Unit 5 would be covered under the 1977 Clean Air Act Amendments (Section 169a) as needing Best Available Retrofit Technology (BART) to reduce visibility of impairment. The visibility protection requirements were promulgated by EPA in regulations codified in 40 C.F.R. pt. 51, subpt. P. Adding LSFO scrubbers to Unit 5, which is essentially the best technology available for controlling $SO_2$ emissions, would satisfy BART requirements.

The Environmental Protection Agency (EPA) promulgated regional haze regulations on July 1, 1999, with a goal of pristine visibility at all Class I areas (national parks) by 2064. Like the $PM_{2.5}$ National Ambient Air Quality Standards (NAAQS), this rule targets the reduction of fine particulates. The rule calls for visibility improvements to be achieved incrementally in 10-year planning cycles. The first 10-year plan is due in 2008, with subsequent plans due every ten years thereafter. In its May 24, 2002, decision, the District of Columbia Circuit Court of Appeals vacated in part and remanded to EPA its Regional Haze rule. Under a consent decree with Environmental Defense, EPA is now mandated to address the issues vacated by the court in a proposed rule by April 2004. A final rule is then due by April 2005.

A regional haze control strategy is being developed for a 2008 implementation date. The plan currently targets $SO_2$ and $NO_x$ control technologies on units subject to BART requirements, and allows for trading on a limited basis. BART requirements apply to fossil fuel fired steam generating units that began operation on or after August 7, 1962 and began construction before August 7, 1977. Assuming the recently announced scrubbers are built as planned; TVA will have scrubbers on all of its BART units (BRF, COF5, CUF, PAF, and WCF8) in time to meet the initial visibility control strategy.

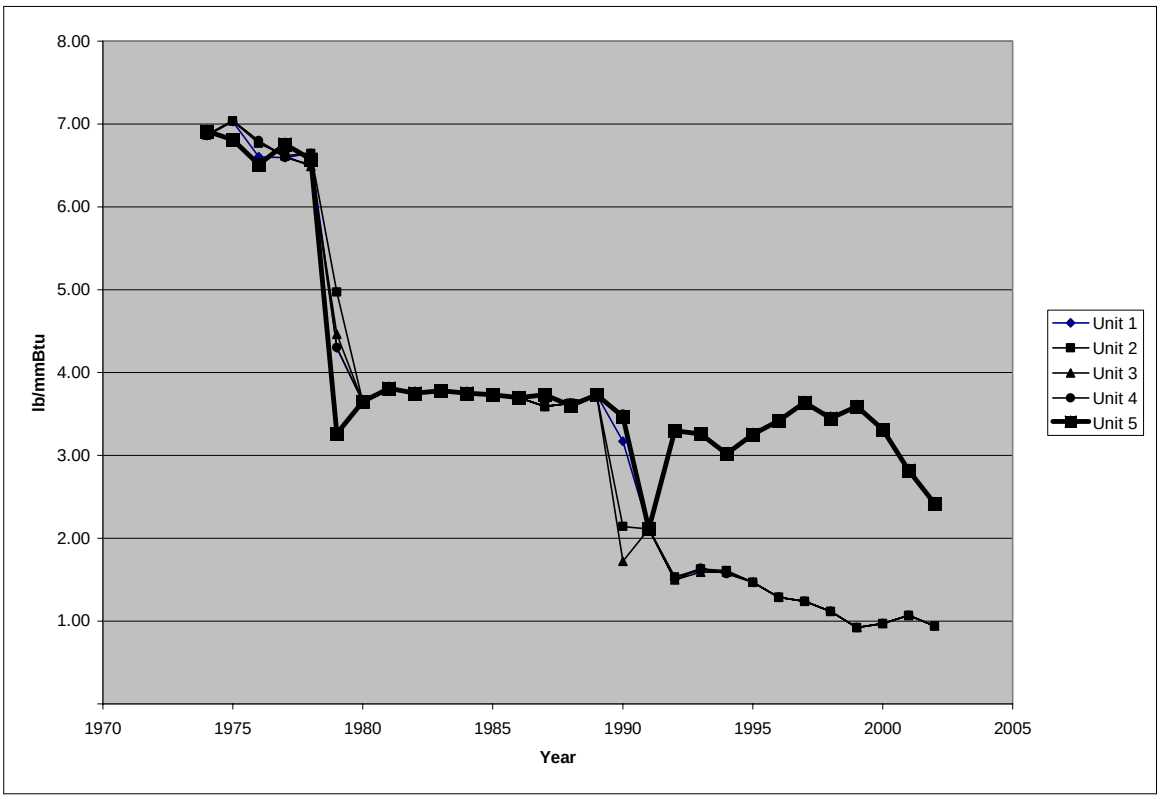


**Figure 1-3. Historic Colbert $SO_2$ Emissions**

The FGD technology review for Colbert Fossil Plant Unit 5 was based on TVA performance needs, compatibility with existing facilities at the plant, costs, and availability of fuels, and maintenance procedures. TVA additionally required that the technology be commercially available and fully demonstrated on utility coal-fired plants larger than 100 MW and for those burning medium to high-sulfur coal (>3 lb/mmBtu). An evaluation of candidate technologies for COF Unit 5 was conducted. Appendix A summarizes the results of that evaluation. The evaluation results show LSFO is the technology of choice, followed closely by LSFO with organic acid addition. The use of organic acids to enhance scrubber performance is not planned in the Unit 5 scrubber.

## 1.3. The Scoping Process

A TVA interdisciplinary team reviewed the potential direct, indirect, and cumulative effects of the proposed use of LSFO technology at COF Unit 5 for $SO_2$ reduction. From this review, the following project aspects identified for detailed analyses could potentially result in impacts:

- Beneficial effects to air quality from reducing $SO_2$ emissions
- Disposal of gypsum byproduct (solid waste)
- Wastewater and discharges to surface waters

- Transport of limestone to COF
- Noise from limestone transport and unloading, and from equipment used to produce the limestone slurry.
- Socioeconomic effects of the project related to increased jobs
- Wetlands
- Cultural Resources

## 1.4. Related National Environmental Policy Act (NEPA) Documents

- Energy Vision 2020 – Integrated Resource Plan Environmental Impact Statement TVA. 1995.
- Colbert Fossil Plant Units 1 through 5 Reduction Systems for Control of Nitrogen Oxides Environmental Assessment and Finding of No Significant Impact. TVA. February 2003.
- Colbert Fossil Plant Construction of Skimmer Wall Environmental Assessment (EA) and Finding of No Significant Impact (FONSI). TVA. January 2002.
- Colbert Fossil Plant Installation of Flue Gas Conditioning System and Reevaluation of Mitigation for Wastewater and Surface Water Effects from Installation of Selective Catalytic Reduction System at Colbert Fossil Plant Environmental Assessment (EA) and Finding of No Significant Impact (FONSI). TVA. September 2003.
- Coal Combustion By-Product Marketing Environmental Assessment and Finding of No Significant Impact. February 1990.
- Colbert Plant Property and Permanent Easement to Colbert County for Water Treatment Plant EA and FONSI. TVA. December 1999.

## 1.5. Public and Agency Involvement

This Draft Environmental Assessment will be sent to the agencies listed below for comments:

- Alabama Department of Conservation and Natural Resources
- Alabama Department of Environmental Management
- National Park Service
- United States Fish and Wildlife Service

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# CHAPTER 2

## 2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

### 2.1. The Proposed Action

The proposed action is to construct and operate FGD (scrubber) systems on Unit 5 at Colbert Fossil Plant. The project is intended to reduce $SO_2$ emissions by at least 95 percent at full load conditions. The scrubber(s) would utilize wet limestone forced oxidation (LSFO) technology, as described in Appendix A because of its high $SO_2$ removal performance and excellent reliability. Generally speaking, an absorber would be constructed along with those subsystems and utilities necessary to support its operation. A limestone receiving, handling facility would be constructed to provide the reagent needed in the scrubbers. Additional construction would include a gas handling system to transport flue gas from the existing precipitators, a new stack, water supply systems, power supply and control systems, a gypsum dewatering facility, facilities for transporting gypsum to market via barge, and a gypsum disposal area (for gypsum that could not be marketed).

The current proposal contemplates construction to begin on the Unit 5 scrubber potentially as soon as June 1, 2004, with operation starting about October 2007. The scrubber would be designed and constructed to achieve various electricity production goals and to maximize operational flexibility. There is no plan to construct more than the Unit 5 scrubber module at this time. However, site arrangement alternatives developed for this project consider the possible future construction of scrubbers on Units 1 through 4 to ensure those facilities could be efficiently and economically accommodated at a later date, in the event TVA elects to do so. The Unit 5 absorber, the limestone handling facilities, and all associated components that support the Unit 5 FGD system would be constructed to the west of the powerhouse.

The discussion of alternatives below relies on nameplate capacity as a general metric for absorber size. The design of the limestone handling facilities, absorbers, and air handling equipment will be based on the maximum heat inputs that are commensurate with the current performance limits of each unit, which may correspond to a slightly lower generation rate. For example, the absorber design for Unit 5 (which has a nameplate capacity of 550 MW) may correspond to a generation capacity closer to 500 MW, since that is more in line with the generation capacity currently achievable for the unit.

The addition of an FGD scrubber system on Colbert Unit 5 involves the construction of several subsystems and integration of these subsystems into plant operations and connection to various utilities that support their operation. Most of Unit 5 and its operation would remain the same after the new scrubber is in place. Due to the high removal efficiency of the scrubber, higher sulfur coal may be burned in Unit 5 than currently burned, but the overall result would be a substantial reduction in $SO_2$ emissions. The scrubber would be placed in service downstream of the current particulate and NOx control systems.

The footprint for the proposed FGD system for Unit 5 is shown in Figure 2-1. Figure 2-2 shows the proposed scrubber facilities in and around the powerhouse. Appendix B Figures B-1, B-2a, and B-2b show more detailed drawings of these facilities. Where clearly supported by prudent and cost effective planning, some facilities and systems will be designed to allow for relatively easy expansion should scrubbers be added later to Units 1

through 4. Following is a brief description of the major components and systems of the proposed scrubber and their operational aspects.

### 2.1.1. The Absorber

Two absorber designs are under consideration for the proposed project. The single tower design can typically provide 95 percent $SO_2$ removal. The twin tower design, which is proposed for this project, has lower power requirements and can deliver $SO_2$ removal performance at least 95 percent when burning medium to high sulfur coals. Figure B-3 contains a preliminary flow diagram for the twin tower scrubber design

The typical absorber consists of a limestone slurry/flue gas contact area and mist eliminators. Appendix B Figure B-4 shows a 3-dimensional view of the absorber and associated ductwork. An absorber could be 150 feet tall and 84 feet in diameter and hold nearly 15,000,000 gallons (although never filled to this level).

The absorber dwarfs all other tanks used in connection with scrubbing. Limestone slurry occupies the lower portion of the absorber (sometimes called the reaction tank). Both systems are kept in motion by jet air sparging and the agitation caused by injection of oxidation air.

The oxidation air, which is sparged or blown into the absorber liquid, converts the dissolved calcium sulfite to calcium sulfate (gypsum). As the gypsum crystallizes, the heavier particles sink to the bottom of the tank where the concentration reaches about 15 to 30 percent; a bleed stream is extracted to maintain equilibrium, which is pumped to the gypsum dewatering facility. The absorber would be designed for the introduction of flue gas above the level of the slurry liquid where it passes through one or more layers of slurry sprays. The treated flue gas passes through mist eliminators, then to the stack. The stack height would be determined by Good Engineering Practice standards, regulatory requirements, computer dispersion modeling using United States Environmental Protection Agency- (USEPA) approved Industrial Source Complex 3 (ISC3) model, and computer and/or physical flow modeling. Booster fans may be added to maintain the necessary flow through the absorber.

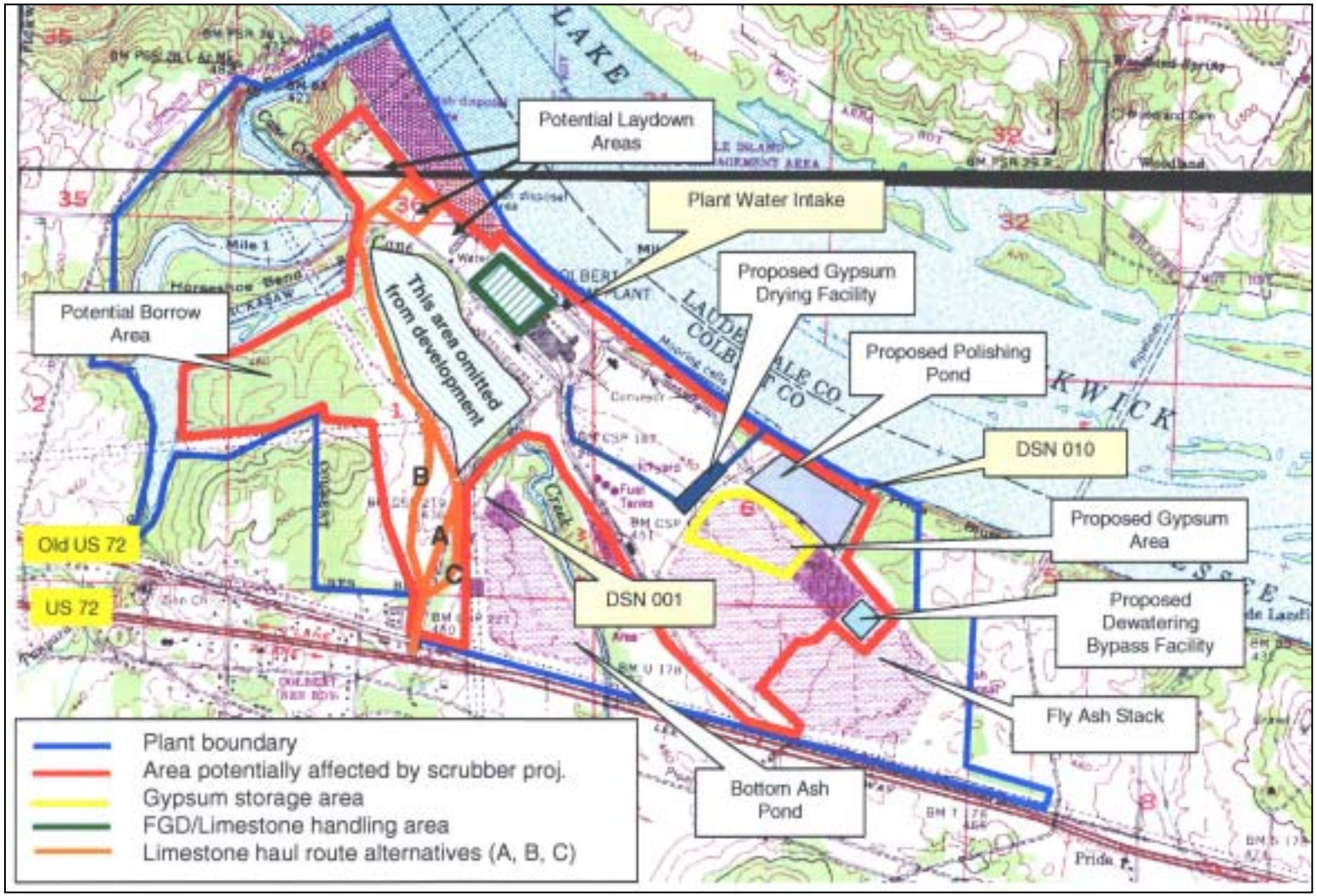


**Figure 2-1. Generalized Footprint of Unit 5 FGD Project at Colbert Fossil Plant**

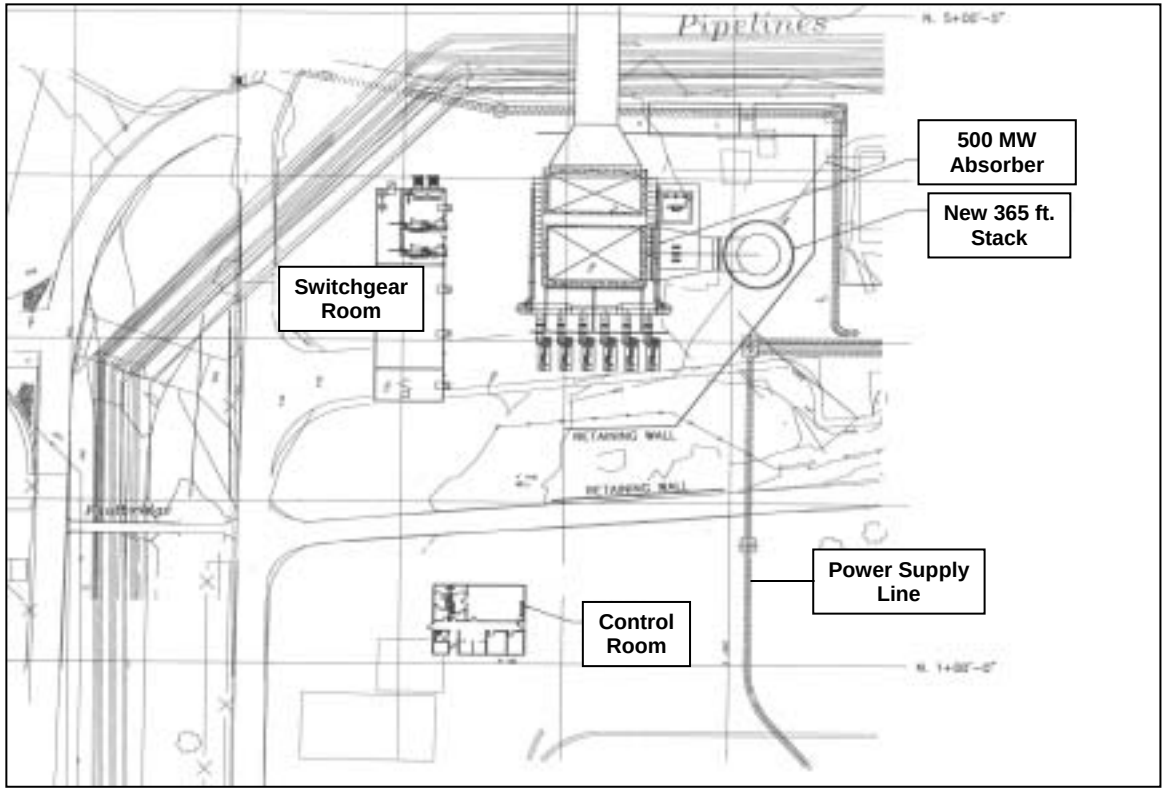


**Figure 2-2. General Arrangement of Unit 5 FGD System**

### 2.1.2. The Limestone Reagent Preparation System

This system consists of the equipment used to receive, store, and process the limestone, resulting in production of the limestone slurry used in scrubbing. Process water and crushed limestone are fed to a ball mill. A propylene glycol based antifreeze solution may be added to the limestone and/or conveying system when moisture content and extremely cold conditions warrant. However, because of procedural and structural enhancements in the limestone handling system, not more than 50 gallons of antifreeze is expected to be used during any 24-hour period and not more than 2 days at a time. This use results in insignificant concentrations of propylene glycol entering the FGD and subsequently the dry fly ash runoff pond systems. The resulting slurry is sent to a holding tank, where it is pumped to a hydro cyclone classifier, where unacceptably large limestone particles are recycled to the ball mill. The slurry enters product tanks, where it is held for pumping to the absorber. The grinding would be accomplished by two or more ball mills.

### 2.1.3. Limestone Purchase and Transport

Limestone is used to make the reagent used in wet-limestone forced-oxidation scrubbers. Crushed limestone would be purchased from one or more quarries located in the vicinity and transported to the site by truck. The quantity of limestone needed for scrubbing is contingent on the limestone purity, the reagent ratio (i.e., strength of limestone slurry solution), fuel heating value, and the amount of sulfur in the coal. Based on preliminary assumptions of fuel quality and TVA business plan coal burn projections, estimates were prepared of the quantity of limestone needed. Approximately 160,000 tons per year of limestone would be required for Pittsburgh 8 coal. After boiler controls and modifications are made to the Unit 5 boiler, it is expected that the primary fuel will become Western Kentucky coal, but the limestone demand would be approximately the same for operation at the 5.0 lb $SO_2$/mmBtu heat input limit. These modifications are planned but not yet scheduled. The estimates for Unit 5 while operating on Pittsburgh coal are conservative for annual limestone consumption since lower sulfur coals would be used as backup fuels in the event primary fuels are not available. Backup fuels, which could be used up to 20 percent of the time, include Colorado low-sulfur coal or Illinois Basin medium sulfur coal. Additional conservatism is introduced into the estimate since the average fuel sulfur content would be somewhat lower than the maximum allowed.

Since TVA's purchase of limestone for COF Unit 5 constitutes only a small fraction (less than 10 percent) of the total limestone production capacity of existing quarries in the vicinity and since multiple uses of limestone are present in the general area, the demand for this commodity is fungible, and TVA's purchase of limestone for Unit 5 would likely not result in the mining of additional areas. The exact source of limestone is not known since limestone purchases are competitively bid, and a request for proposals for limestone to supply the scrubber(s) would not be released until late 2005 or early 2006. The USGS (2003) indicates four companies operate active quarries in Colbert, Madison, Morgan, Lawrence, and Limestone Counties (USGS, 2003).

- Hoover, Inc.
- Rogers Group, Inc.
- U.S. Aggregates, Inc.
- Vulcan Materials Co.

Based on historical data supplied by the Rogers Group and Vulcan Materials, TVA believes that several of the North Alabama quarries operated by these suppliers could probably

meet TVA specifications for limestone used to prepare scrubber slurry. Rogers Group operates three of the quarries, one each in Colbert, Lawrence, and Limestone Counties. The closest of the three is about five miles southeast of Tuscumbia (in Spring Valley). Vulcan Materials Company operates three nearby quarries at Tuscumbia, Pride, and Cherokee, Alabama, along with three more distant quarries in Franklin, Morgan, and Madison Counties.

Using the best information available, TVA has evaluated the impacts of transporting limestone along probable delivery routes from the three likely quarries in the vicinity of the plant. These quarries are shown in Figure 2-3. The route from the Cherokee Vulcan Materials Company quarry would be east along U.S. 72 to the plant entrance. The route from the Pride Vulcan Materials Company quarry would be west along U.S. 72 to the plant entrance. The route from the Rogers Group Quarry in Spring Valley would be north on County Road (CR) 57 (also known as Three Mile Lane), then west along U.S. 72 to the plant entrance.

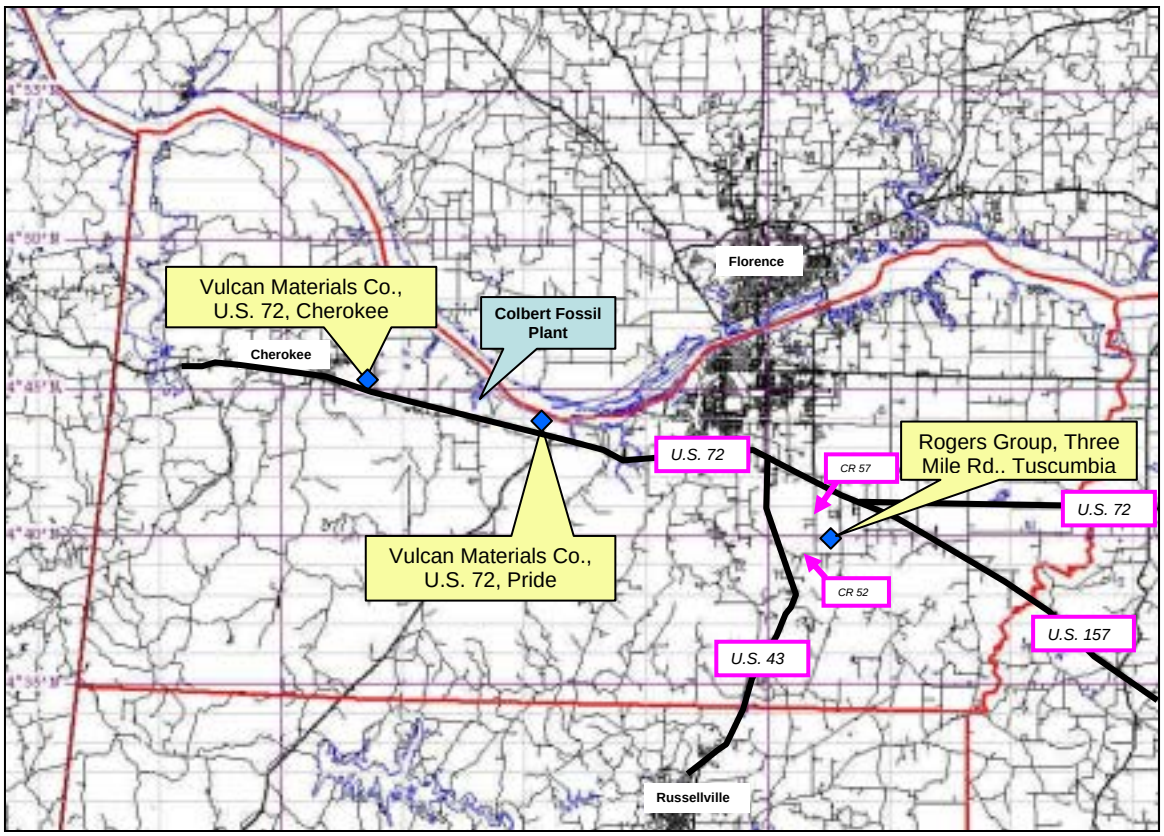


**Figure 2-3. Nearby Limestone Quarry Locations and Transportation Routes**

In the unlikely event that barge or rail transport of limestone is required, this EA would be supplemented to describe the associated environmental impacts.

This EA describes the potential range and types of possible impacts that would likely occur as a result of transporting limestone to the site via truck. The transportation analysis assesses the impacts of the total tonnage received to support scrubbing of Unit 5. The

operating mode which would result in the greatest rate of limestone delivery to Colbert would be from the firing of coal which results in the emission of 5 lb $SO_2$/mmBtu heat input. As noted above, use of backup coals would consume less limestone, primarily because of their lower sulfur content, and therefore result in fewer limestone deliveries. Limestone delivered by truck would be transported only during day shift and on weekdays. Reflecting 10 holidays per year, deliveries would be expected 251 days per year. Based on a limestone activity of 90 percent and a truck capacity of 18 tons, the delivery of 160,000 tons of limestone would require approximately 35 round trips per day, or about 4.4 round trips per hour over an 8-hour work shift.

Once near the plant, several alternative routes were considered for transporting limestone to the plant. Figure 2-1 shows three alternative routes from the reservation entry point from U.S. 72 to the limestone handling area. Each of the routes could utilize a common portion, which is a Construction Haul Road that provides access to the western part of the secured plant area from the Plant Entrance Road. All routes would be two-way except for the loop near the limestone stacking area.

A. Alternative A would involve trucks turning off U.S. 72 at the main plant entrance, continuing up the main plant entrance road approximately 2200 feet (to just south of the point where the bottom ash sluice lines pass beneath the Plant Entrance Road, hereafter called the “Y”) where the trucks would turn left onto the Construction Haul Road. This route would continue across the existing bridge on Cane Creek, and on to the limestone handling area loop road.

B. This alternative would be same as “A” except that trucks would, immediately after crossing the railroad at the main plant entrance, connect with a new road to be constructed just to the west of the Plant Entrance Road. Trucks would then join with the Construction Haul Road as described in “A.” This route would isolate the limestone truck traffic to its own road except for a short distance near the entrance to the reservation.

C. This alternative would be same as “A” except that trucks would, immediately after crossing the railroad at the main plant entrance, connect with a new road to be constructed just to the east of the Plant Entrance Road. Trucks would cross the Plant Entrance Road just south of the “Y” noted above to join with the Construction Haul Road as described in “A.” A variation of this alternative would be to utilize the existing entrance road as the haul road and prepare the new road as the normal conveyance for other plant traffic. This would avoid a crossing of traffic using the two roads at the “Y” and, like “B,” isolate the limestone truck traffic to its own road except for a short distance near the entrance to the reservation.

Since route Alternatives B and C incur higher costs of construction and would disturb natural areas along the existing Plant Entrance Road, Alternative A is the preferred route for the project. Alternatives B and C would involve constructing new roadbeds for about a quarter of a mile paralleling the existing Plant Entrance Road. The impacts of implementing each of the limestone haul route alternatives are assessed in this EA (Figure B-5 shows the preferred route Alternative A, labeled Option 1 in the drawing).

Each of the routes, along with present traffic into and out of the COF Reservation must traverse the existing rail bed that is actively used by Southern Railway. Figure 2-4 shows a close up view of the plant entrance, and the intersecting U.S. 72, old U.S. 72, the railroad,

and the plant entrance road. Delays of 20 minutes or more at the plant entrance are currently experienced as a result of train stoppages, and these delays could affect traffic flow. At the expected 4.4 trucks per hour delivery schedule for scrubbing Unit 5, a backup of 1 or 2 trucks could occur until the entrance was clear.

Upgrade of the Construction Haul Road including the existing bridge across Cane Creek is proposed to support large delivery trucks and worker commuter traffic during construction. The haul road would eventually be used by trucks delivering limestone for use in the Unit 5 scrubber once it is operational. Upgrades include widening the roadbed to allow two-way traffic (although the loop road would be one way), capping the road surface to limit the suspension of dust, modifying the bridge surface, and various other improvements. Also, changes to the intersection of the upgraded haul road with the existing Plant Entrance Road will be made to improve safety and limit interference with plant employees coming to and leaving work. All of the changes and upgrades would take place before substantial traffic is incurred by the delivery of construction materials to the site and before the number of construction workers increases substantially. The initial road surface, which is expected to be crushed limestone or a similar aggregate, would remain in place until scrubber limestone deliveries begin, at which time it would be permanently capped with a macadam or tar and chip material. This would avoid the destruction of the permanent surface by the very heavy materials delivery trucks. Figure B-5 shows details of the proposed changes.

Improvements to the junction of the improved haul road with the Plant Entrance Road include the construction of turn lanes and merge lanes. Trucks entering the reservation from the south would be required to stop prior to turning left onto the haul road. The left turn lane would accommodate up to five trucks to avoid obstructing outgoing traffic flow from the main plant area. Trucks leaving the haul road would not stop but simply merge with outgoing traffic. Upgrades would include appropriate curbing and signage. Although not planned at this time, limestone deliveries could be staged to avoid morning and afternoon periods when traffic is likely to be highest, if the additional four limestone trucks per hour lead to congestion.

The approximately 140-foot bridge across Cane Creek was originally constructed to bring large materials and components that did not arrive by barge into the plant area. It has been used infrequently over the years, but is in good condition. The bridge was designed and constructed to carry heavy loads but with its current decking, allows only one-way traffic. As part of the scrubber project, TVA plans to remove the existing 20-foot wide wooden deck and metal side rails and add a concrete deck with concrete curbs to create a total usable width of 24 feet. None of the load-bearing surface would overhang the current support beams. No changes below the level of the deck are planned, except for ditching for storm water management and the addition of riprap where road improvements are made at the intersection of the road with either end of the bridge. Details of the proposed bridge modifications are shown in Figure B-6.

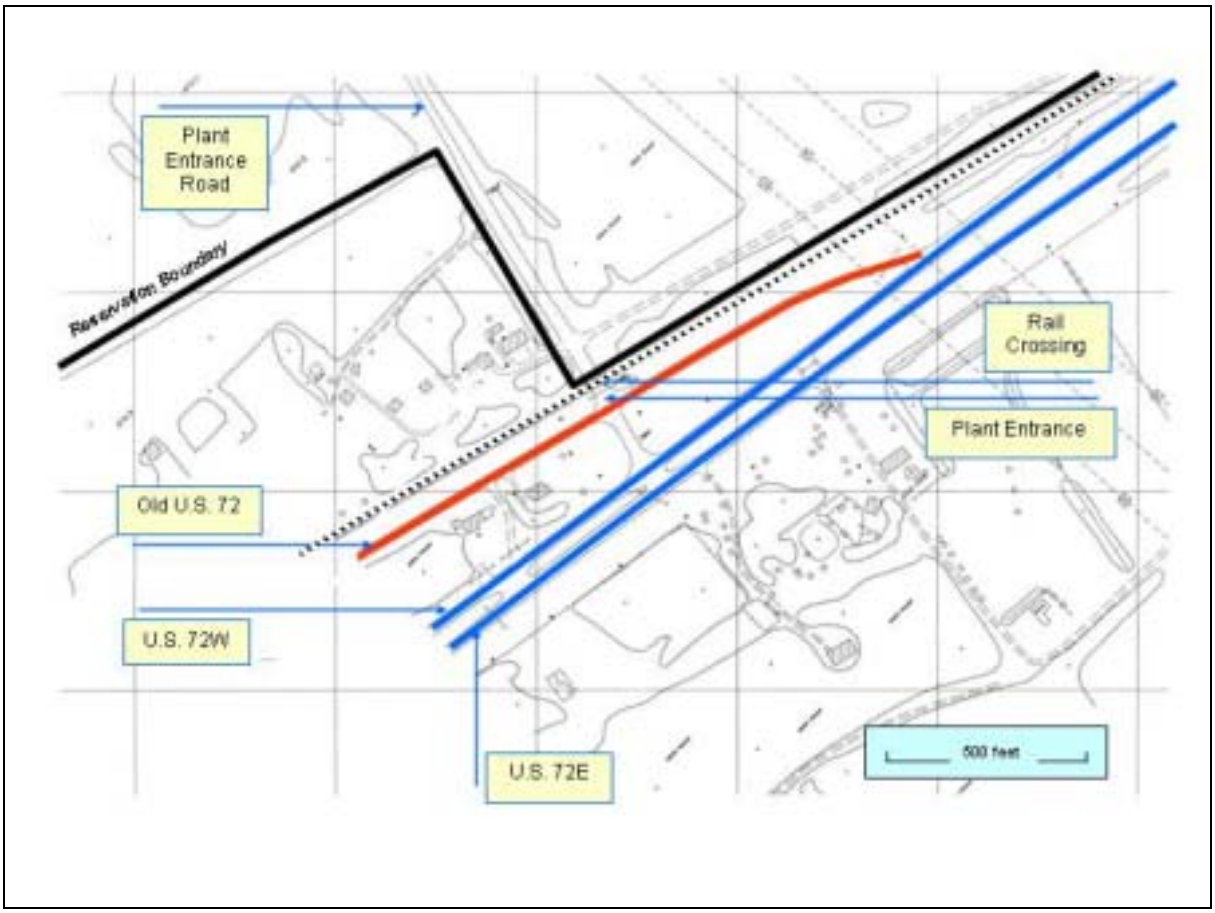


**Figure 2-4. Plant Entrance and Rail Bed Crossing**

### 2.1.4. Gypsum Slurry Dewatering, Transfer, and Storage System

Gypsum is produced by the reaction of the limestone and $SO_2$ in the LSFO absorber. Because of the high quality and market value of the gypsum expected from Unit 5, facilities are being incorporated to process this material for barge transport to markets. The gypsum stream would be pumped from the absorber through above ground pipes to a facility for dewatering (Figure 2-1). Figure B-1 shows the slurry pipe route. Typically, this stream would flow at less than 400 gallons per minute and contain approximately 30 percent solids by weight. These solids would consist predominantly of gypsum crystals (>90 percent), but small amounts of unreacted limestone (<3 percent), other inerts (6 percent), and fly ash (< 0.5 percent) would be present

The dewatering facility would consist of a mechanical dewatering system, staging area, and loading/unloading areas. After dewatering, the gypsum would be conveyed to a barge for transport to markets. Dewatered gypsum, which has a moisture content of about 3 to 6 percent by weight, not immediately loaded to barges would be temporarily stacked in a specially designed storage building to await transport to purchasers or transported to the gypsum disposal area.

The amount of gypsum produced by LSFO scrubbing is dependent on the sulfur content and heating value of the coal, absorber efficiency and the amount of coal fired. Based on preliminary assumptions of fuel quality and TVA business plan coal burn projections,

estimates were prepared of the quantity of gypsum produced by the project. As noted above for the limestone, the estimates are based on conservative assumptions.

The annual gypsum production of Unit 5 is expected to be 260,000 tons/year, which is approximately equivalent to 229,000 cubic yards per year (for gypsum composed primarily of calcium sulfate). Figure 2-5 shows approximately the proposed location of the dry disposal area, which at 24 acres would be designed to accommodate nearly 1.5 million cubic yards of material. This would provide approximately 6.6 years of disposal capacity for the gypsum produced by Unit 5. Gypsum may also be disposed of the ash disposal area if space requirements dictate. Gypsum may also be removed from the disposal area and reprocessed if market needs dictate. TVA plans to mitigate depletion of the gypsum disposal facility by aggressively marketing the gypsum.

The proposed gypsum disposal area is located in the northern portion of the inactive Ash Pond 5 (Figure 2-5). Figures 2-6 shows a close-up view of the fly ash/gypsum storage areas. Figure 2-7 shows a conceptual view of the proposed gypsum drying facility. Effluent from the dewatering facility would be directed to the existing stilling pond. A sediment detention pond, or polishing pond, would be constructed to provide additional treatment of effluent from the stilling pond that now serves the existing dry ash stacking area but would accept dewatering effluent once that facility became operational. During periods of time when the dewatering system is not operational, gypsum slurry will be by-passed into a separate gypsum settling pond which will then discharge into the stilling pond and then into the polishing pond. Gypsum would then be removed with heavy equipment and disposed of in the gypsum disposal area.

Figures 2-8 and 2-9 show the initial and final flow schemes for materials associated with gypsum handling and disposal at COF. These schemes differ primarily in the way storm water runoff is handled, with storm water initially going to the polishing pond and ultimately going to the existing stilling pond before discharging through the polishing pond. Incorporating the storm water runoff further upstream in the wastewater treatment pond system will improve water quality at exit point DSN 010.

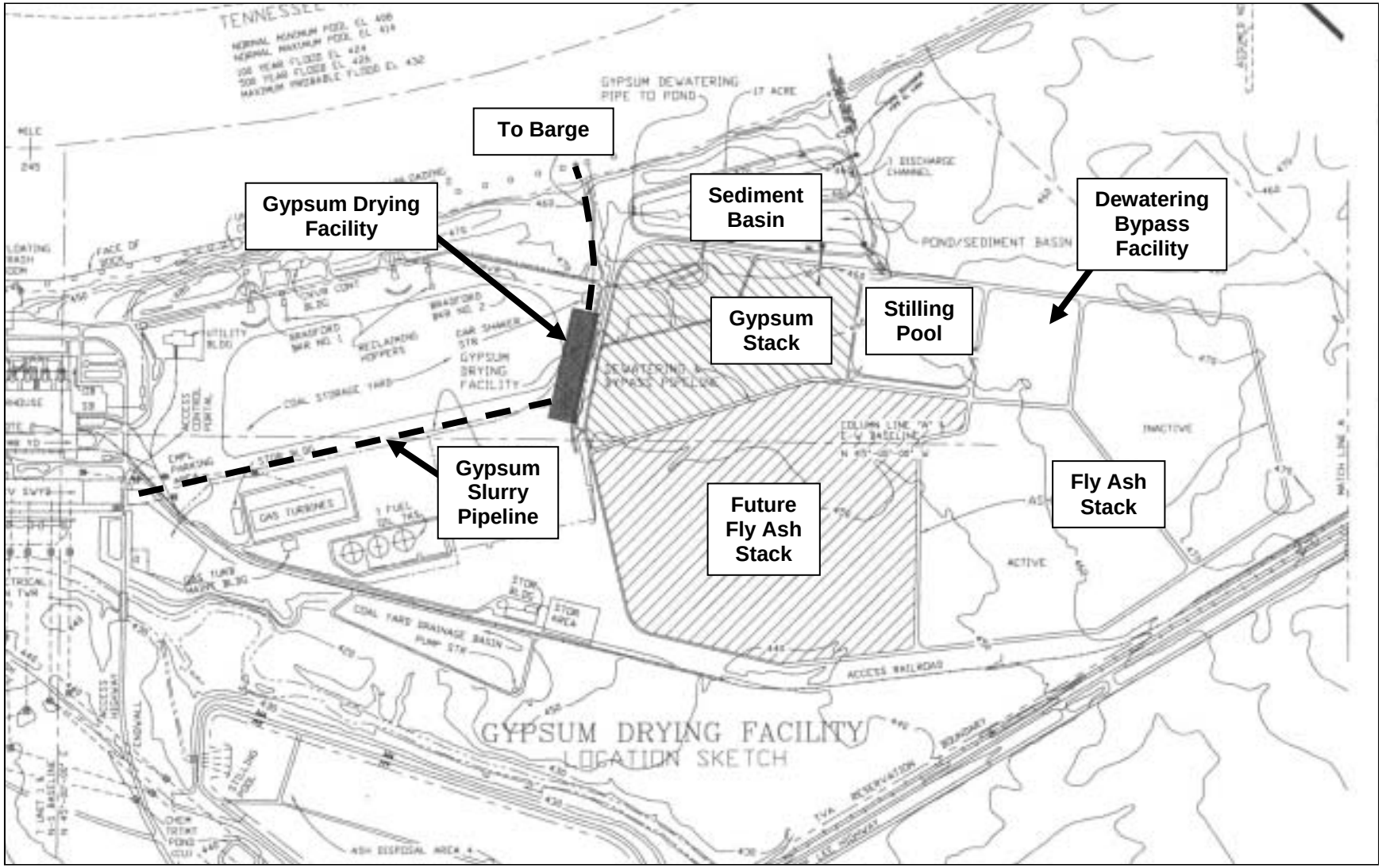


**Figure 2-5. Location of Fly Ash and Gypsum Handling/Storage Facilities**

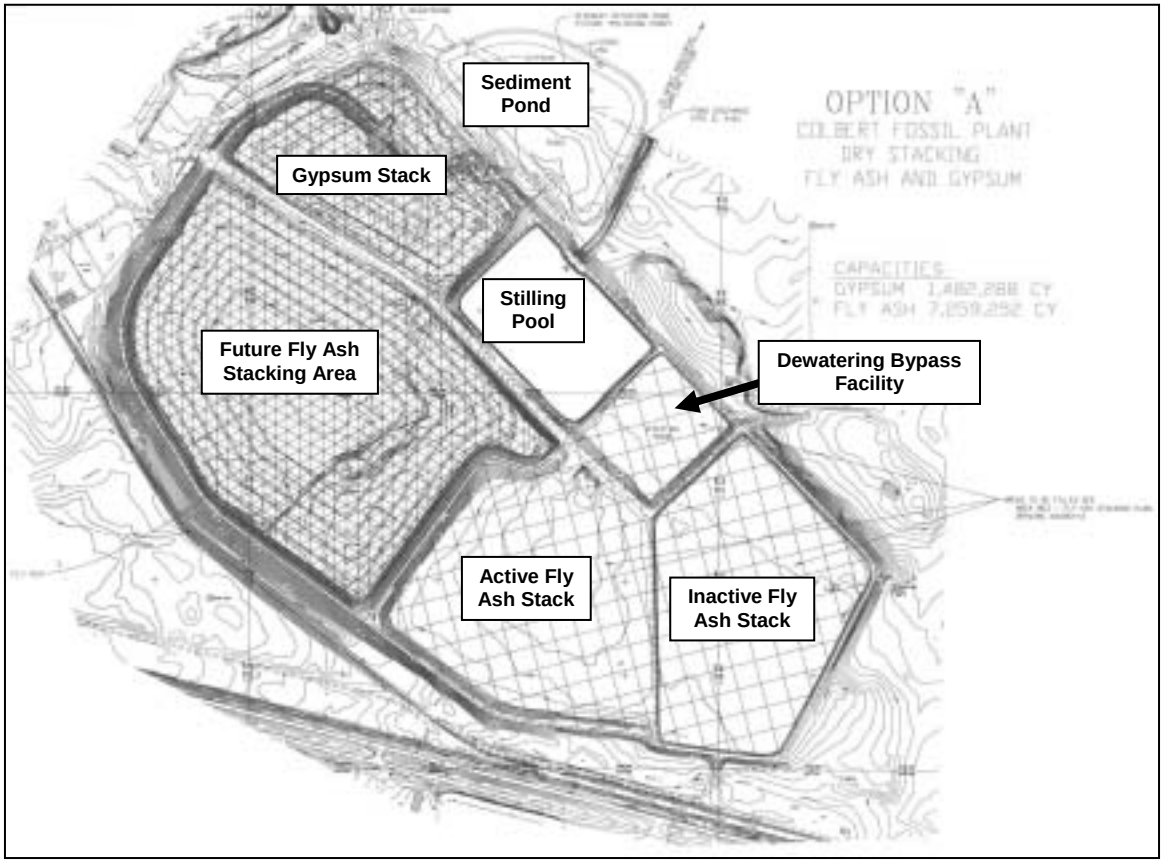


**Figure 2-6. Colbert Fly Ash and Gypsum Dry Storage Areas**

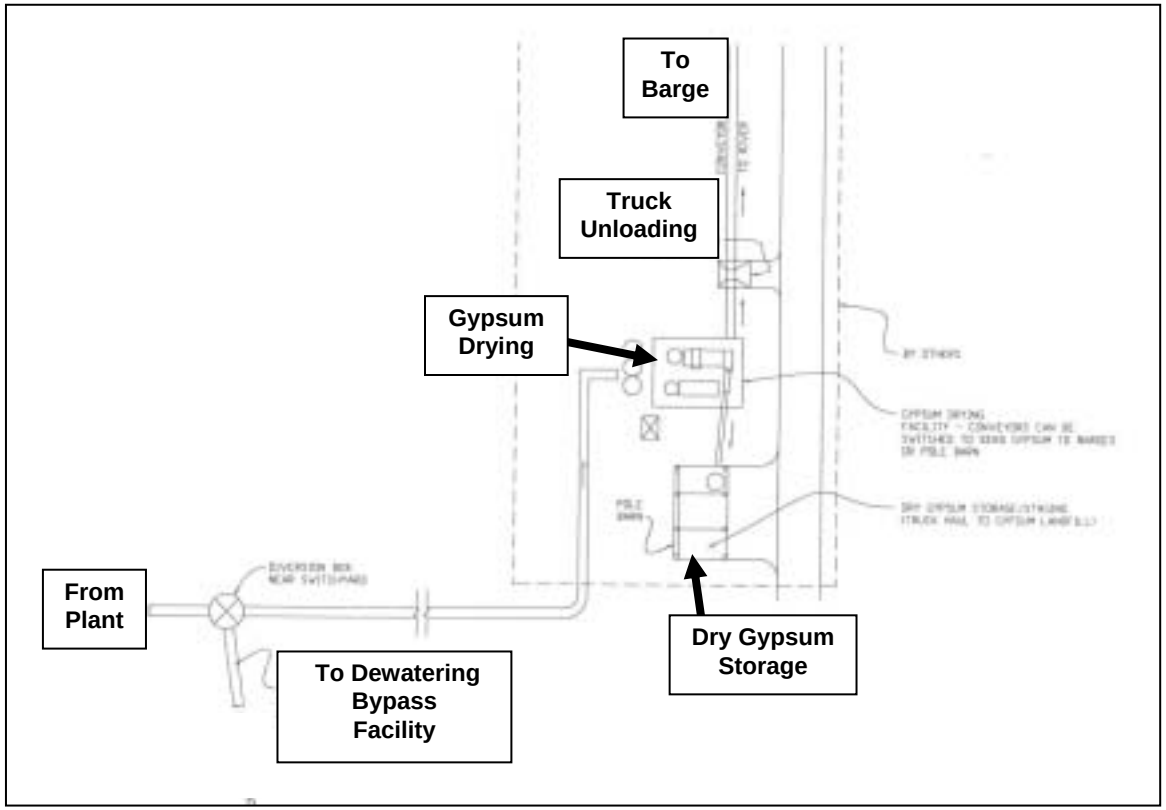


**Figure 2-7. Gypsum Drying Facility**

**Figure 2-8. Initial Surface Water Flow Scheme**

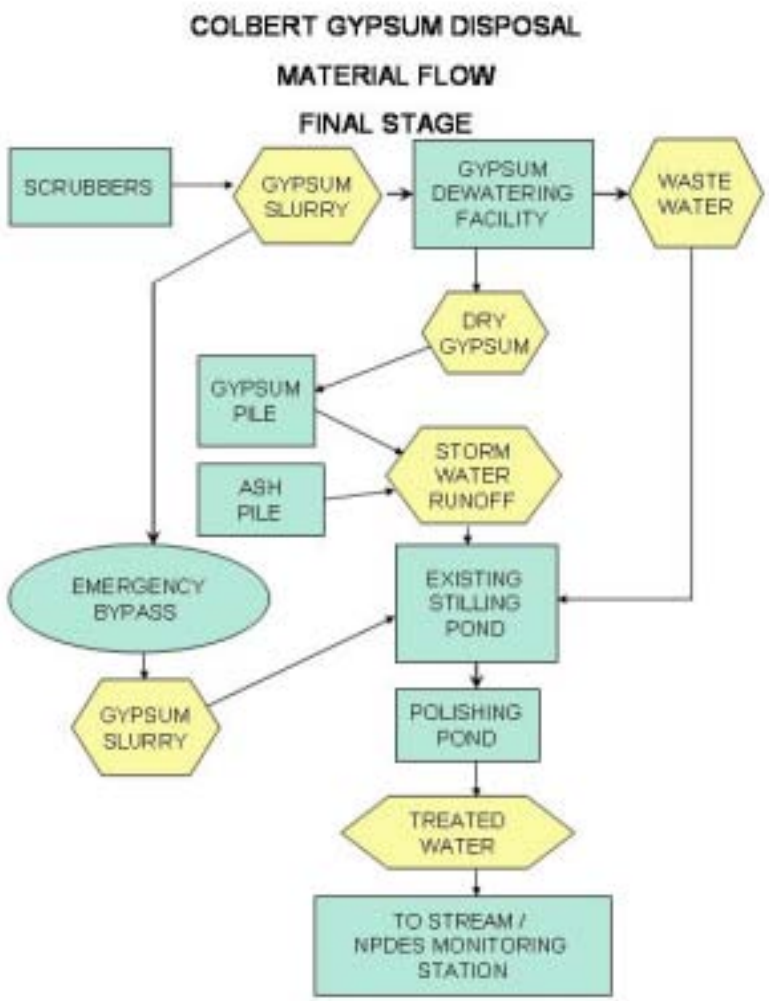


**Figure 2-9. Final Surface Water Flow Scheme**

### 2.1.5. Utility Connections and Laydown Areas

**Water Supply**
Typical process water balances for the two scrubber designs being considered are presented in Table 2-1 below. The system requires both process and cooling water. These estimates should be considered illustrative only, since they are based on preliminary design data, but are sufficient for adequate evaluation of potential environmental impacts.

**Table 2-1. Typical Process Water Balance**

| | | Flow Rate (gpm)[a] | |
|---|---|---|---|
| | **Parameter** | **Single Tower** | **Twin Tower** |
| ***Inlet*** | | | |
| | Absorber Make-up | 406 | 408 |
| | Mist Eliminator Wash | 247 | 247 |
| | Wet-dry Interface Wash | 128 | 128 |
| | FOX[b] Lance Wash | 21 | 21 |
| | Limestone Slurry | 201 | 204 |
| | Absorber Inlet | 414 | 416 |
| | **Total** | **1417** | **1426** |
| ***Outlet*** | | | |
| | Evaporation | 1070 | 1070 |
| | Carryover | <1 | <1 |
| | Absorber Bleed | 320 | 328 |
| | Other (incl gypsum crystals) | 26 | 28 |
| | **Total** | **1417** | **1426** |

a - gpm = gallons per minute
b – FOX = forced oxidation

The projections in Table 2-1 assume a 5 lb $SO_2$/mmBtu coal is burned in Unit 5. The average usage would probably be somewhat lower since Unit 5 would be fired some of the time with coal whose sulfur content would produce an $SO_2$ emission rate considerably lower than 5 lbs $SO_2$/mmBtu. The lower sulfur content would result in lower process water demand.

Cooling water for equipment (which is ideally of lower temperature than the water used for process purposes) may be obtained as a slipstream of the process water supply or be obtained from a separate source. Depending on its source and temperature, cooling water may need to be chilled before being used. No temperature constraints exist for process water. Approximately 400 gpm is expected to be needed for equipment cooling.

For this EA, it is conservatively assumed that water demands could be as high as 2,000 gpm. At this rate for a capacity factor of 75 percent, the scrubber would use approximately 788 million gallons of raw water annually. A little less than half of this would be returned to the river, while the remainder would be discharged to the atmosphere as water vapor.

The color-coded drawing (Figure D-1) in Appendix D shows alternative connection points for possible water supply. Appendix D also contains more detailed information about existing pumps and other hardware at Colbert. The options presented below for obtaining cooling and process water supply were considered for the project.

- Option 1 - Crosstie with existing U5 raw cooling water (RCW) pumps' discharge.
- Option 2 - Add pumps similar to the existing U5 RCW pumps, taking same suction.
- Option 2A - Add only 1 pump similar to the existing U5 RCW pumps, taking same suction. Use third U5 RCW pump for a spare.
- Option 3 - Add pumps similar to the PAF U3 design at intake structure
- Option 4 - Restore clear water pyrite pumps
- Option 5 - Crosstie with existing U5 fly ash sluice water pumps
- Option 6 - Any combination of above options 1-5
- Option 7 - Using any extra station sump capacity
- Option 8 - Tap condenser cooling water discharge

Appendix D contains more information about the technical aspects and feasibility of each option.

Option 3 would involve construction of new equipment in and near the COF intake channel and would involve work in the Tennessee River to dredge materials or place new structures. This option would require a USACE permit and state water quality certification. All other options involve tapping into raw or discharged piping elsewhere in the plant that have sufficient capacity for all or part of the demand.

The water supply needs of the Unit 5 FGD project (whether single or double tower) would be met by a combination of Options 1 and 8. Cooling water would be taken from an existing flange tap downstream of the three raw cooling water pumps currently serving Unit 5. These pumps are rated at 5,000 gpm each and would easily supply the 400-gpm slipstream needed to cool various scrubber components. Cooling water would be returned to various floor drains after use. Process water would be taken from the Unit 5 condenser exit stream and be incorporated into the scrubber bleed stream that is sent to the gypsum drying facility. Tapping these sources will result in no additional intake of water from the river and avoid any construction activities in the waters of the U.S.

**Power Supply**

During construction, it is estimated that 1.0 to 1.5 MVA is needed to supply equipment needs. It is expected those needs would be met by using a combination of the following options:

- Use existing welding service (150 KVA) freed up following completion of the SCR project, and
- Tap existing 4160 volt feeders used previously for the Unit 5 ID fans taken out of service when new fans were installed during the SCR project, or
- Use power available in the new Power Distribution Center (PDC) constructed to serve operational power needs of both the SCR and scrubber.

Where possible, use would be made of existing power supplies during construction.

Unit 5 would continue to produce about the same amount of gross power as it does now; however, in operational mode, the new scrubber would be a power consumer. Table 2-2 provides an approximate typical breakdown of the power demand by various scrubber system components.

**Table 2-2. Projected Operating Power Demand**

| Parameter (no. of items) | Value Total (kW)[a] |
|---|---|
| Booster Fans (none needed) | None |
| Recycle Pumps (5 or 6, with 1 spare) | 6500 |
| Oxidation Blowers (1, with 1 spare) | 900 |
| Limestone Grinding, Ball Mills (1, with 1 spare) | 925 |
| Agitators (none needed, will use jet air) | None |
| Other[b] | 2,250 |
| Margin (+25%) | 2,650 |
| **Total** | **13,225** |

a - kW = kilowatt
b – includes water pumps and station service in various buildings

Figure 2-2 shows the new transformers and power lines needed to serve the Unit 5 FGD system. Operational power needs for the limestone handling area may be met by using power available in the new SCR Power Distribution Center (PDC) constructed to serve the SCR and FGD systems. Power for the FGD system components may be obtained from the SCR PDC or by tapping the feeds for Unit 5 ID fans taken out of service when new SCR ID fans were installed, whichever is most economical and technically feasible. Two power centers will be established, one to serve the ball mills and other equipment in the limestone handling area and one to serve the scrubber equipment. Electrical equipment would be designed to meet TVA codes and safety requirements.

Figure 2-2 shows the location of the dedicated control room for the Unit 5 scrubber. Underground cables would be constructed from the control room to the scrubber, limestone preparation building, the limestone conveyor and transfer points, and the switchgear room. The control system would be designed to meet all TVA specifications for materials, performance, and fire protection.

**Equipment Laydown Areas**

Probable equipment laydown areas are shown in Figure 2-10. Typically, laydown areas are nearby and not currently used for other plant functions but have been cleared and/or previously disturbed by industrial activities. The most likely areas to be used for laydown are west of the site proposed for the scrubber. Approximately 2 to 3 acres would be devoted to fabrication activities.

The area identified in Figure 2-10 for parking (P1) is now generally free of brush and trees. Conversion of this area into a parking facility for craft personnel would involve clearing and ground surface leveling to enable access. The cleared area would be covered with bottom ash or crushed limestone to provide a stable surface for use of normal vehicular traffic during inclement weather. Signage would be erected to direct the parking of vehicles in rows and to identify entry/exit points. Parking area P2 already exists.

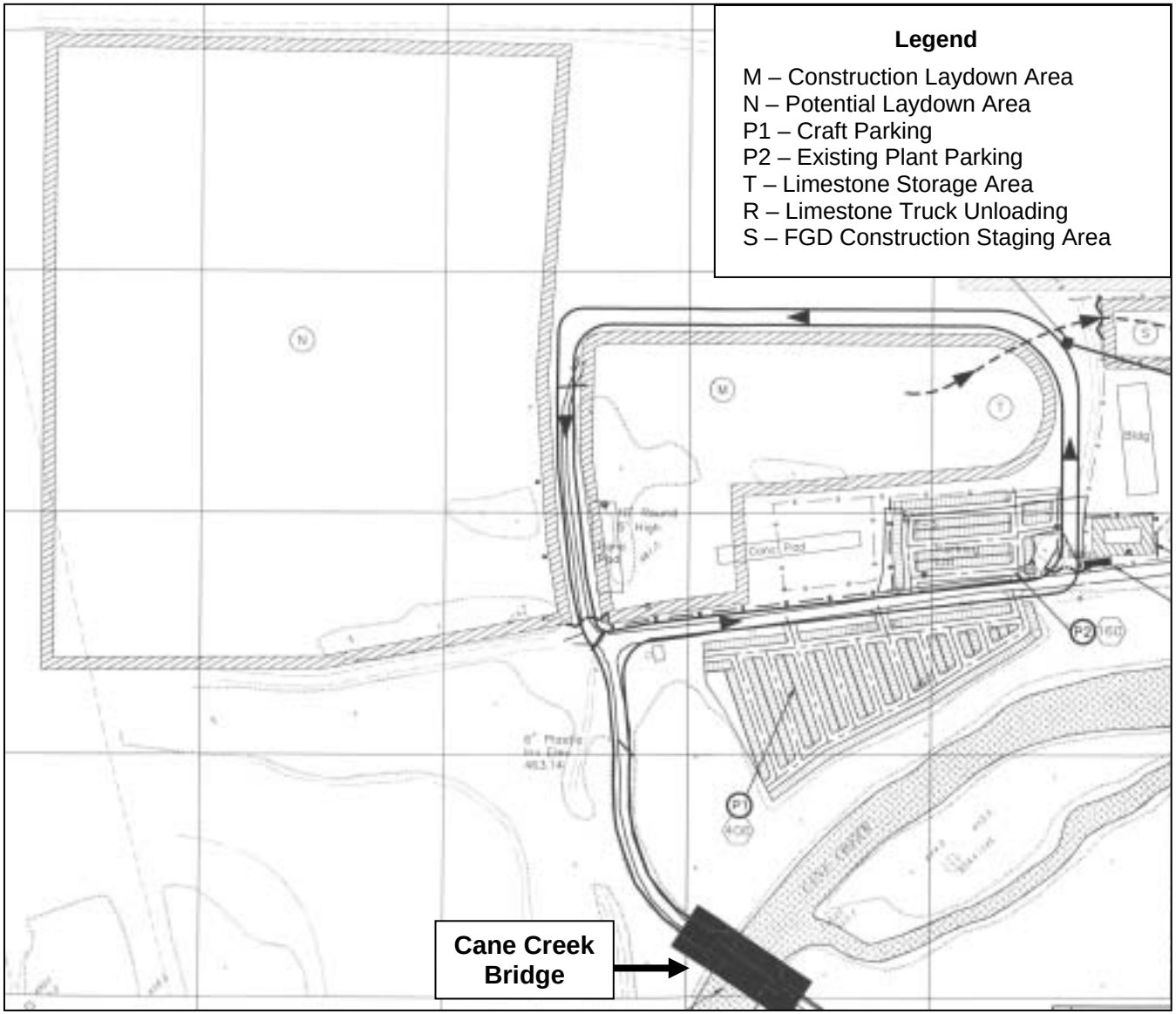


**Figure 2-10. Contractor Parking and Laydown Areas**

Construction laydown area M would be cleared of trees and brush to make room for storage of project materials and components, but not otherwise modified. Areas whose ground cover is disturbed by the unloading and loading scrubber components would be reseeded upon completion of the project. Construction laydown area N is identified for potential laydown, but would probably not be cleared unless area M runs out of space. If used, it would be modified as described above for area M.

### 2.1.6. Staffing and Workforce Management

The plot below (Figure 2-11) shows preliminary construction staffing projected for the scrubber project.

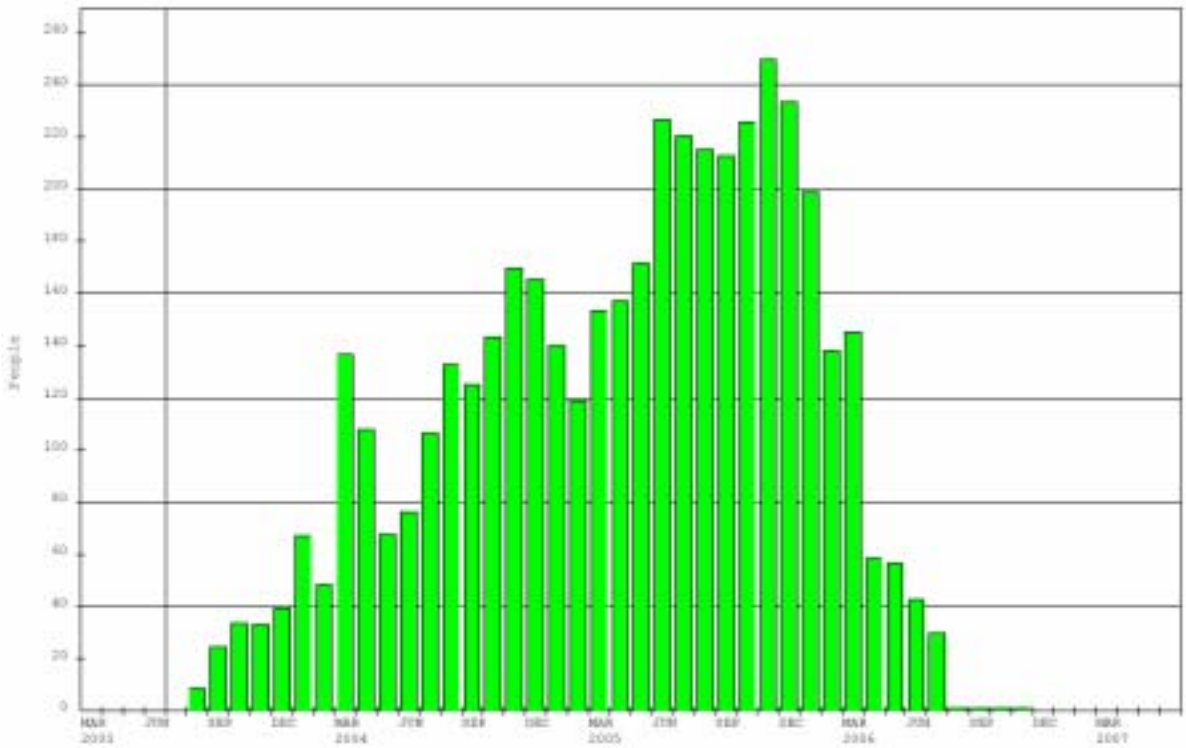

**Figure 2-11. COF Unit 5 Construction Staffing**

A conservative peak estimate for workers on site at any one time during the construction phase of the scrubber project is 575, which includes 250 for scrubber construction (all day shift), 225 permanent plant staff (day shift), and approximately 100 people working onsite on small construction projects (such as the NOxStar systems on Units 1 through 4) and/or unit outages. The most labor-intensive portion of the Unit 5 SCR construction will be completed well before significant work on the scrubber gets underway. Scrubber construction will take place during daylight hours, except to overcome unacceptable schedule delays.

Plant permanent staffing is expected to reach 250 following startup of the SCR and is expected to be increased by 25 to 50 additional people once the Unit 5 scrubber becomes operational. This would bring the total permanent daytime staff for operating the plant, complete with NOx controls and the Unit 5 scrubber, to approximately 300.

## 2.2. Alternatives to the Proposed Action

Commercially available technologies were initially considered for application at COF. Compatibility with existing operating and maintenance systems at the plant were the major considerations resulting in selection of wet limestone scrubbing as the proposed application at COF. A sodium based scrubber for a portion of the $SO_2$ emissions was briefly considered but eliminated due to time constraints. A brief analysis of the other options considered for COF can be found in Appendix A.

Under a No Action Alternative, no FGD or other system for $SO_2$ reduction from COF would be installed. A No Action Alternative would not meet TVA's goal to reduce $SO_2$ emissions from COF. The No Action Alternative for COF would likely result in the need to reduce $SO_2$ emissions from other TVA fossil plants or require purchase of additional pollution credit allowances.

## 2.3. Comparison of Alternatives

The FGD system for Unit 5 would be an addition to an expansive, heavy industrial facility having a significant property buffer, located in an area that has been heavily disturbed by previous plant developmental activities. No new facilities would be required to unload equipment transported to the site. Therefore, the potential would be small for on-site construction impacts to terrestrial ecology, aquatic ecology, noise, land use, air quality, and visual aesthetics. This system will produce gypsum (a new by-product for COF) and also result in a change in the effluent characteristics emanating from the by-product handling facility. Operational impacts are primarily dependent upon the engineering features and safeguards included in the design of the FGD system and the environmental commitments. These features and safeguards listed in Table 2-3 would minimize the probability and extent of release of pollutants to the environment.

**Table 2-3. Summary and Comparison of Alternatives By Resource Area**

| Issue Area | Impacts from No Action Alternative | Impacts from Proposed Action Alternative With Commitments |
|---|---|---|
| Air Quality | • Continuation of current air emissions from the plant; no additional impacts. | • Insignificant, transient air pollutant emissions from construction-related activities including land clearing, site preparation, and vehicular traffic. An air construction permit will be obtained.<br>• $SO_2$ would be reduced by 95 percent. |
| Terrestrial Ecology | • None to vegetation.<br>• Insignificant direct impacts to wildlife. | • No significant, adverse impacts to terrestrial ecology of state or region.<br>• Impacts to terrestrial animals would be insignificant. Minor beneficial effects to terrestrial animals both locally and regionally could result from air quality improvements.<br>• Potential for spread of intrusive terrestrial plants is minimal and insignificant. |

| Table 2-3. Summary and Comparison of Alternatives By Resource Area | | |
|---|---|---|
| **Issue Area** | **Impacts from No Action Alternative** | **Impacts from Proposed Action Alternative With Commitments** |
| Protected and Sensitive Species | • None to plants or aquatic animals.<br>• Insignificant indirect or cumulative impacts to protected terrestrial animals would persist. | • No federal-protected or sensitive plants or animals are present. No impacts to federal- or state-protected species.<br>• No adverse impacts to state-listed terrestrial animals are expected. Minor benefits may result from air quality improvement.<br>• No direct impacts on sensitive or federal- or state-protected aquatic animals or their habitats. |
| Wetlands and Floodplains | • Insignificant | • Approximately 7.85 acres of non-jurisdictional wetlands most of which are located in an NPDES permitted coal byproduct disposal area; other portion has been determined to be isolated and nonjurisdictional. If a USACE permit/state water quality certification is required, TVA would comply with mitigation requirements. Impacts would be insignificant. |
| Visual Resources | • None | • Visual aesthetic impacts at the plant site would be insignificant. Visual discord of construction activities would be temporary and minor. |
| Noise | • None | • Noise impacts from construction and operation would be minimal and insignificant. |
| Cultural Resources | • None | • A Phase II archaeological site evaluation will be necessary prior to any ground disturbance in the area for the new polishing pond. No historic properties are affected |
| Coal Combustion Byproduct Generation, Handling, and Disposal | • None | • The effects of disposal in the existing stacking area would be insignificant, and marketing of the gypsum will extend the lifetime of the stacking facility.<br>• Design constraints for the stacking area and new polishing pond have been incorporated to insure structural stability and protect surface water and groundwater. |
| Managed Areas and Ecologically Significant Sites | • None | • None |

**Table 2-3. Summary and Comparison of Alternatives By Resource Area**

| Issue Area | Impacts from No Action Alternative | Impacts from Proposed Action Alternative With Commitments |
|---|---|---|
| Surface Water and Wastewater | • None | • Minor, insignificant impacts to receiving stream from construction.<br>• No direct (toxic) impacts to Tennessee River are expected from construction or operational activities because the effluents would be required to meet National Pollutant Discharge Elimination System permit limits. .<br>• Best management practices will be implemented for all construction activities. A storm water construction permit will be obtained. |
| Groundwater Quality | • None | • Insignificant impacts to groundwater from construction activities and operational activities. CW 2 will be monitored for offsite impacts.<br>• Should the water quality of any private well be impaired by gypsum leachate contaminants such that the water is no longer suitable for its intended use, the owner would be provided either a water treatment system, a connection to the local public water system or a new well.<br>• No significant impact on river water quality is expected from proposed land disposal of gypsum generated by the Unit 5 FGD system.<br>• Design constraints for the gypsum stacking area and new polishing pond would be imposed to protect groundwater quality. |
| Aquatic Ecology | • None | • Insignificant impacts are anticipated due to increases in volume or sediment load and construction wastes.<br>• Proposed operational changes would not have a significant adverse impact on aquatic life in the Tennessee River. |
| Socioeconomics | • None | • Impacts to employment and income would be beneficial.<br>• Impacts to population and community services would be insignificant.<br>• No environmental justice impacts are anticipated. |

| Table 2-3. Summary and Comparison of Alternatives By Resource Area | | |
|---|---|---|
| **Issue Area** | **Impacts from No Action Alternative** | **Impacts from Proposed Action Alternative With Commitments** |
| Transportation | • None | • Impacts from construction would be temporary and minor.<br>• Impacts from limestone delivery would be insignificant. |

## 2.4. Summary of TVA Commitments and Proposed Mitigation Measures

**Compliance Measures**

1. An Air Construction Permit would be obtained prior to construction.
2. A state water quality certification or USACE permit for wetland alteration may be required.
3. A phase II archaeological evaluation would be required prior to construction of the new polishing pond.
4. Off-site groundwater well P2 would be monitored for off-site impacts. Should the water quality of any private well be impaired and it is no longer suitable for its intended use, the owner will be provided either a water treatment system, a connection to the local public water system, or a new well.
5. Design constraints would be implemented for the gypsum stacking area and new polishing pond to ensure structural stability and to protect surface and groundwater resources.
6. A modification to the NPDES permit to allow discharge of new effluents would be obtained prior to operation of the scrubber.
7. A storm water construction permit would be obtained prior to construction.

**Commitment Measures**

1. Portable toilets would be provided as needed for the additional construction workforce.
2. A vegetative buffer along Cane Creek adjacent to the proposed borrow area would be maintained.

## 2.5. Environmental Permits and Applicable Regulations

- Implementation of the proposed action would result in the need to modify the NPDES permit for Outfall Discharge Serial Number (DSN) 010 and the appropriate air permits issued by the state of Alabama.

- Modification of the water intake could require coordination with the USACE for a Clean Water Act Section 404 Permit; state water quality 401 certification would be obtained as needed for work on the intake.

- Alteration of wetlands requires coordination with the USACE for a Clean Water Act Section 404 Permit. Prior to alteration of wetlands, TVA would coordinate with the USACE to obtain a jurisdictional determination. If USACE determines the wetlands to be jurisdictional, TVA would obtain a USACE permit/state water quality certification as needed and comply with all mitigation requirements.

- Coverage under the construction storm water permit would be obtained from the ADEM to ensure all construction-related activities comply with applicable regulatory requirements.

- Hydrostatic test discharges would be handled in accordance with the BMP developed in accordance with the NPDES permit.

# CHAPTER 3

## 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

### 3.1. Air Quality

#### 3.1.1. Affected Environment

Air quality is an environmental resource value that is considered important to most people. Through its passage of the Clean Air Act, Congress has mandated the protection and enhancement of our nation's air quality resources. National Ambient Air Quality Standards (NAAQS) for the following criteria pollutants have been set to protect the public health and welfare:

- sulfur dioxide ($SO_2$)
- ozone ($O_3$)
- nitrogen dioxide ($NO_2$)
- particulate matter whose particles are <= 10 micrometers ($PM_{10}$)
- particulate matter whose particles are <= 2.5 micrometers ($PM_{2.5}$)
- carbon monoxide (CO)
- lead (Pb)

A listing of the NAAQS is given in Table 3-1.

National standards, other than annual standards, are not to be exceeded more than once per year (except where noted). Attainment status for the new $PM_{2.5}$ standard for any site has yet to be determined. The original timeline for this new standard required monitors to be in place nationwide, between 1998 and 2000, with data collection taking place between 1998 and 2003. Assessment of attainment status for this new standard will only be possible after 3 years of data have been collected. The results of ambient air monitoring near COF are shown in Table 3-2.

Table 3-2 gives the results of ambient air quality monitoring of criteria pollutants that are considered representative of the COF site. All areas in the vicinity of the site are currently in attainment for $PM_{10}$, $NO_2$, CO, $SO_2$, Pb, and $O_3$ standards.

**Table 3-1. National Ambient Air Quality Standards**

| Pollutant | Primary[a] | Secondary[b] |
|---|---|---|
| Sulfur Dioxide | 0.14 parts per million (ppm) (365 micrograms per cubic meter [µg/m$^3$]) maximum 24-hour concentration not to be exceeded more than once per year.<br>0.03 ppm (80 µg/m$^3$) annual arithmetic mean. | 0.5 ppm (1,300 µg/m$^3$) maximum 3-hour concentration not to be exceeded more than once per year. |
| Ozone (Old)[c] | 0.12 ppm maximum 1-hour concentration with an expected exceedance of no more than one day per year based upon a 3-year average. | Same as primary standard. |
| Ozone (New) | 0.08 ppm based on the average of the fourth-highest daily maximum 8-hour concentration during each ozone season (currently May 1 – September 30) for each of three consecutive years. | Same as primary standard. |
| Nitrogen Dioxide | 0.053 ppm (100 µg/m$^3$) annual arithmetic mean. | Same as primary standard. |
| Carbon Monoxide | 35 ppm (40 milligrams per cubic meter [mg/m$^3$]) maximum 1-hour concentration not to be exceeded more than once per year.<br>9 ppm (10 mg/m$^3$) maximum 8-hour average concentration not to be exceeded more than once per year. | None. |
| $PM_{2.5}$ (New Standard) | 15 µg/m$^3$ annual average.<br>65 µg/m$^3$ (24-hour average) | Same as primary standard |
| $PM_{10}$ | 150 µg/m$^3$ maximum 24-hour average concentration with an expected exceedance of no more than one per year based upon a 3-year average.<br>50 µg/m$^3$ annual arithmetic mean. | Same as primary standard. |
| Lead | 1.5 µg/m$^3$ maximum quarterly arithmetic mean. | Same as primary standard. |

Source: 40 Code of Federal Regulations, Part 50, as currently amended.
a - Standards set to protect public health.
b - Standards set to protect public welfare.
c - Only applicable in areas not attaining the standard prior to September 16, 1997.

**Table 3-2. Ambient Concentrations of Criteria Air Pollutants Near COF Compared With Air Quality Standards**

| Pollutant | Level of Standard (ppm)[a] | 1-Year Maximum or Mean | |
|---|---|---|---|
| | | Concentration (ppm)[a] | Percent of Standard |
| Ozone (Old Standard)[b] | Maximum 1-hour average (0.12) | 0.094[d] | 78 |
| Ozone (New Standard)[c] | 4th Highest 8-hour average (0.08) | 0.075[d] | 94 |
| Sulfur Dioxide | Maximum 3-hour average (0.5) | 0.063[d] | 13 |
| | Maximum 24-hour average (0.14) | 0.018[d] | 13 |
| | Annual mean (0.030) | 0.0022[d] | 7 |
| Nitrogen Dioxide | Annual mean (0.053) | 0.0071[d] | 13 |
| Carbon Monoxide | Maximum 1-hour average (35) | 10.1[e] | 29 |
| | Maximum 8-hour average (9) | 6.4[e] | 71 |
| $PM_{10}$ (Old Standard) | (µg/m$^3$) | (µg/m$^3$) | |
| | Maximum 24-hour average (150) | 53.0[f] | 35 |
| | Annual mean (50) | 21[f] | 42 |
| $PM_{2.5}$ (New Standard) | (µg/m$^3$) | (µg/m$^3$) | 57 |
| | Maximum 24-hour average (65) | 37.3[d] | 86 |
| | Annual average (15) | 12.9[d] | |
| Lead | (µg/m$^3$) | (µg/m$^3$) | |
| | Quarterly mean (1.5) | 0.36[g] | 24 |

a - ppm unless otherwise noted.
b - Concentration must be 0.125 ppm or higher to be considered above the level of the standard (0.120).
c - Fourth-highest concentration must be 0.085 ppm to be considered above the level of the standard (0.08 ppm).
d - Ozone 1 hour, ozone 8 hour, $SO_2$, $NO_2$, and $PM_{2.5}$ values for Colbert County, Alabama, 2003.
e - CO values for Jefferson County, Alabama, 2003.
f - $PM_{10}$ values for Madison County, Alabama, 2003.
g - Lead value for Pike County, Alabama, 2003.

The air quality in the vicinity of COF is generally good; the area complies with all ambient air quality standards, including those for sulfur dioxide ($SO_2$), nitrogen dioxide ($NO_2$), and particulate matter (PM). Regionally, air quality is also generally good. The new 8-hour ozone and $PM_{2.5}$ standards will be more stringent than the old ozone and particulate standards. Many areas are having difficulty meeting attainment of the new 8-hour ozone and $PM_{2.5}$ standards. The states have already made recommendations to EPA as to which counties should be designated nonattainment for the 8-hour ozone standard and will soon make recommendations as to which counties should be designated nonattainment for the $PM_{2.5}$ standard. EPA will finalize attainment status designations for these areas under the 8-hour ozone and $PM_{2.5}$ standard later this year.

### 3.1.2. Environmental Consequences

Under the No Action Alternative, air pollutant emissions would be unchanged. Consequently, air quality would not be improved.

**Construction Impacts**

The proposal under consideration would have associated transient air pollutant emissions during the construction phase of the project. Construction-related air quality impacts are primarily related to land clearing, site preparation, and the operation of internal combustion engines.

Land clearing, site preparation, and vehicular traffic over unpaved roads and the construction site result in the emission of fugitive dust PM during site preparation and active construction periods. The largest fraction (greater than 95 percent by weight) of fugitive dust emissions would be deposited within the construction site boundaries. The remaining fraction of the dust would be subject to transport beyond the property boundary. If necessary, emissions from open construction areas and unpaved roads could be mitigated by spraying water on the roadways as needed to reduce fugitive dust emissions by as much as 75 percent. The project would comply with Alabama regulations applicable to fugitive emissions.

Combustion of gasoline and diesel fuels by internal combustion engines (vehicles, generators, construction equipment, etc.) would generate local emissions of PM, $NO_x$, CO, volatile organic compounds, and $SO_2$ during the site preparation and construction period. The total amount of these emissions would be small and would result in minimal off-site impacts.

Air quality impacts from all of these construction activities would be temporary and dependent on both man-made factors (e.g., intensity of activity, control measures, etc.) and natural factors (e.g., wind speed, wind direction, soil moisture, etc.). However, even under unusually adverse conditions, these emissions would have, at most, a minor, transient impact on off-site air quality and be well below the applicable ambient air quality standard. Overall, the air quality impact of construction-related activities for the project would not be significant.

**Operational Impacts**

An air quality analysis was performed in accordance with the USEPA's Guidelines on Air Quality Models (USEPA, 1996). The focus of the analysis was to determine the air quality impacts of $SO_2$ emissions on the area surrounding Colbert Fossil Plant (COF) before and after installation of flue-gas desulfurization (FGD) on Colbert Unit 5.

Refined modeling was performed using the ISC3 model assuming maximum emissions. These modeling runs were made using detailed receptor sets and representative hourly meteorology. The model was run assuming a 100 percent operational load. A description of the dispersion models, sources, data requirements, and modeling results is presented in the following sections.

Five scenarios were modeled for COF, referred to below as Cases 1 through 5, to assess air quality impacts of the proposed project. Comparing the results of modeling Cases 1 and 2 allows the determination of the incremental impact of adding the proposed scrubber to Unit 5 (i.e., no other sources included) considering actual stack heights. Comparing the results of modeling Cases 3 and 4 allows the determination of incremental impact of adding the proposed scrubber to Unit 5, while reflecting the emissions from Units 1-4 (also using actual stack heights). Case 5 results reflect the modeling constraints imposed by the regulating air-permitting agency, which prohibit taking full credit for the actual height of the stack serving Units

1-4. Applicants in Alabama can take credit only for the stack height specified by regulation as Good Engineering Practice, which depends on the heights and locations of buildings and other structures in the vicinity of the stack. For the 600-foot (183.5-meter) stack serving Units 1-4, GEP is 365 feet (111.25 meters). Case 5 results show whether the proposed scrubber threatens the continued attainment of applicable SO2 ambient air quality standards near the plant and whether a reasonable expectation exists that a permit for operating Unit 5 with the proposed scrubber could be expected from ADEM. The conditions for each modeling case are described as follows:

Case 1 Unit 5 only before FGD is installed with the current stack configuration and emissions at the State Implementation Plan (SIP) limit of 4.0 lb/mmBtu.

Case 2 Unit 5 only with the proposed stack configuration and emissions based on combustion of 5.0 lb/mmBtu coal with FGD installed.

Case 3 Units 1-5 with actual stack heights and flue gas conditions for all units and emissions at the existing SIP limits for all units.

Case 4 Units 1-4 with actual stack heights and flue gas conditions and emissions at the current SIP limit of 2.2 lb/mmBtu. Unit 5 with the proposed stack configuration and emissions based on combustion of 5.0 lb/mmBtu coal with FGD installed.

Case 5 Units 1-4 with Good Engineering Practice (GEP) stack height, no plume merging, and emissions at the current SIP limit of 2.2 lb/mmBtu. Unit 5 with the proposed stack configuration and emissions based on combustion of 5.0 lb/mmBtu coal with FGD installed.

*Air Quality Dispersion Model* - The Industrial Source Complex 3 (ISC3) model, a USEPA-approved model, was used to estimate air pollutant concentrations surrounding Colbert fossil plant (USEPA, 1995b). A description of ISC3 is contained in Volume II of the user's guide. The model is based on the straight-line, steady-state Gaussian plume equation, which is used with some modifications to model simple point source emissions.

*Sources* - The physical dimensions and flue gas parameters of the stacks used in each of the modeled cases are presented in Table 3-3. The emission rates used in each of the modeled cases are presented in Table 3-4 and represent continuous operation during the year. The emissions and exhaust flows presented in these tables reflect maximum operating conditions. This approach ensured that the modeling produced conservative estimates of ambient impacts. The modeling results for Cases 1-5 are presented in Table 3-5.

**Table 3-3. Stack Locations and Physical Dimensions for Each Modeling Case**

| Unit No. | Easting (km) | Northing (km) | Stack Base Elevation (ft-msl) | Stack Height (m) | Stack Diameter (m) | Stack Exit Velocity (m/s) | Stack Temp. (K) |
|---|---|---|---|---|---|---|---|
| ***Case 1*** | | | | | | | |
| 5 | 422.240 | 3844.860 | 459 | 152.4 | 7.210 | 23.140 | 417.6 |
| ***Case 2*** | | | | | | | |
| 5 | 422.176 | 3844.942 | 459 | 111.25 | 7.7 | 15.240 | 326.4 |
| ***Case 3*** | | | | | | | |
| 1-4 | 422.320 | 3844.800 | 459 | 183.5 | 8.0 | 27.7 | 425.4 |
| 5 | 422.240 | 3844.860 | 459 | 152.4 | 7.210 | 23.140 | 417.6 |
| ***Case 4*** | | | | | | | |
| 1-4 | 422.320 | 3844.800 | 459 | 183.5 | 8.0 | 27.7 | 425.4 |
| 5 | 422.176 | 3844.942 | 459 | 111.25 | 7.7 | 15.24 | 326.4 |
| ***Case 5*** | | | | | | | |
| 1-2 | 422.320 | 3844.800 | 459 | 111.25 | 5.38 | 29.4 | 425.4 |
| 3-4 | 422.320 | 3844.800 | 459 | 111.25 | 5.6 | 29.4 | 425.4 |
| 5 | 422.176 | 3844.942 | 459 | 111.25 | 7.7 | 15.24 | 326.4 |

**Table 3-4. $SO_2$ Emissions Used in Modeling**

| Units | Emission Rate (lb/mmBtu) | Emission Rate (g/s) |
|---|---|---|
| ***Case 1*** | | |
| 5 | 4.0 | 2796 |
| ***Case 2*** | | |
| 5[a] | 0.25 | 175 |
| ***Case 3*** | | |
| 1-4 | 2.2 | 2352 |
| 5 | 4.0 | 2796 |
| ***Case 4*** | | |
| 1-4 | 2.2 | 2352 |
| 5[a] | 0.25 | 175 |
| ***Case 5*** | | |
| 1-2 | 2.2 | 1105 |
| 3-4 | 2.2 | 1247 |
| 5[a] | 0.25 | 175 |

a - Unit 5 emissions are based on coal with 5.0 lb $SO_2$/mmBtu and 95 percent $SO_2$ removal.

| Table 3-5. $SO_2$ Modeling Results | | | |
|---|---|---|---|
| | **Averaging Period** | **NAAQS ($\mu g/m^3$)** | **Concentrations ($\mu g/m^3$)** |
| ***Case 1*** | | | |
| | Annual | 80 | 6.8 |
| | 24-hour | 365 | 122.4 |
| | 3-hour | 1300 | 786.1 |
| ***Case 2*** | | | |
| | Annual | 80 | 4.0 |
| | 24-hour | 365 | 54.0 |
| | 3-hour | 1300 | 162.6 |
| ***Case 3*** | | | |
| | Annual | 80 | 9.6 |
| | 24-hour | 365 | 190.4 |
| | 3-hour | 1300 | 1060.0 |
| ***Case 4*** | | | |
| | Annual | 80 | 6.4 |
| | 24-hour | 365 | 85.4 |
| | 3-hour | 1300 | 462.1 |
| ***Case 5*** | | | |
| | Annual | 80 | 23.0 |
| | 24-hour | 365 | 322.1 |
| | 3-hour | 1300 | 978.0 |

*Receptors* - The refined ISC3 modeling was performed with receptors extracted from the United States Geological Survey (USGS) Digital Elevation Model database. The receptors covered a 12-kilometer (km) by 12-km area centered on the site. Receptors were spaced 250 m apart for a total of 2401 receptors.

*Meteorology* - ISC3 dispersion modeling was performed using 6 years (1980, 1982-86) of meteorological data based on hourly onsite surface meteorological measurements at Colbert with Huntsville NWS backup, and twice-daily upper air measurements from Nashville, Tennessee. Hourly mixing heights were determined from Nashville, Tennessee, morning and afternoon mixing depths.

*Air Quality Modeling Results* - Modeling was performed to evaluate the impact of the COF FGD project on air quality in the surrounding area. The modeling results also provide a comparison of impacts relative to established air quality metrics. In particular, pollutant-specific national ambient air quality standards (NAAQS) are the concentration levels established by USEPA to protect public health for various averaging times.

Table 3-5 summarizes the modeling results of air impacts for each case. The highest concentration (in micrograms per cubic meter) in the vicinity of the plant is presented for the annual averaging period and the highest 2$^{nd}$-highest is presented for both the 24- and 3-hr averaging periods (to enable comparison with air quality standards). The direct benefit in terms of reduced ground level $SO_2$ concentrations in the vicinity of the plant can be seen by comparing the results for Cases 3 and 4. These two cases assume Units 1-4 continue to burn

2.2 lb $SO_2$/mmBtu coal (the current SIP limit) while Unit 5 switches from a 4.0 lb $SO_2$/mmBtu coal (the current SIP limit, unscrubbed) to a 5.0 lb $SO_2$/mmBtu coal (scrubbed). Installing an FGD system on COF Unit 5 would be beneficial to air quality with no significant detrimental effects. The actual highest short-term (3-hr and 24-hr averages) ambient $SO_2$ concentrations would be reduced by more than 55 percent by scrubbing Unit 5. The annual average concentration would be reduced by about one-third. None of the maximum concentrations for any of the cases exceed the applicable NAAQS.

Emissions of other pollutants for which NAAQS exist are not expected to be appreciably changed by the addition of the scrubber. Ground-level concentrations of these pollutants may increase under some atmospheric conditions as a result of the installation of a shorter stack, but those ambient concentrations will remain well below their respective NAAQS. When the SCR is operating (which has already been constructed on Unit 5), mercury can be converted to a water-soluble compound and be removed in the scrubber at a rate of 80 to 90 percent for the type of coal expected to be burned in Unit 5 (Moore, 2003). Without an SCR, the removal of mercury in wet limestone scrubbers is typically 55 percent. Also, scrubbing is likely to capture some of the fine particulates that now escape the electrostatic precipitators in very low concentrations.

**Cumulative Regional Impacts**

The installation of FGD at COF Unit 5 is part of an $SO_2$ emissions reduction effort that contemplates FGD installation on several of TVA's fossil plants. Construction of an FGD system at Paradise Unit 3 is already underway. The other units being considered for installation of FGD are BRF Unit 1 and KIF Units 1-9. The proposed action (installation of FGD on COF Unit 5) is part of a TVA system-wide emissions reduction effort that is expected to benefit overall regional air quality.

Cumulative impacts on air quality in the Southeast due to changes in future emissions were evaluated by the Southern Appalachian Mountains Initiative (SAMI) by performing extensive photochemical and regional haze modeling. A primary conclusion from SAMI's work was that reduction of emissions within a state would provide the most improvement to the air quality within the same or adjacent states. Although SAMI did not model individual sources, the conclusions of the study can be extended to a collection of sources to infer that the primary air quality benefit of $SO_2$ emissions reductions will be within the states where they are located and in the region adjacent to those states. Thus, although $SO_2$ emissions reductions due to installation of FGD at BRF, COF, KIF, and PAF are expected to lead to improvement in overall regional air quality, the most improvement would be within the TVA region.

## 3.2. Surface Water and Wastewater

### 3.2.1. Affected Environment and Existing Wastewater Treatment Systems

**Affected Environment**

The COF site is located on the Tennessee River on Pickwick Reservoir at TRM 245 in north Alabama in a rural area near the community of Barton. The nearest major cities are Florence, Sheffield, Muscle Shoals, and Tuscumbia, Alabama, about 10 miles east of the site. Portions of the site are drained by Cane Creek, which has an average flow of 99 cubic feet per second (cfs) (Fehring, et al., 1987). The creek is classified by ADEM for the uses of swimming, fish and wildlife. The Tennessee River is classified for the uses of public water supply, fish and wildlife, swimming, and other whole body water contact sports (Alabama Water Quality Criteria Standards, 1991).

The initial source for all process wastewater at COF except for the sanitary wastewater is the Tennessee River. The Tennessee River in the vicinity of the site has experienced historical pollution problems as a result of discharges from municipal and industrial treatment facilities and nonpoint sources (Watson, et al., 1985; Mulkey, 1986; Fehring, et al., 1986 and 1987). Mercury contamination in Pickwick was a significant concern in the 1970s, but concentrations in fish have decreased to levels below Food and Drug Administration limits, and the issue is no longer considered to be significant.

Recent concerns for the reservoir have included occasional low-dissolved oxygen from Wilson Dam and occasionally questionable bacteriological quality. The city of Sheffield also has had concerns with trihalomethanes in its water supply (Fehring, et al., 1987). However, the quality is currently considered to be relatively good, typically meeting ADEM's water quality standards for the designated uses of public water supply and fish and wildlife from the Sheffield water intake at TRM 254.3 to Wilson Dam at TRM 259.4 (Alabama Water Quality Criteria Standards, 1991). Reservoir Water Quality Index values have been high, averaging over 91 for 1990, indicating very good reservoir water quality (Meinert, 1991). Unlike most other TVA reservoirs, Pickwick Reservoir does not thermally stratify, although stratification of dissolved oxygen and to a lesser extent pH does occur (Fehring, et al., 1987). Pickwick is ranked as the least nutrient laden of the nine main stem reservoirs of the Tennessee River system (Placke, 1983). The most substantive issue concerning Pickwick water quality at present would be preventing any further degradation during extreme conditions, such as low-flow drought periods, periods of zero flow, and periods of reverse flow.

Another concern is the effect of warm water discharges in the summer. The existing water discharge permits issued by ADEM are designed to protect aquatic species from ill effects due to hot water. TVA monitors water temperatures in the vicinity and inputs these data into computer models to predict when the combination of flow and weather conditions could potentially lead to water discharges in excess of limits specified by ADEM. To avoid discharging water at temperatures above ADEM-specified limits, COF curtails coal-fired generating activities as necessary to maintain compliance. These reductions in generation occasionally occur in the summertime when intake temperatures reach predetermined temperature limits.

A sample of the Tennessee River from the COF intake on April 11, 2001, had the following water quality characteristics:

- specific conductance 250 micromhos
- “M” alkalinity 92 ppm as Calcium Carbonate
- Chloride 10 ppm as Chlorine
- Hardness, total 124 ppm as Calcium Carbonate
- Iron, total 2.8 ppm as Iron

Historical ammonia nitrogen concentrations in the vicinity of COF from USEPA’s STORET database range from 0.04 to 0.3 mg $NH_3$-N/L. Historical nitrate plus nitrite concentrations in the vicinity range from 0.45 to 0.59 mg N/L. Since nitrite is oxidized to nitrate by the standard potable water treatment of chlorination, the water in the vicinity is a source of drinking water, which is well below the drinking water standard of 10 mg N/L for nitrate. Three municipal drinking water intakes are within 10 miles of COF: the city of Sheffield’s Municipal Water Intake, Colbert County Municipal Water Intake, and the city of Cherokee’s Municipal Water Intake.

The Colbert County Municipal Water Intake is located approximately 150 feet upstream of DSN 010, the COF discharge for Ash Pond 5. The intake is a 30-inch pipe that projects about 350

feet from the bank into the river. This municipal drinking water plant was scheduled to be operational in May 2003 but its completion has been delayed indefinitely. The design capacity of this plant is 5 mgd. The plant is expected to withdraw 500,000 to 600,000 gallons per day upon initial start-up and gradually increase the amount of water used as additional customers are found. This plant is equipped with standard equipment for potable water treatment, including equipment for chlorinating water.

**Existing Wastewater Treatment Systems**

*Existing Coal Combustion Byproducts (CCB) Wastewater Treatment Facilities* – The existing CCB handling systems include several areas that receive and treat CCB wastewater streams including the fly ash runoff pond (Ash Pond 5) and the bottom ash pond (Ash Pond 4). The locations of several of these ponds are shown on Figures 2-1, 2-5, and 2-6.

*Ash Pond 5 (Runoff Pond)* – COF Units 1-5 will burn approximately 3.5-4.0 million tons of coal annually. The coal averages 9.4 percent ash; with a range of 5.2-14.3 percent therefore, total ash production will average approximately 300,000-340,000 tons of ash per year. The ash is collected as either fly ash, which is fine enough and light enough to be carried with the flue gas stream exiting the boiler, or as bottom ash, which is coarser and heavier and falls to the bottom of the boiler. At COF, the fly ash/bottom ash split is approximately 90 percent fly ash and 10 percent bottom ash.

Fly ash production is approximately 270,000 tons per year. The fly ash handling system at COF is a dry fly ash handling system. ESPs capture fly ash from the flue gases into hoppers. From the hoppers, fly ash is pneumatically transported to silos.

The dry fly ash is then conditioned with water and loaded into dump trucks for transport to the fly ash disposal or utilization areas. According to the current fly ash stacking plan, the maximum active area of exposed dry fly ash at the dry fly ash stacking area would be 10 acres or less (D. W. Robinson, TVA, personal communication, 2002). As stacking areas become inactive, they would be stabilized with an interim cover, such as grass or bottom ash, for fugitive dust control. Fugitive dust control would need to be in place on the unexposed or stabilized areas. The dry fly ash stack is graded to a 1 percent to 2 percent slope at the end of each day helping to limit ponding and encourage sheet flow runoff. Runoff from the dry fly ash stacking area drains to a sedimentation pond, Ash Pond 5, where it evaporates or overflows through Outfall DSN 010 into the Tennessee River.

On average, an estimated 0.143 million gallons per day (mgd) are discharged from Ash Pond 5 through NPDES Outfall 010, which then discharges to the Tennessee River at TRM 245.8. In the plant NPDES permit, TVA is required to monitor pH, oil and grease, total suspended solids, and total recoverable arsenic in Ash Pond 5 water discharges. This ash pond currently receives water only from runoff induced by precipitation as shown in Table 3-6.

| Table 3-6. Flow Sources From Ash Pond 5 | |
|---|---|
| **Source** | **Annual Average Outflow From Ash Pond 5 (mgd)** |
| Precipitation Dry Fly Ash Stacking Area | 0.193 |
| Evaporation from Dry Fly Ash Stacking Area | -0.050 |
| Total Net Flow: | 0.143 |

*Ash Pond 4 (Bottom Ash Pond)* – Bottom ash collected in the bottom of the boiler is washed from the boiler with jets of water and sluiced to Ash Pond 4 for dewatering. Bottom ash production is expected to be approximately 30,000 tons per year. Sources of flow into Ash Pond 4 are listed in Table 3-7. In the plant NPDES permit, TVA is required to meet effluent limitations on Ash Pond 4 as shown in Table 3-8. These requirements include limitations for acute toxicity.

| Table 3-7. Inflow Sources to Ash Pond 4 | |
|---|---|
| **Source** | **Annual Average Inflow to Ash Pond 4 (mgd)** |
| Bottom ash sluice water | 5.4070 |
| Powerhouse sumps | 2.0910 |
| Coal pile runoff pond | 0.6171 |
| Dry fly ash silo wash down | 0.2880 |
| Nonchemical metal cleaning wastes (except air heater) | 0.0600 |
| Nonthermal sump | 0.0320 |
| Metal cleaning treatment pond through DSN 001b | 0.0233 |
| Septic tank through DSN 001a | 0.0080 |
| Direct precipitation onto ash pond | 0.1505 |
| Seepage from ash pond dike | -0.1560 |
| Evaporation from ash pond | -0.1201 |
| Total | 8.401 |

Source: 1999 NPDES Permit Number AL0003867

*Chemical Treatment Pond* – The chemical treatment pond receives the intermittent (once every 24 months) wash water from the units Air Preheaters and boiler wash. Effluent from the chemical treatment pond is monitored at DSN 001b before being discharged to the bottom ash pond. The chemical treatment pond is managed to meet limits listed in Table 3-8.

*Surface Runoff* – The existing plant site runoff is regulated under the Alabama NPDES Permit AL0003867. Existing facilities and BMPs are used to ensure compliance with the permit conditions. Some plant runoff is directed through the Runoff Pond and Bottom Ash Pond systems discussed above, while other runoff goes directly to the Tennessee River through permitted discharge points.

**Table 3-8. DSN 001 and DSN 001b Discharge Requirements**

| Effluent Characteristics | Effluent Limitations | | Monitoring Requirements | |
|---|---|---|---|---|
| | Monthly Average mg/L or ppd | Daily Maximum mg/L, ppd, or s.u. | Measurement Frequency | Sample Type |
| **DSN 001** | | | | |
| Flow (mgd) | Monitor | Monitor | 1/week | Instantaneous |
| pH | - | within range 6.0-9.0 | 1/week | Grab |
| Oil and Grease | 7.0 | 9.0 | 1/week | Grab |
| Total Suspended Solids | 19.0 | 55.0 | 1/ week | Grab |
| Total Copper | - | Monitor | 1/month | Grab |
| Total Iron | - | Monitor | 1/month | Grab |
| 48-Hour Acute Bio-monitoring | - | 50 percent | 1/year | Grab |
| Total Phosphorus as P | Monitor | Monitor | 1/quarter | Grab |
| Total Nitrates | Monitor | Monitor | 1/quarter | Grab |
| Hydrazine | Monitor | Monitor | 1/month | Grab |
| Ammonia as Nitrogen | Monitor | Monitor | 1/quarter | Grab |
| Total Arsenic | Monitor | Monitor | 1/ 2 weeks | Grab |
| **DSN 001b** | | | | |
| Flow | Monitor | Monitor | Daily | Total Volume Estimate |
| pH (must be 6.0 or greater) | - | Monitor | 1/discharge | Grab |
| Total Copper | 1 | 1 | 1/discharge | Grab |
| Total Iron | 1 | 1 | 1/discharge | Grab |

Source: 1999 NPDES Permit Number AL0003867
mg/L = milligrams per liter s.u. = standard unit
ppd = pounds per day mgd = million gallons per day

### 3.2.2. Environmental Consequences

Under the No Action Alternative, plant surface runoff and permitted discharges would be unchanged due to scrubber construction, so wastewaters and their receiving surface waters would not be affected.

Wastewater due to the proposed COF Unit 5 scrubber system and related activities would have no significant impact on the aquatic environment of Cane Creek or the Tennessee River. Changes in wastewater streams would occur during construction and operation of the proposed FGD systems. The following sections describe these changes and potential impacts on plant effluents and their receiving surface waters.

**Construction Impacts**

Wastewaters generated during construction of the proposed Unit 5 FGD scrubber system may include construction storm water runoff, domestic sewage, dewatering of work areas, nondetergent equipment washings using BMPs, and hydrostatic test discharges. All construction activities would be within the existing plant site. Surface runoff would flow to existing facilities that must meet regulatory requirements. In addition, a Construction Storm

Water Permit would be in effect which requires the development of a project-specific Storm Water Pollution Prevention Plan. This plan would identify specific BMPs to address construction-related activities, which would be conducted accordingly, to ensure that storm water impacts are minimized and that no sediment or other polluting materials are introduced into receiving waters. Thus, no significant impacts to Cane Creek or the Tennessee River are expected from construction activities.

*Construction Workforce Domestic Sewage Disposal* - A conservative peak estimate for workers on site at any one time during the scrubber project is 575. This is based on 250 for scrubber construction (all day shift); 225 permanent plant staff (day shift); plus an additional 100 people for a plant outage that could occur during a peak month. Portable toilets and existing facilities would be provided for the additional scrubber construction workforce. Outages occur routinely, and those additional workers would be handled by portable toilets. All portable toilets would be regularly pumped out and the sewage transported by tanker truck to a publicly owned treatment works accepting pump out.

**Operational Impacts**

Under the No Action Alternative, plant surface runoff and permitted discharges would be unchanged due to scrubber construction or operation; therefore, wastewaters and their receiving surface waters would not be affected.

During operation of the proposed Unit 5 FGD scrubber system, surface runoff should not be significantly different from current wastewaters at this site. The wastewater streams, which could change substantively under the Proposed Alternative, are the addition of FGD scrubber system wastewater, the fly ash runoff pond effluent, and the surface runoff from the proposed limestone handling area. The operation of the proposed Unit 5 scrubber would create an additional flow stream that would be eventually routed through ash pond 5, as shown in Figures 2-8 and 2-9. The estimated flow from the proposed FGD system is approximately 400 gpm (0.576 MGD), which would increase the total daily average discharge from Ash Pond 5 (DSN 010) from its current 0.143 MGD to approximately 0.719 MGD. The flows of the bottom ash sluiced and the amount of fly ash hauled to the dry stack could increase if a higher sulfur coal is burned (see Section 2.1), and the chemical characteristics of the fly ash runoff pond effluent could change because of burning higher-sulfur coal on Unit 5. The chemical characteristics of the bottom ash sluice should not change substantively.

No direct negative (toxic) impacts on the receiving streams (Cane Creek and the Tennessee River) would be anticipated because both DSN 001 (Ash Pond 4 effluent) and DSN 010 (Ash Pond 5 effluent) would be required to meet NPDES limits which will be developed to ensure water quality standards are met. Mitigative actions discussed below would be taken as necessary to meet all discharge requirements. Thus, the proposed COF Unit 5 scrubber system and the change to higher-sulfur coal would have no significant impact on the aquatic environment of Cane Creek or the Tennessee River.

*Management of Scrubber Wastewater* – The proposed addition of a wet LSFO FGD system to COF Unit 5 would consist of the following:

- One or two absorbers
- A system which receives bulk limestone and prepares a limestone slurry
- A gas handling system that would transport gas from the existing precipitators until emitted from the stack

- A new gypsum handling system

The proposed Unit 5 FGD system would be downstream of the Unit 5 ESP and NOx reduction equipment. The Unit 5 absorber(s) would contain limestone slurry in the lower portion, and oxidation air, which would be sparged or blown into the absorber liquid, would convert the dissolved calcium sulfite to calcium sulfate (gypsum). As the gypsum concentration reached about 30 percent, slurry blowdown would be initiated to maintain design solids equilibrium. The estimated flow from the proposed Unit 5 FGD system is approximately 400 gpm.

The gypsum from the Unit 5 scrubber would be piped and stacked separately from fly ash to facilitate marketing. It should not contain appreciable fly ash because of the efficiency of the existing Unit 5 ESP. With the scrubber being operational in 2007, TVA predicts that the proposed ponds would accommodate the FGD gypsum byproduct from Unit 5 for 6.6 years (assuming none is marketed) or until about 2013. Marketing of the gypsum could extend the life expectancy of the proposed ponds indefinitely. If the gypsum were marketed, the gypsum stream would be pumped from the absorber through above ground pipes to a facility for dewatering (Figures 2-1 and 2-7). As described earlier, the dewatering facility would consist of a staging area, mechanical type dryers, and loading/unloading areas. After dewatering, the gypsum would be conveyed to a barge for transport to markets. Dewatered gypsum, which would have a moisture content of about 3 to 6 percent by weight, not immediately loaded to barges would be temporarily stacked in a specially designed nearby area to await transport to purchasers.

The proposed gypsum storage area is located in the northern portion of the inactive Ash Pond 5 (Figure 2-5). Figures 2-6 shows a close-up view of the fly ash/gypsum storage areas. Figure 2-7 shows a conceptual view of the proposed gypsum drying facility. Effluent from the dewatering facility would be directed to the existing stilling pond. A sediment detention pond, or polishing pond, would be constructed to provide additional treatment of effluent from the stilling pond, which now serves the existing dry ash stacking area, but would accept dewatering effluent once that facility became operational.

Figures 2-8 and 2-9 show the initial and final flow schemes for materials associated with gypsum handling and disposal at COF. These schemes differ primarily in the way storm water runoff is handled, with storm water initially going to the polishing pond and ultimately going to the existing stilling pond before discharging through the polishing pond. Including the storm water runoff earlier with wastewater will improve water quality at discharge point DSN 010.

*Water Withdrawals for Process and Cooling Water for Scrubber System* – Based on preliminary design information, water needs for the Colbert Unit 5 scrubber have been estimated. Conservatively assuming 5 lb $SO_2$/mmBtu coal is burned in Unit 5, the total of Unit 5 scrubber process water and equipment cooling water is conservatively estimated to be 2000 gpm, which would be taken from the existing water system from within the plant. Approximately 400 gpm of the 2000 gpm will be used for equipment cooling, with the remainder going to process needs. Since this would not increase the current withdrawals, there would be no impact on the Tennessee River. The average usage would actually be somewhat lower than the estimate based on 5 lb $SO_2$/mmBtu since Unit 5 would be fired some of the time with coal whose sulfur content would produce an $SO_2$ emission rate considerably lower than 5 lbs/mmBtu. The lower sulfur content results in lower process water demand.

*Limestone Handling for Scrubber System* - The limestone for the proposed Unit 5 FGD system would be delivered by truck as described in Section 2.1.3 and Section 3.5. A conservative

estimate for the limestone needed for the proposed Unit 5 system is 160,000 tons/year. The runoff from the limestone storage areas would receive primary settling in settling ponds and then be discharged to the existing CCB wastewater treatment facilities.

*Whole Effluent Toxicity* - In order to predict the potential for toxicity resulting from the scrubber addition, TVA conducted 48-hour acute toxicity tests with fathead minnows (*Pimephales promelas*) and the daphnid, *Ceriodaphnia dubia*, using serial dilutions of scrubber pond effluent from the Cumberland Fossil (CUF) Plant, located near Cumberland City, Tennessee. This effluent was chosen as a surrogate for the Colbert Unit 5 scrubber effluent due to similarities of the proposed fuels and the scrubber configuration at the two facilities. The serial dilution approach allows comparison of the test results with the projected effluent concentration in the receiving stream so that conclusions can be drawn about the potential of impacts to aquatic life caused by discharge of the effluent.

Although there is currently no WET monitoring requirement or limitation for DSN 010, the analytical framework contained in the Technical Support Document for Water Quality-based Toxics Control (EPA/505/2-90-001) provides a basis for calculation of a “safe” instream effluent concentration based on a dilution factor derived from the stream flow relative to the effluent flow and application of a safety factor. The following equation is used to derive an $LC_{50}$ endpoint (defined as the concentration of effluent which is lethal to 50 percent of the test organisms) which must not be exceeded in order to protect aquatic life from acute toxicity.

$$LC_{50} \geq 100 \text{ percent} \div (\text{Dilution Factor}) \times 0.3]$$

Based on the Tennessee River 7Q10 flow of 7,171 MGD and the projected discharge from DSN 010 of 0.719 MGD, the $LC_{50}$ of the wastewater would have to be $\geq$ 0.03 percent for protection of aquatic life from acute toxicity. Testing showed no toxicity to fathead minnows, with the resulting 48-hour $LC_{50}$ > 100 percent effluent. Exposure of daphnids to the CUF scrubber effluent resulted in a 48-hour $LC_{50}$ of 61.2 percent effluent. These data show a safety factor of more than four orders of magnitude and thus indicate that no problem with toxicity resulting from the scrubber discharge in Outfall 010 would be expected.

No change in the quality of DSN 001 is anticipated and compliance with WET limits for that effluent has historically been 100 percent.

Under the No Action Alternative, no scrubbers would be installed on Unit 5 at the COF. Present plant activities would continue, but without the scrubbers, difficulties would ensue in meeting sulfur dioxide (SO2) emission reductions. Present levels of SO2 emissions would continue to affect the quality of wildlife habitat and visitor experience in surrounding Managed Areas and Ecologically Significant Sites.

## 3.3. Solid and Hazardous Waste and Gypsum Marketing

### 3.3.1. Affected Environment

**Construction Debris**
Construction debris would be disposed on site at the on-site inert landfill.

**Municipal Solid Waste**
Nonhazardous materials not suitable for disposal in the on-site inert landfill would be taken to the Browning Ferris Industries Morris Farm Sanitary Landfill in Lawrence, near Hillsboro,

Alabama. This landfill, a Subtitle D landfill with two clay liners and two synthetic liners, was opened in September 1997. The BFI Morris Farm Sanitary Landfill is permitted to receive 1,500 tons per day and has more than 20 years of capacity remaining.

**Coal Combustion Byproduct Generation, Marketing, and Handling**
COF Units 1-5 are expected to burn between 3.52 and 4.07 million tons of coal annually through at least 2015. As stated earlier, the coal averages ranges from 5.2 percent to 14.3 percent ash depending on the source. Total ash production will range from approximately 300,000 to 340,000 tons of ash per year. The ash is collected as either fly ash, which is fine enough and light enough to be carried with the flue gas stream exiting the boiler, or as bottom ash, which is coarser and heavier and falls to the bottom of the boiler. The fly ash/bottom ash split is about 90 percent fly ash and 10 percent bottom ash.

All bottom ash produced at COF is currently sluiced to the active bottom ash pond. Bottom ash is reclaimed for use in dike construction, roadways on the plant reservation, or for community projects like walking tracks. Between 30,000 to 34,000 tons of bottom ash are handled in this manner annually. Markets for bottom ash are currently being explored. Increasing marketability of bottom ash would require a pyrite separation system as part of the bottom ash handling equipment at the plant. Pyrites and mill rejects would be segregated from the bottom ash and handled separately if a pyrite separation system were installed. This system is not part of the current proposed FGD system and would undergo an appropriate environmental review at the time a specific project is proposed.

Prior to 1990, all fly ash was sluiced to ash ponds on the plant site and dredged to dredge cells. Failure of one of the dredge cells due to sinkhole development necessitated the conversion to dry fly ash handling. In 1990, COF converted to dry fly ash collection, but because the fly ash contains high levels of unburned carbon, the material is not suitable for most market uses like ready-mix cement. Currently, small amounts of fly ash are being marketed at COF for use in landscaping mulches, but most of the fly ash is conditioned to about 18 percent moisture in pug mills and hauled to a fly ash stacking area for disposal. Rainfall runoff from the dry fly ash stacking area is routed to a small settling pond for treatment. This pond discharges to the river intermittently through serial discharge DSN 010.

TVA is exploring ways to beneficiate the fly ash in order to reduce the carbon level, to market the material, and to avoid disposal. Several technologies are being evaluated for fly ash beneficiation. The most promising technology is carbon burn out in which the fly ash is reburned in a fluidized bed combustion process. The advantage of this process is that there are no unusable byproducts from the process. Efforts to accomplish this benefit are not part of the currently proposed project and would be the subject of future environmental review, if a specific project is proposed.

### 3.3.2. Environmental Consequences

**Construction Impacts**
The construction-related demolition debris would most likely be shipped to the BFI Morris Farm Landfill or similarly permitted Class D landfill. The amount of material generated over the life of the project requiring disposal in a landfill is significantly less than is permitted per day at the BFI Morris Farm Landfill. Since there is more than 20 years capacity at the landfill, no significant impacts to local landfill capacity are anticipated.

A new 14-acre polishing pond would be constructed to treat the effluent from the scrubber and the dry fly ash runoff area prior to discharge to the Tennessee River. A 24-acre area inside the established dry ash stacking area will be developed for use as a gypsum stacking area for any gypsum that is not marketable. Both of these areas are depicted in Figures 2-1, 2-6, and 2-7.

Both of these facilities will be constructed by excavating the soil to near bedrock to look for signs of karstic throats (sinkholes) and pinnacles. Karstic throats will be over excavated to an acceptable depth as determined by the design engineer. These areas will then be refilled with selected fill material back to the sub grade to insure structural stability. Pinnacles will be removed and three feet of sub grade will be placed over the pinnacle area prior to installation of the liner. The liner for the new polishing pond would consist of minimum three feet of clay compacted to a permeability of 1 X 10-7 cubic centimeters per second and the gypsum stacking area will consist of three feet of compacted clay with permeability of 1 X 10-6 cubic centimeters per second. Both systems would have a minimum of three feet of sub grade material above bedrock. These measures would protect the structural integrity of the systems and result in no significant impacts to the groundwater emanating from the areas.

The new scrubber on Unit 5 is expected to produce approximately 260,000 tons of marketable gypsum annually. A new gypsum dewatering facility will be conceptually constructed as depicted in Figure 2.7. The dewatering facility will consist of a mechanical dewatering system, staging area, and loading and unloading facility. After dewatering, the gypsum will be conveyed to a barge for transport to markets. If other modes of transportation are required, an additional environmental review will be conducted for the new methods of transportation.

The marketing of the gypsum has been covered in a previous EA “Coal Combustion By-Product Marketing” and FONSI dated February 1990. This EA concluded that there would not be any significant environmental consequences from marketing this material.

**Gypsum Slurry Dewatering, Transfer, and Storage System**

Gypsum is produced by the reaction of the limestone and $SO_2$ in the LSFO absorber. Because of the high quality and market value of the gypsum expected from Unit 5, facilities are being incorporated to process this material for barge transport to markets. As detailed earlier, the gypsum stream would be pumped from the absorber through above ground pipes to a facility for dewatering (Figure 2-1). Typically, this stream would flow at less than 400 gallons per minute and contain approximately 30 percent solids by weight. These solids would consist predominantly of gypsum crystals (>90 percent), but small amounts of unreacted limestone (<3 percent), other inerts (6 percent), and fly ash (< 0.5 percent) would be present.

The dewatering facility would consist of a mechanical dewatering system, staging area, and loading/unloading areas. After dewatering, the gypsum would be conveyed to a barge for transport to markets. Dewatered gypsum, which has a moisture content of about 3 to 6 percent by weight, not immediately loaded to barges would be temporarily stacked in a specially designed nearby area to await transport to purchasers, or moved to the disposal area.

The amount of gypsum produced by LSFO scrubbing is dependent on the sulfur content and heating value of the coal, absorber efficiency and the amount of coal fired. Based on preliminary assumptions of fuel quality and TVA business plan coal burn projections, estimates were prepared of the quantity of gypsum produced by the project. As noted above for the limestone, the estimates are based on conservative assumptions.

The annual gypsum production of Unit 5 is expected to be 260,000 tons/year, which is approximately equivalent to 229,000 cubic yards per year (for gypsum composed primarily of calcium sulfate). Figure 2-1 shows approximately the proposed location of the dry disposal area, which at 24 acres would be designed to accommodate nearly 1.5 million cubic yards of material. This would provide approximately 6.6 years of disposal capacity for the gypsum produced by Unit 5. TVA plans to mitigate depletion of the gypsum storage facility by aggressively marketing the gypsum.

The proposed gypsum storage area is located in the northern portion of the inactive Ash Pond 5 (Figure 2-5). Figures 2-6 shows a close-up view of the fly ash/gypsum disposal areas. Figure 2-7 shows a conceptual view of the proposed gypsum drying facility. Effluent from the dewatering facility would be directed to the existing stilling pond. A sediment detention pond, or polishing pond, would be constructed to provide additional treatment of effluent from the stilling pond, which now serves the existing dry ash stacking area but would accept dewatering effluent once that facility became operational.

Figures 2-8 and 2-9 shows the initial and final flow schemes for materials associated with gypsum handling and disposal at COF. These schemes differ primarily in the way storm water runoff is handled, with storm water initially going to the polishing pond and ultimately going to the existing stilling pond before reaching the polishing pond. Including the storm water runoff earlier with wastewater will improve water quality at exit point DSN 010.

The storm water runoff due to the proposed gypsum slurry dewatering transfer and storage systems associated with the COF Unit 5 scrubber would have no significant impact on the aquatic environment of Cane Creek or the Tennessee River.

## 3.4. Aquatic Ecology

### 3.4.1. Affected Environment

Installation and operation of the scrubber system could potentially impact aquatic communities in Pickwick Reservoir adjacent to COF. This reach of Pickwick is more riverine than conditions found nearer Pickwick Dam. The dominant factor influencing aquatic conditions in the vicinity of COF is the discharge from Wilson Dam, about 14.4 river miles upstream. TVA began a program to monitor the ecological conditions of its reservoirs systematically in 1990. Reservoir (and stream) monitoring programs were combined with TVA's fish tissue and bacteriological studies to form an integrated Vital Signs Monitoring program. Vital signs monitoring activities focus on (1) physical/ chemical characteristics of waters; (2) physical/chemical characteristics of sediments; (3) benthic macroinvertebrate community sampling; and (4) fish assemblage sampling (Dycus and Baker, 2001).

Benthic (lake bottom) macroinvertebrate and fish samples were taken in three areas of Pickwick Reservoir from 1990 through 1994, and again in 1996, 1998, 2000, and 2002 as part of TVA's Reservoir Vital Signs monitoring program. Areas sampled included the forebay (area of the reservoir nearest the dam), a mid-reservoir transition station at TRM 230, and an upper-reservoir inflow station just below Wilson Dam at TRM 259. Any fish species (and most benthic species) present elsewhere in the reservoir could occur in the vicinity of COF. Results of sampling at the transition and inflow stations are presented below because they would be more representative of fish and benthic communities in the vicinity of COF.

Benthic macroinvertebrates are included in aquatic monitoring programs because of their importance to the aquatic food chain, and because they have limited capability of movement, thereby preventing them from avoiding undesirable conditions. Sampling and data analysis were based on seven parameters that indicate species diversity, abundance of selected species that are indicative of good (and poor) water quality, total abundance of all species except those indicative of poor water quality, and proportion of samples with no organisms present. Compared to the transition stations of other TVA run-of-the-river reservoirs, the transition station benthic community at Pickwick has rated excellent in 1994, 1996, and 1998, good in 2002 (draft TVA data), but fair in 2000. The benthic community at the inflow rated fair in 1996, 1998, and 2002 (draft TVA data), and good in 1994 and 2000 compared to the inflow stations of other TVA run-of-the-river reservoirs (Dycus and Baker 2001).

The Reservoir Vital Signs monitoring program also has included annual fish sampling at Pickwick from 1990 through 1994, and in 1996, 1998, 2000, and 2002. Fish are included in aquatic monitoring programs because they are important to the aquatic food chain and because they have a long life cycle that allows them to reflect conditions over time. Fish are also important to the public for aesthetic, recreational, and commercial reasons. Ratings are based primarily on fish community structure and function. Also considered in the rating is the percentage of the sample represented by omnivores and insectivores, overall number of fish collected, and the occurrence of fish with anomalies such as diseases, lesions, parasites, deformities, etc. Compared to comparable stations at other run-of-the-river reservoirs, the fish assemblage at the Pickwick mid-reservoir station rated good in 1990, 1991, 1993, 1994, 2000, and 2002 (draft TVA data), fair in 1992 and 1998, and excellent in 1996. At the inflow, the fish assemblage has rated good in all sampling years (Dycus and Baker 2001 and draft TVA data). A total of 36 fish species were collected at the transition and inflow stations in TVA's most recent fish collections in the fall of 2002 (draft TVA data).

Freshwater mussels (bivalve mollusks) are the largest and most notable members of the invertebrate community of the Tennessee River. TVA has conducted two recent mussel surveys in the vicinity of COF. A 1992 dive survey of the reach between the mouths of Cane Creek and Mulberry Creek yielded 34 live mussels representing nine native mussel species (none were federally or state-listed as endangered species). Results indicated that very few mussels exist in this area of the reservoir, and those present are widespread throughout much of the Tennessee River system (TVA 1992). In 1998 TVA staff conducted a dive survey at the barge terminal (TRM 246.9) along the left (descending) bank just upstream of COF that identified 12 native mussel species (none were federally or state-listed as endangered species); all are widespread and abundant elsewhere in Pickwick Reservoir (Jenkinson, 1998).

Pickwick Reservoir provides many opportunities for sport anglers. A Sport Fishing Index (SFI) has been developed to measure sport fishing quality for various species in Tennessee and Cumberland Valley Reservoirs (Hickman 1999). The SFI is based on the results of fish population sampling by TVA and state resource agencies and, when available, results of angler success as measured by state resource agencies (i.e., bass tournament results and creel surveys). In 2002, Pickwick rated above average for black bass, bluegill, channel catfish, smallmouth bass, and spotted bass, but below average for crappie, hybrid striped/white bass, largemouth bass, sauger, and white bass. Fossil plant CCW discharge channels or structures have historically provided enhanced sport fishing opportunities for species such as catfish, white bass, and striped bass that are seasonally attracted to warmer waters found there.

### 3.4.2. Environmental Consequences

**Construction Impacts**
Under the No Action Alternative, scrubber equipment would not be installed or operated, and no earthmoving or clearing associated with scrubber installation would occur, so no impacts to aquatic life would result.

Under the Action Alternatives, potential construction impacts to Pickwick Reservoir would include temporary erosion and siltation resulting from earthmoving associated with the borrow area, storage areas for flyash and gypsum, and construction associated with truck routes. Minor soil disturbance may be associated with use of the equipment laydown area. Some of these areas have previously been disturbed by plant construction and modification activities, or are presently used for smaller borrow areas. Erosion and siltation impacts would be minimized by implementation of BMPs to control erosion during construction and stabilize disturbed areas after construction is complete, and by routing surface runoff to existing treatment facilities that meet regulatory requirements. These measures would substantially reduce the potential impacts in Pickwick Reservoir, to the point of causing only minor, temporary, and insignificant effects on fish and other aquatic life.

**Operational Impacts**
Water demands of the magnitude assumed for this EA would not increase intake volume or velocity since this water will be derived from existing intake sources, so significantly increased mortality of fish and aquatic life is not anticipated. The handling and storage of coal combustion products (CCP) and gypsum could result in the potential for changes in the chemistry of permitted discharges. During routine operations at COF, water discharged from the ash and gypsum storage ponds would be managed to meet appropriate discharge toxicity limits. Implementation of these measures would result in insignificant impacts to aquatic life that uses adjacent areas of Pickwick Reservoir for spawning or feeding.

## 3.5. Managed Areas and Ecologically Significant Sites

### 3.5.1. Affected Environment

The proposed project site, including Unit 5 location, borrow areas, gypsum and fly ash disposal areas, laydown areas, and staging area, is on the grounds of the Colbert Fossil Plant (COF), immediately adjacent to the Tennessee River. Directly across from the plant is the Seven Mile Island State Wildlife Management Area (WMA). The 4,685-acre WMA extends an average of one-quarter mile beyond the northern shoreline from the main channel of the Tennessee River and is a part of the Pickwick Reservoir Reservation. The Alabama Department of Conservation and Natural Resources administers waterfowl and small game hunts within the WMA.

A Nonessential Experimental Population status has been given to certain threatened or endangered species within a twelve-mile reach of the Tennessee River immediately downstream of Wilson Dam by the U.S. Fish and Wildlife Service (USFWS). This status was given to sixteen federal-listed endangered and threatened mussel species and one federal-listed endangered snail species. This area ends at TRM 246.0, three-quarters mile upstream from the COF project area (See Protected Aquatic Animals).

Both Key Cave Aquifer and Key Cave National Wildlife Refuge are three miles upstream of the COF project area. Both areas provide recharge for the Key Cave aquifer. Key Cave contains habitat for two federal-listed endangered species, one Alabama state-listed protected species,

and two Alabama state-listed special concern species. The USFWS manages the refuge for the protection of these species and to promote wildlife diversity.

A review of the Nationwide Rivers Inventory (NRI) indicates no such designated streams are within the vicinity of the proposed project area.

### 3.5.2. Environmental Consequences

Under the Action Alternative, scrubbers would be installed on Unit 5 at the COF. Although Seven Mile Island WMA is directly adjacent to the plant, the distance from the project site (0.2 miles) is sufficient to avoid significant impacts to the WMA. Best Management Practices will be implemented to protect wildlife habitat on the river during the construction phase of the project.

The Key Cave National Wildlife Refuge, Key Cave Aquifer Hazard Area, and the area containing Nonessential Experimental Population are within three miles of the project area. Because their distance is sufficient (0.75-3.0 miles), no impacts are anticipated from the scrubber installation at the COF.

Because no streams listed on the NRI occur in the vicinity of the project area, no impacts to such streams would occur as a result of the proposed Action Alternative.

Under the No Action Alternative, no effects to these managed and ecologically significant sites would occur.

## 3.6. Transportation

### 3.6.1. Affected Environment

Colbert Fossil Plant is served by highway and railway modes of transportation. Portions of the existing transportation network in the vicinity of the plant are shown in Figures 2-1, 2-4, and 2-5. The plant is located in Colbert County, Alabama, approximately 10 miles west of Tuscumbia, Alabama, and 3 miles east of Cherokee, Alabama. Truck and automobile access to the plant is via U.S. Highway 72. U.S. Hwy 72 is a principal four-lane divided highway with wide shoulders traversing a gently rolling rural area in an east-west direction through North Alabama. State Road 247 is a two-lane highway that serves as a connector and feeder route to U.S. Hwy 72. The following Table 3-9 shows the 2002 Average Annual Daily Traffic (AADT) counts (reference: Alabama Department of Transportation, Second Division, District 1).

**Table 3-9. Average Annual Daily Traffic Counts***

| Location | Number |
|---|---|
| U.S. Hwy 72 | 21,300 |
| State Road 247 | 2,360 |

*2002 ADOT

Norfolk Southern operates a main east-west rail line just south of the plant; however, no deliveries to the plant are made by rail except for special circumstances, such as transformer movements.

### 3.6.2. Environmental Consequences

If no plans are undertaken to add a scrubber facility at Colbert Fossil Plant, none of the roads listed above will be affected. By adding a scrubber facility, there will be additional road traffic generated during both the construction of the facility itself and for deliveries of limestone to the plant. This analysis is based on the impacts that truck delivery of limestone would have on the area roads. Although the rail delivery system is utilizable, rail delivery of limestone is not being considered for this facility.

**Construction Impacts**

By building a scrubber facility at Colbert Fossil Plant, there will be minor impacts to the federal, state, and county roads during both the construction and operational periods. Additional traffic generated would be for construction of the facility itself. The construction period of the scrubbers will be approximately 3 years, with the peak workforce of about 250 employees with the peak during unit outages. There will also be additional traffic added to the road network throughout the day in the form of construction material deliveries to the site (estimated at 100 deliveries per day). These deliveries may be by highway or river. Assuming an average ridership of 1.6 persons per vehicle, and a trip in and out each day, about 513 vehicles trips will be added to the road network due to daily commuters during this period. Some additional delay may be experienced at the intersection of Plant Entrance Road and U.S. Hwy 72 at shift changes. The people primarily experiencing the delay will be the construction commuters. Such a problem can be easily tolerated for the duration of the construction period. The employment levels will spike to peak levels in short durations, rising and falling quickly over a period of one to two months. A much smaller number of additional workers may be on-site performing construction-related work during the few months before and after a unit outage.

The methodology in the Highway Capacity Manual, (Special Report 209, Third Edition, Transportation Research Board, 1994) was used to identify possible traffic flow problem areas. The manual provides a qualitative method to measure the operational conditions within a traffic stream and their perception by motorists. This method takes into account lane widths, shoulder effects, average highway speed, alignment, etc. Six levels of service (LOS) are defined and given letter designations, from A to F, with LOS A representing the best conditions and LOS F the worst. At several representative points, the LOS for the existing traffic was compared to the LOS resulting from the sum of the existing traffic and the projected additional traffic. Traffic impact is considered significant if the predicted LOS drops below D.

In the long term, operation of the scrubbers would not generate any noticeable additional traffic for the roads in the local area. The roads in this area are fully capable of absorbing this additional traffic with no drop in the existing level of service currently provided to the road users. The potential traffic impact for both the construction and operational phase of the scrubber is insignificant. There is no location where the LOS provided to the commuting public drops below LOS D due to this development. Therefore, transportation impacts during construction would be insignificant.

**Scrubber Operations**

The scrubber facility will be sited in the center of Colbert Fossil Plant. After construction is completed, operation of the scrubbers will require additional permanent staff of approximately 25-50 people. Truck deliveries of limestone will be 35 per day for unit 5. The truck deliveries would not affect the capacity or level of service currently provided by the existing road network.

The proximity of a railroad “at grade” crossing is noted. On occasion, the plant access road will be blocked by a passing train. Assuming the road would be blocked an average duration of 10 minutes, one to two trucks could be queued to enter or leave the plant. There is sufficient room to store these trucks approaching from the east of COF. However, trucks arriving from the west and other inbound traffic could temporarily exceed the turn lane space and cause a short queue in the left lane of US Highway 72 East. This could be tolerated by the passing public for the short durations involved. For longer waits, alternative truck idling area is available on old US Highway 72. Overall impacts to road service due to scrubber operations would be insignificant.

## 3.7. Visual Resources

### 3.7.1. Affected Environment

Visual resources are evaluated based on existing landscape character, distances of available views, sensitivity of viewing points, human perceptions of landscape beauty/sense of place (scenic attractiveness), and the degree of visual unity and wholeness of the natural landscape in the course of human alteration (scenic integrity).

The proposed project area is located in a rural portion of northwest Alabama, lying just southeast of the confluence of Cane Creek and the Tennessee River near TRM 245. The topography is gently sloping with agricultural operations, residential development, and mixed pine forests scattered about the pastoral Colbert County countryside. Potential user groups that would likely have direct views of activities and structures introduced within the proposed project area include motorists traveling US Highway 72, recreational lake users, employees and visitors to the plant, and residents in the vicinity of the proposed project area.

Views available to employees and plant visitors along the entrance road leading from US Highway 72 to the plant vary from the initial rural character, which gradually gives way as the forest thins and the landscape becomes more industrial in character. As the entrance road continues, views open to the north and east revealing plant structures and operations in the foreground and middleground distances.

The more prominent vantage points from which to view the proposed project area are located along US Highway 72 and the Tennessee River. Views at these locations are available from the foreground and middleground viewing distances, exposing structures and buildings within the plant, coal storage areas, and ash disposal areas. However, these views are somewhat screened by mature vegetation and are available only briefly. The existing buffer leaves only the taller structures readily visible to motorists and recreational lake users from the foreground and middleground distances. The tallest of these vertical elements, the higher voltage transmission line structures and the stacks at Colbert Fossil Plant are visible for several miles into the background (4 miles and beyond) viewing distance. Direct foreground and middleground views of the plant and industrial operations are limited to locations within the plant site and the loading/mooring facilities at the shoreline.

The scenic attractiveness of the proposed project area is minimal and the scenic integrity is low to very low.

### 3.7.2 Environmental Consequences

Consequences of the impacts to visual resources are examined based on changes between the existing landscape and the landscape character after alteration, identifying changes in the

landscape character based on commonly held perceptions of landscape beauty and the aesthetic sense of place.

Under the No -Action Alternative, the scrubbers would not be installed; resulting in no need for a change in current land use within the existing Colbert Fossil Plant boundary and the visual character would remain in its current state.

Under the Action Alternative, TVA would proceed with the installation of the scrubbers, resulting in a need to alter current land use in order to support activities associated with their installation, operation, and maintenance. This would include harvesting a large percentage of the pine forest that is located to the interior of the parcel and identified as Potential Borrow Area (shown in Figure 2-1). Based on the proposed harvest boundaries, a vegetative buffer would be retained along the shoreline, at points along Cane Creek, and along much of the periphery of the Colbert Fossil Plant reservation. This retained buffer would continue to screen direct views of plant operations.

Views would change little for employees and visitors entering along Colbert Plant Entrance Road. The most discernable alterations, which would include substantial grading to the east of the site, as well as the harvesting of existing pine stands, would be viewed in the foreground of plant operations and would become visually subordinate to the overall landscape character associated with the plant site.

Views of clearing, site grading, timber harvesting, and other site preparation activities from the points along US Highway 72 and from the Tennessee River would remain in context with the existing industrial setting and the scenic value would not be substantially diminished due to the forested buffer that would be retained. Seasonal variations in foliage and vegetative cover would introduce the possibility of direct views of project operations; however, these views would be intermittent and through dormant vegetation - resulting in no adverse impacts affecting the scenic attractiveness or scenic integrity.

Area residents would likely notice an increase in equipment and personnel in the proposed project area. These impacts would be temporary and would be confined to the project period. Generally, activities occurring within the reservation boundary would not be perceivable off site, as the vegetative buffer would continue to screen views of internal operations. Direct views of construction operations would be probable as the Colbert-Reynolds transmission line crosses US 72 and views open into the project area through the transmission line right of way. This view for motorists would be brief and would be partially screened from residents living to the south of US 72 due to changes in elevation and mature vegetation. Changes visible to recreational lake users would remain visually subordinate to the established landscape character. Impacts most noticeable to those in the project vicinity would include an increase in the number and frequency of trucks entering and leaving the plant site. However, since limestone deliveries would occur during hours of normal plant operation, as previously described in Section 2.1.3., substantive impacts would be greatly reduced.

Views of these proposed alterations in landscape character would not be exceedingly visible, and upon completion, the proposed alterations would not be readily discernable from the viewing points and distances described above. Therefore, impacts to visual resources resulting from the proposed project would be insignificant.

## 3.8. Terrestrial Ecology Plants and Animals

### 3.8.1. Affected Environment

**Terrestrial Ecology (Plants)**
Colbert Fossil Plant (COF) is located within the Highland Rim section of the Interior Low Plateau Physiographic Province as described by Fenneman (1938). Botanically, the proposed project site occurs within the Mississippian Plateau section of the Western Mesophytic Forest Region as recognized by Braun (1950). In the region of northern Alabama where the project lands occur, native forest communities generally consist of mixed oak forests varying in composition in relation to topography and soils. Historically, upland forests in the project area were characterized by mixtures of southern red oak, black oak, post oak, and white oak with dogwood commonly present in the understory.

COF is located where the Tennessee River forms the county line between Colbert and Limestone Counties in north Alabama. The area in and around Colbert Fossil Plant has been heavily impacted and altered as a result of the construction and operation of the existing facilities. Field inspections in September 2003 of the areas associated with proposed action reveal that little native vegetation remains. The proposed scrubber project would impact several areas within the COF reservation. The vegetated areas to be impacted consist of immature (estimated 20-30 years) forests, early successional thickets, and industrial areas. The following areas are sites designated within COF potentially to be impacted by the installation of scrubbers on Unit 5.

The proposed borrow area is approximately 88 acres of immature forest. This forested area is comprised of loblolly pine, sweet gum, sycamore, mimosa, green ash, dogwood, black locust, redbud, and sassafras with an herbaceous layer including ragweed, goldenrod, and sericea. The proposed limestone handling area (approximately 21 acres) is a non-vegetated industrial area of the plant and is currently a gravel construction site with a small amount of exposed soil. The proposed gypsum dewatering area (approximately 2.7 acres) is an immature forested area including loblolly pine, sycamore, sweet gum, southern red oak, and dogwood. The proposed pond area (approximately 19 acres) is comprised of approximately 35 percent early successional thicket intergrading to immature forest. The early successional thicket includes a mix of herbaceous and woody vegetation (estimated age 8-15 years) with ragweed, goldenrod, sericea, pokeweed, Japanese honeysuckle, privet, sumac, mimosa, black locust, and sweet gum. The immature forest consists of southern red oak, black locust, sweet gum, sycamore, dogwood, redbud, Virginia creeper, and cross vine. The proposed flyash storage area is approximately 67 acres of early successional thicket including both herbaceous and woody vegetation with ragweed, crab grass, sericea, goldenrod, black cherry, winged elm, persimmon, sweet gum, sycamore, green ash, and southern red oak. The proposed gypsum storage area is approximately 27 acres of early successional thicket and includes a mixture of herbaceous and woody material including ragweed, goldenrod, passionflower, pokeweed, mimosa, sumac, sycamore, sweet gum, green ash, and black locust. The vegetation of all six areas is common and representative of disturbed areas in the vicinity. No uncommon plant communities are present on or adjacent to any of the six areas.

**Terrestrial Ecology (Animals)**
Wildlife habitat at the project site has been previously altered during the construction and operation of the Colbert Fossil Plant. The areas to be impacted consist of early successional habitat and young forested stands of timber. Common species of animals observed at the site include northern mockingbird, eastern meadowlark, American crow, belted kingfisher, great blue

heron, eastern cottontail rabbit, raccoon, gray rat snake, and Fowler's toad. No uncommon animals or habitat were observed at the site.

### 3.8.2. Environmental Consequences

**Terrestrial Ecology (Plants)**
The lands within the Colbert Fossil Plant reservation would remain as they are now for the foreseeable future. No impacts to uncommon terrestrial communities or otherwise unusual vegetation would be expected as a result of this Alternative. Under the No Action Alternative, no project-related impacts would result from the introduction or spread of invasive terrestrial plant species.

Some disturbance of existing plant communities would occur in installing the new scrubbers. Because no uncommon terrestrial communities or otherwise unusual vegetation occur on the lands to be disturbed under the proposed Action Alternative, impacts to the terrestrial ecology of the region are expected to be insignificant as a result of the proposed activities. No uncommon plant communities or otherwise sensitive plant habitats occur in the proposed project area. Therefore, impacts from the spread of invasive terrestrial plant species as a result of the proposed project would be minimal and insignificant.

**Terrestrial Ecology (Animals)**
Current operations at the fossil plant would continue at the site. No impacts to the area's existing terrestrial ecology would occur under the No Action Alternative.

No rare or unusual habitats exist at the site. Work associated with the proposed project would be restricted to the immediate area surrounding the fossil plant. Therefore, the proposed project would not result in direct or cumulative impacts to the terrestrial ecology of this region. The reduction in sulfur emissions from the plant would benefit terrestrial resources in the region.

## 3.9. Protected and Sensitive Species

### 3.9.1. Affected Environment

**Plants**
Review of the TVA Regional Heritage database indicates that two federally listed and 28 Alabama state-listed plant species are known from Colbert County and Limestone County, Alabama. A more detailed review of TVA Natural Heritage records indicates that three state-listed plant species are known from within five miles of COF. No federally listed plants are reported within five miles of the site (Table 3-10).

**Table 3-10. State-Listed Plant Species Reported From Within Five Miles of COF, and Federally Listed Plant Species Reported in Colbert County and Limestone County, Alabama**

| Common Name | Scientific Name | Federal Status* | State Status** |
|---|---|---|---|
| Alabama glade-cress | *Leavenworthia alabamica* | | NOST |
| Dutchman breeches | *Dicentra cucullaria* | | NOST |
| False rue-anemone | *Enemion biternatum* | | NOST |
| Leafy prairie clover | *Dalea foliosa* | LE | NOST |
| Lyre-leaf bladderpod | *Lesquerella lyrata* | LT | NOST |

**NOST=No status. Alabama Heritage does not assign a state status to listed rare plant species.
*LE = federally listed endangered: LT = federally listed threatened

Field inspection of the project area conducted in September 2003 revealed that neither these nor other federally or state-listed plant species are present on lands to be affected by the proposed activities nor are suitable habitats for such species present.

**Terrestrial Animals**

A review of TVA Regional Natural Heritage files indicates that two federally listed terrestrial species are known from the vicinity of Colbert Fossil Plant (Table 3-11). Key Cave, located approximately 4 miles upstream of the fossil plant contains a maternity colony of federally endangered gray bats (*Myotis grisescens*) during summer months. This colony of bats can forage up to 32 km from the cave including riparian areas in the vicinity of the Colbert Fossil Plant.

Federally threatened bald eagles (*Haliaeetus leucocephalus*) forage along Pickwick Reservoir throughout the year. Although no successful nests are known from the vicinity of the fossil plant, the species regularly roosts near Colbert Fossil Plant.

**Table 3-11. Federally Protected Terrestrial Animals Known From the Vicinity of Colbert Fossil Plant**

| **Common Name** | Scientific Name | Federal Status | State Status |
|---|---|---|---|
| Gray bat | *Myotis grisescens* | Endangered | Endangered |
| Bald eagle | *Haliaeetus leucocephalus* | Threatened | Threatened |

**Aquatic Animals**

Data from the TVA Regional Natural Heritage Project database and the Alabama Natural Heritage Program database indicate that seven state- and one federal-listed aquatic animal species are reported from the Tennessee River (Pickwick Reservoir) and its tributaries downstream of Colbert Fossil Plant (Table 3-12).

**Table 3-12. State- and Federally Listed Aquatic Animal Species Reported From the Tennessee River (Pickwick Reservoir) and its Tributaries Downstream of Colbert Fossil Plant**

| Scientific Name | Common Name | State Status | Federal Status |
|---|---|---|---|
| **Mussels** | | | |
| *Obovaria retusa* | Ring pink | Endangered | Endangered |
| *Ligumia recta* | Black sandshell | Special Concern | - |
| *Potamilus ohiensis* | Pink papershell | Special Concern | - |
| *Toxolasma lividus* | Purple lilliput | Special Concern | - |
| *Truncilla truncate* | Deertoe | Protected | - |
| **Fish** | | | |
| *Elassoma alabamae* | Spring pygmy sunfish | Protected | - |
| *Etheostoma Tuscumbia* | Tuscumbia darter | Protected | - |

*Mussels* – A number of surveys of freshwater mussel resources have been conducted in the upstream part of Pickwick Reservoir during the last 25 years. These post-impoundment surveys and other studies in the area suggest that five federal-endangered mussel species and several species tracked in Alabama occur in the riverine part of the Tennessee River downstream from Wilson Dam. Farther downstream in the reservoir, however, mussel diversity declines and the endangered species appear to be either absent or much less abundant.

However, the five mussel species listed in Table 3-12, including the federal-endangered ring pink mussel, have all been recently collected near Kogers Island, downstream of the project site along the north shore of the reservoir, and in the main channel of the Tennessee River (Pickwick Reservoir). None of these species has been encountered during the recent surveys adjacent to the project site.

*Fish* – The two state-listed fish species known from the area, the spring pygmy sunfish and the Tuscumbia darter, are known to occur in tributary streams in this portion of the Tennessee River system. The preferred habitat of both of these fish is springs with heavy growths of aquatic vegetation. This habitat does not occur on or adjacent to the project site, and these fish are not likely to occur in areas that could potentially be affected by this action.

**Seven Mile Island Area**

Six federal-endangered and several state-listed aquatic animal species have been observed around and upstream from the Seven Mile Island complex or from one of several tributary streams and cave systems located upstream of Colbert Fossil Plant (Table 3-13). The two cavefishes and two crayfishes are cave obligate species and are not likely to occur in the main channel of the Tennessee River. Of the remaining species known to occur in the vicinity of the Seven Mile Island complex, none have been observed adjacent to COF.

**Table 3-13. State- and Federally Listed Aquatic Animal Species Reported From the Tennessee River (Wilson Reservoir Tailwater) and its Tributaries Upstream of COF**

| Scientific Name | Common Name | State Status | Federal Status |
|---|---|---|---|
| **Mussels** | | | |
| *Hemistena lata* | Cracking pearlymussel | Endangered | Endangered |
| *Lampsilis abrupta* | Pink mucket | Endangered | Endangered |
| *Cyprogenia stegaria* | Fanshell | Endangered | Endangered |
| *Plethobasus cicatricosus* | White wartyback | Endangered | Endangered |
| *Plethobasus cooperianus* | Orange-foot pimpleback | Endangered | Endangered |
| *Actinonaias pectorosa* | Pheasantshell | Protected | - |
| *Cumberlandia monodonta* | Spectaclecase | Protected | - |
| *Ellipsaria lineolata* | Butterfly | Special Concern | - |
| *Elliptio dilatata* | Spike | Special Concern | - |
| *Lampsilis ovata* | Pocketbook | Special Concern | - |
| *Ligumia recta* | Black sandshell | Special Concern | - |
| *Obovaria subrotunda* | Round hickorynut | Special Concern | - |
| *Plethobasus cyphyus* | Sheepnose | Protected | - |
| *Pleurobema cordatum* | Ohio pigtoe | Special Concern | - |
| *Pleurobema rubrum* | Pyramid pigtoe | Protected | - |
| *Ptychobranchus fasciolaris* | Kidneyshell | Special Concern | - |
| *Quadrula c. cylindrica* | Rabbitsfoot | Special Concern | - |
| *Quadrula metanevra* | Monkeyface | Special Concern | - |
| *Toxolasma lividus* | Purple lilliput | Special Concern | - |
| *Truncilla truncata* | Deertoe | Protected | - |
| **Snails** | | | |
| *Lithasia armigera* | Armored rocksnail | Special Concern | - |
| *Lithasia geniculata* | Ornate rocksnail | Special Concern | - |
| *Lithasia lima* | Warty rocksnail | Special Concern | - |
| *Lithasia salebrosa* | Muddy rocksnail | Special Concern | - |
| *Lithasia verrucosa* | Varicose rocksnail | Special Concern | - |
| *Pleurocera alveare* | Rugged hornsnail | Special Concern | - |
| *Pleurocera corpulenta* | Corpulent hornsnail | Special Concern | - |
| *Pleurocera curta* | Shortspire hornsnail | Special Concern | - |
| *Pleurocera walkeri* | Telescope hornsnail | Special Concern | - |
| **Crayfish** | | | |
| *Cambarus jonesi* | Troglobitic crayfish | Special Concern | - |
| *Procambarus pecki* | Troglobitic crayfish | Special Concern | - |
| **Fish** | | | |
| *Speoplatyrhinus poulsoni* | Alabama cavefish | Protected | Endangered |
| *Typhlichthys subterraneus* | Southern cavefish | Protected | - |

**Nonessential Experimental Populations**
The USFWS has begun a project to establish nonessential experimental populations of 16 federally listed endangered mussels and one endangered freshwater snail in the first ten miles of Pickwick Reservoir downstream from Wilson Dam (TRM 258 to TRM 248). None of these mollusk species are currently known to exist in the river reach near COF, and these potential future populations are not expected to extend downstream into the river reach adjacent to Colbert Fossil Plant (U.S. Fish and Wildlife Service, 2001).

### 3.9.2. Environmental Consequences

**Plants**
Under the No Action Alternative, current operations of the fossil plant would continue. No occurrences of federally listed or state-listed plant species are known on or immediately adjacent to COF, therefore, no impacts to such plant species are expected as a result of the No Action Alternative.

No occurrences of federally listed or state-listed plant species are known on or immediately adjacent to the lands to be disturbed under any of the proposed Action Alternative. Therefore, no impacts to such plant species are expected from the proposed action.

**Terrestrial Animals**
No populations of state or federally listed terrestrial animals are known from the project site, although gray bats and bald eagles forage in the vicinity of Colbert Fossil Plant. The proposed activity would be restricted to the immediate vicinity of the fossil plant and would not impact gray bat and bald eagle foraging areas. The reduction in sulfur emissions would be beneficial to threatened and endangered animals in the region.

**Aquatic Animals**
Under the Action Alternatives, potential construction impacts to Pickwick Reservoir would include temporary erosion and siltation resulting from earthmoving associated with the borrow area, storage areas for flyash and gypsum, and construction associated with truck routes. Minor soil disturbance may be associated with use of the equipment laydown area. Some of these areas have previously been disturbed by plant construction and modification activities, or are presently used for smaller borrow areas. Erosion and siltation impacts would be minimized by implementation of BMPs to control erosion during construction and stabilize disturbed areas after construction is complete, and by routing surface runoff to existing treatment facilities that meet regulatory requirements. These measures would substantially reduce the potential impacts in Pickwick Reservoir, to the point of causing only minor and temporary effects on fish and other aquatic life.

Since no protected aquatic animal species are known to occur in the portion of Pickwick Reservoir that would potentially be directly impacted by construction activities, no impacts on protected aquatic species found in Pickwick Lake are expected.

Under the No Action Alternative, current operations would not change at Colbert Fossil Plant, and no impacts to protected aquatic animal species would occur. Since water use, and discharges at Colbert Fossil Plant would not differ noticeably from current operations, no impacts to protected aquatic animals in Pickwick Reservoir are expected.

## 3.10. Groundwater

### 3.10.1. Affected Environment

The Tuscumbia Limestone (Mississippian age) constitutes bedrock over the majority of the plant site and consists of up to 200 feet of medium-bedded to massive, fossiliferous limestone with abundant chert. The limestone locally contains up to 8 percent bitumen (i.e., a viscous hydrocarbon mixture) which occurs within the rock matrix and occasionally in small vugs or cavities (Benziger, 1951). The Tuscumbia is underlain by up to 200 feet of cherty limestone of the Fort Payne formation (Mississippian), followed by 30 feet of the Chattanooga Shale (Devonian). These sedimentary units are essentially flat-lying with regional dips of less than one degree. Past core drilling and outcrop observations have shown little evidence of bedrock faulting. Only one fault was identified, and its displacement was less than one foot (Benziger, 1951). Surface lineament analysis and subsurface investigations indicate two major, near-vertical bedrock joints sets present in the bedrock (Lindquist et al., 1994). One joint set is oriented approximately N45°W and the other about N45°E. Groundwater circulation through these joints is believed to be the primary mechanism responsible for development of the numerous dissolution cavities observed in the bedrock. Evidence of karst terrain is abundant with numerous sinkholes across the site and several caves along the river bluff.

The upper bedrock surface at the site is extremely irregular due to differential weathering of the limestone. Consequently, thickness of the residual and alluvial soils which mantle bedrock is highly variable, ranging from about 1 to 80 feet. Residual soils are present across most of the reservation, and generally consist of clay with variable amounts of chert gravel and cobbles. Quaternary age alluvial deposits are limited to areas along Cane Creek and adjacent to the river beneath the inactive ash pond. The alluvium is typically composed of lenticular deposits of clay, silt, sand, and chert gravel averaging about 10 feet in thickness (Benziger, 1951).

The first occurrence of groundwater beneath the site is generally near the base of the soil overburden or in the upper portion of bedrock. Exceptions occur in the immediate vicinity of plant surface impoundments, e.g., ash pond 4, the metal cleaning pond, and the stilling pond associated with inactive ash pond 5. In these areas, impoundment seepage artificially maintains saturation or near-saturation of the soil profile below the impoundment. Natural recharge of the overburden is derived from infiltration of precipitation. The Tuscumbia Limestone represents the principal aquifer in the site locality. Groundwater occurs in bedrock fractures, joints, and bedding planes, many of which have been enlarged by dissolution of carbonate minerals present in the rock matrix. Borehole flowmeter tests in 10 site wells indicate that hydraulically-active fractures are typically limited to the upper 45 feet of bedrock, with the most transmissive zones occurring between elevations 377 and 413 feet MSL (Lindquist et al., 1994). Local recharge to the bedrock aquifer occurs from several sources, including downward seepage from the soil overburden, direct infiltration of surface runoff through sinkholes and streams, and lateral inflow along the southern boundary of the plant reservation. Groundwater in the Tuscumbia generally flows northward and ultimately discharges into Tennessee River (Figure 3-1).

Private water-supply wells in the plant vicinity are listed in Table 3-14 and locations are shown on Figure 3-1. With the exception of well P2, all wells are used as backup water supplies and for nonpotable uses, such as lawn-garden irrigation and car washing. Well depths range from 136 to 265 feet suggesting that all are completed in the Tuscumbia aquifer. TVA has monitored the water quality of wells P2 and P8 at least semiannually since September 1989. Monitoring was also performed at well P3 until May 1998 and at P15 until November 1994. Evaluation of

water quality data for these wells indicates that none have been affected by plant operations (Lindquist et al., 1994; Milligan, 2001).

**Table 3-14. Well Inventory in Plant Vicinity**

| Well No. | Owner | Well Use | Depth (ft) | Comment |
|---|---|---|---|---|
| P2 | E. Buckley | residential | 190 | |
| P3 | J. Newsome | unused | 265 | residence on public water |
| P8 | G. Donald | backup | 200 | residence on public water |
| P15 | G. Foster | unused | 136 | residence on public water |
| P16 | D. Sides | backup | 220 | residence on public water |
| P17 | P. Sides | backup | 220 | residence on public water |
| P18 | F. Seward | backup | (?) | residence on public water |
| P19 | S. Dickinson | backup | 250 | residence on public water |
| P20 | D. McAnalley | backup | 180 | residence on public water |

### 3.10.2. Environmental Consequences

**Construction Impacts**
Under the Action Alternative, plant construction activities potentially affecting groundwater resources would be limited to foundation excavations requiring groundwater control. Foundation designs for the FGD system facilities are currently incomplete. However, recent experience with FGD system construction at PAF suggests that maximum excavation depths should be less than about 30 feet. Such excavations would not be expected to encounter significant groundwater because depth to water in the plant area is on the order of 35 feet. Groundwater control, if required, would be temporary and would not be expected to affect performance of off-site private wells, the nearest of which is over one mile from the construction site.

There would be no groundwater resource impacts associated with the No Action Alternative.

**Operational Impacts**
For the Action Alternative, potential sources of groundwater contamination during plant operations include infiltration of leachate from the proposed gypsum storage area and from the polishing and stilling ponds. Chemical characteristics of gypsum leachate associated with the proposed FGD system are currently unavailable. The characteristics of potential leachate from the Cumberland Fossil Plant are similar to those expected for potential leachate from gypsum slurry at COF. Analysis of a gypsum leachate sample directly collected from the slurry tank at TVA's Cumberland Fossil Plant in September 2003 very conservatively indicates aqueous concentrations exceeding EPA drinking water MCLs for cadmium, selenium, chloride, manganese, and sulfate (Table 3-15). This effluent was chosen as a surrogate for the Colbert Unit 5 scrubber effluent due to similarities of the proposed fuels and the scrubber configuration at the two facilities.

A compacted 3-foot clay liner with permeability of $10^{-6}$ or less would form the base of the gypsum storage area (Figure 2-6). Gypsum deposited in the storage area would be susceptible to infiltration of precipitation resulting in limited seepage of leachate through the bottom liner and into underlying soils. The average rate of leachate seepage from the stack is conservatively estimated to be on the order of 8 percent of local average annual precipitation (50.7 in/yr) or approximately 7,200 gpd (or 27,400 Lpd). This estimate is based on a 15-month field water balance study of a FGD waste lysimeter (Boggs et al., 1990) that exhibited an average seepage rate equivalent to 6 percent of precipitation and on hydrologic modeling of several TVA ashfills (e.g., Lindquist and Young, 1989; Young and Beard, 1989) that indicated seepage rates ranging from 3–8 percent of precipitation. Leachate seepage emerging through the base of the gypsum stack would migrate downward through the partially saturated residuum and into the underlying Tuscumbia aquifer. Groundwater flow patterns shown on Figure 3-1 indicate that contaminants entering the shallow bedrock aquifer would then flow northeastward and ultimately discharge into the Tennessee River.

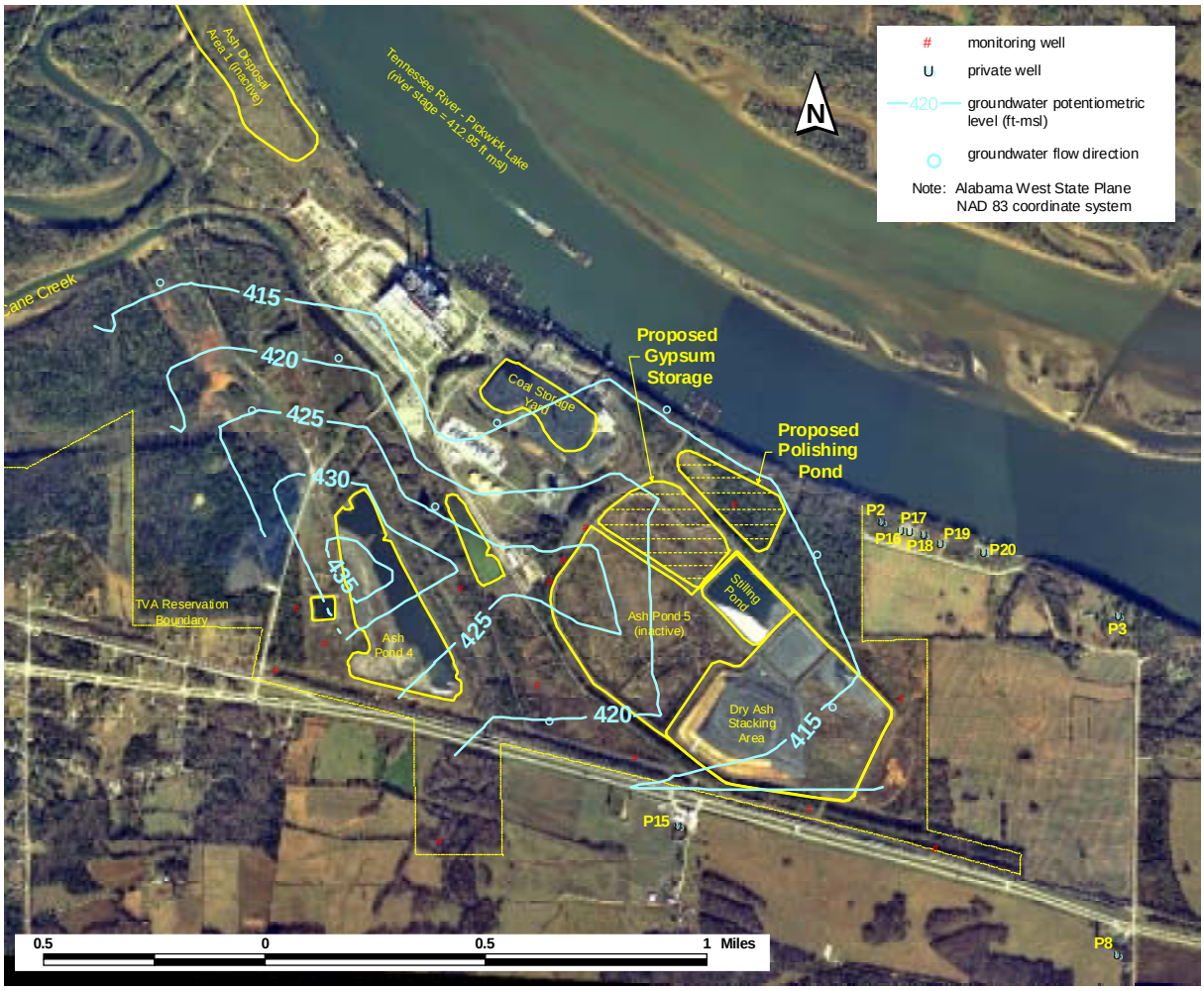


**Figure 3-1. Groundwater Levels and Movement in Tuscumbia Limestone Aquifer (April 2002)**

The existing 12-acre stilling pond and the proposed 14-acre polishing pond represent additional potential sources of gypsum leachate contamination. As discussed in Section 2.1.4, the stilling pond would receive dewatering effluent from the gypsum drying facility, emergency gypsum slurry discharges, and storm-water runoff from the gypsum stack during the later stage of operations. The polishing pond would receive effluent from the stilling pond for further treatment and during initial operations storm-water runoff. The existing stilling pond incorporates a 3-foot compacted clay bottom liner having permeability of $10^{-6}$ or less. The proposed polishing pond would be lined with 3-foot of compacted clay with permeability of $10^{-7}$ or less. Seepage estimates based on hydraulic analysis of bottom liners and underlying geologic media are approximately 14,100 gpd (53,400 Lpd) for the stilling pond and 6,000 gpd (22,600 Lpd) for the polishing pond. Gypsum-related contaminants present in seepage passing through pond bottom liners would be conservatively expected to migrate downward through the partially-saturated residuum into the underlying Tuscumbia aquifer and then flow northeastward to the Tennessee River.

Groundwater flow patterns in the site vicinity suggest that off-site wells P2 and P16 through P20 might be located downgradient of the proposed gypsum storage area and associated treatment ponds (Figure 3-1). Well P2, which also lays downgradient of the inactive ash pond and current dry ash stacking facility, has been monitored at least semiannually since September 1989. Water quality data show no evidence of ash leachate contamination of P2 (Milligan, 2001). This may be due to the fact that well P2 is relatively deep (190 feet) and may not encounter shallow groundwater in the upper portion of the Tuscumbia aquifer where leachate would be expected. On this basis, groundwater quality impacts of ammoniated ash disposal at the dry stacking facility are not anticipated at well P2 or at neighboring wells P16 through P20, which are of similar depth.

TVA will continue to monitor the water quality of P2 semiannually as an indicator of groundwater quality in this small residential community. Should the water quality of any private well be impaired by gypsum leachate contaminants such that water is no longer suitable for its intended use, the owner would be provided either a water treatment system, a connection to the local public water system, or a new well.

Conservative estimates of the individual and cumulative contaminant mass loadings to the Tennessee River from the gypsum storage and treatment facilities are provided in Table 3-15. The contaminants of concern (COC) include cadmium, selenium, chloride, manganese, and sulfate. Significant attenuation of cadmium and selenium present in gypsum leachate would be expected due to adsorption and/or complexation during migration through the predominantly clay overburden soils present beneath the site (Langmuir et al., 2003). However, for conservatism no dilution or geochemical attenuation of any of the COC was assumed during groundwater transport to the river. Cumulative COC concentration increases in the Tennessee River were estimated by summing individual COC mass loadings from the gypsum stack and associated treatment ponds, then mixing total COC loadings with the 3Q20 low flow for the Tennessee River of 8,440 cfs or $2.1 \times 10^{10}$ Lpd (personal communication, E. A. Thornton, TVA, 2002). Resulting COC concentration increases in the river are generally below standard analytical detection limits, would not result in COC concentrations exceeding primary or secondary drinking water MCLs, and are expected to have no significant impacts to any surface water resources.

**Table 3-15. Estimated COC Concentration Increases in Tennessee River Due to Gypsum Leachate Seepage**

| COC | Assumed Leachate Concentration (mg/L) | Mass Loading to River (kg/day) | | | Total Mass Loading to River (kg/day) | Estimated Concentration Increase for 3Q20 Flow (mg/L) | EPA MCL (mg/L) |
|---|---|---|---|---|---|---|---|
| | | Gypsum Stack | Stilling Pond | Polishing Pond | | | |
| Cadmium | 0.022 | 0.001 | 0.001 | 0.0005 | 0.002 | 1.1E-07 | 0.005 |
| Selenium | 0.396 | 0.011 | 0.021 | 0.0090 | 0.041 | 2.0E-06 | 0.05 |
| Manganese | 750 | 20.5 | 40.1 | 17.0 | 77.6 | 0.004 | 0.05 |
| Chloride | 1400 | 38.4 | 74.8 | 31.7 | 144.9 | 0.007 | 250 |
| Sulfate | 2700 | 74.0 | 144.3 | 61.1 | 279.4 | 0.014 | 250 |

There would be no groundwater resource impacts associated with the No Action Alternative.

## 3.11. Wetlands

### 3.11.1. Affected Environment

Ground surveys to identify wetlands were conducted on August 25-26, November 13-14, and December 16, 2003, in the areas specified for activities associated with gypsum disposal at the Colbert Fossil Plant. The specified areas are those proposed for the limestone handling area, borrow area #1, the gypsum drying facility, the gypsum storage area, the fly ash storage area, the pond area, and the alternative haul roads A, B, and C. Wetland determinations were performed according to US Army Corps of Engineers (USACE) standards (Environmental Laboratory, 1987), which require documentation of hydrophytic vegetation (Reed, 1997), hydric soil, and wetland hydrology. Wetlands, as defined in USACE's regulations at 33 C.F.R. § 328.3, were identified according to USACE standards (Environmental Laboratory, 1987). The wetlands are classified according to the Cowardin system for the classification of wetlands and deepwater habitats (Cowardin et al., 1979). Broader definitions of wetlands, such as the definition provided in Executive Order 11990 (Protection of Wetlands) and the TVA Environmental Review Procedures definition (TVA, 1983), were also considered in this review.

Wetlands were identified in the pond area (W1), the gypsum disposal area (W2), the fly ash area (W3), the alternative haul road B (W5), and in the vicinity of the pipeline between the gypsum drying facility and the barge mooring area (W4) in Figure 3-2. The total acreage in the five wetlands is approximately 24.1 acres. Wetland determination data forms are provided in Appendix E. There were no wetlands identified in the limestone handling area, borrow area 1, the gypsum drying facility area, or on the alternative haul roads A and C.

**Figure 3-2. Wetland Areas**

Wetland W1 is an approximately 2.2 acre temporarily flooded, palustrine emergent wetland (PEM1A) in the proposed pond area. The wetland has developed in depressions within a previously permitted ash disposal area, which detains precipitation and runoff due to the clay liner that was installed for the ash disposal area.

Wetland W2 is an approximately 4.3 acre seasonally inundated, palustrine emergent/scrub-shrub wetland (PEM/SS1C) that has developed above a rock-and-clay covered sinkhole in a temporarily inactive coal ash pond that has been proposed for gypsum storage.

Wetland W3 is an approximately 0.8 acre PEM1 wetland that has developed in a 15-20 feet wide swale and connected depressional areas at the bottom of a steep berm on the southern edge of inactive ash Pond 5 (proposed fly ash storage pond). Water is detained in this area due to low permeability soils (possibly a clay liner) and an absence of surface drainage.

Wetland W4 is an approximately 0.3 acre temporarily inundated depression located in a scrub-shrub area between the Tennessee River berm and the gravel road that leads to the

barge mooring area. The conveyor between the gypsum dewatering facility and the barge mooring area is proposed in or adjacent to this area.

Wetland W5 is an approximately 16.5 acre palustrine emergent wetland created for water quality enhancement (personal communication, Dave Robinson, Dec. 29, 2003). The wetland extends south from a wastewater treatment pond in a transmission line ROW to the railroad tracks (adjacent and parallel to Highway 72), and then extends to the east in an area between the railroad tracks to the south and a large ash pond to the north. Alternate Road A would cross less than 0.25 acre of this wetland at the head of an excavated channel at the north end of the wetland.

Wetlands W1, W2, W3, and W4 are located in excavated or otherwise disturbed areas with no apparent surface connections to navigable waters. The primary water sources for wetlands W1, W3, and W4 appear to be precipitation and surface runoff. Wetland W2 receives precipitation, surface runoff, and groundwater. The primary water outputs from these wetlands appear to be evapotranspiration and groundwater recharge. Wetland W5 receives groundwater, surface runoff, and precipitation, and has a permitted surface discharge to Cane Creek.

### 3.11.2. Environmental Consequences

The construction of the pond and the proposed uses of the gypsum disposal area and flyash disposal area would appear to require the filling or flooding of wetlands W1, W2, and W3. Depending on the final location for the conveyor between the gypsum drying facility and the barge mooring area, a portion of wetland W4 may be affected. Less than 0.25-acre of wetland W5, in an excavated channel on the west side of the wastewater treatment pond, would be affected by construction of the haul road Alternative C. However, Alternative A has been chosen as the Action Alternative, and no effects are expected on this wetland.

The wetland impacts resulting from this project are expected to be insignificant individually and cumulatively because of the low functional and structural quality of wetlands W1 through W4 and the small size of the affected area of wetland W5.

The primary functions performed by the wetlands identified in the proposed project areas are those related to water quality and wildlife habitat. It is unlikely that the water quality functions of these wetlands have a significant effect on the water quality of the adjacent Tennessee River because they do not appear to be part of the active sections of the existing wastewater treatment system, and all except wetland W5 contain a large amount of coal ash. It is likely that the amount of coal ash in the wetland substrates has reduced or overwhelmed the capacity of the wetlands to transform or immobilize contaminants. If so, the wetlands may not contribute, or may contribute only minimally, to water quality improvement. Any loss or diminution of water quality functions is likely to be replaced or enhanced by the existing settling pond and the polishing pond proposed as part of the scrubber project, and in compliance with the NPDES permit.

The wetlands are utilized by common resident wildlife (i.e., deer, rodents, raccoons, hawks, and coyote) and migratory species (waterfowl and songbirds). The loss of these wetlands is not expected to have an impact on wildlife populations because of the small area of loss, the relatively low habitat quality of the wetlands, and the ability of the wildlife to move to and utilize other habitats and wetlands in the general vicinity.

The discharge of dredge or fill into Waters of the United States is regulated under Section 404 of the federal Clean Water Act (CWA). Section 404 permits are issued by the U.S. Army Corps of Engineers only after the state has issued a water quality certification under Section 401 of the CWA. Under normal circumstances, to conduct activities in wetlands a Nationwide General Permit or an Individual Permit from the U.S. Army Corps of Engineers is required. The regulations in 33 CFR 328.3 states that “Waters of the U.S.” do not include waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of the Clean Water Act. The identified wetlands are in an NPDES-permitted ash disposal area. The USACE would be consulted to confirm that the identified wetlands would be exempt from CWA Section 404 requirements. However, if the wetlands are determined to be jurisdictional by the USACE, the appropriate Section 404 permits would need to be obtained. Appropriate Best Management Practices would be implemented to minimize impacts to those wetlands or portions of wetlands that are outside of the area of permitted fill.

As a federal agency, TVA follows the directives under Executive Order (EO) 11990 (Protection of Wetlands). EO 11990 requires federal agencies to provide leadership and take action to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities. It also requires agencies to consider factors relevant to a proposal’s effect on the survival and quality of the wetlands, including maintenance of natural systems, conservation and long-term productivity of existing flora and fauna, species and habitat diversity and stability, hydrologic utility, fish, wildlife, timber, and food and fiber resources, as well as other uses of the wetlands in the public interest. Due to the location of the wetlands in a highly disturbed waste disposal area, the dominance of common vegetation species in the wetlands, and relatively low functional quality of the wetlands, the proposed activities are expected to have an insignificant impact on the factors considered under EO 11990.

The proposed polishing pond would encompass a 2.2-acre PEM1A wetland area (W1), and the gypsum disposal area would cover a 4.3-acre PEM/SS1C wetland (W2) and an 0.8-acre PEM1 wetland (W3) in the existing NPDES permitted disposal. No current plans exist to alter either of the wetlands identified as W4 and W5. The barge loading conveyor may cross W4 but detailed designs are not available at this time. This issue will be addressed during the design phase for the gypsum de-watering facility. W5 will be avoided buy utilization of option A for transporting limestone into the plant. The entire areas of W1, W2, and W3 would be affected by construction of the proposed polishing pond. The proposed polishing pond would be needed to ensure compliance with applicable NPDES permit discharge criteria for the proposed scrubber. Because the proposed polishing pond is located adjacent to the existing permitted coal combustion by-product disposal area and there is not another area large enough for the pond or current plans to construct a new disposal area, there is no practicable alternative to construction of the project in wetlands. Given the conditions above, TVA has ensured that all practicable measures and BMPs will be utilized to minimize wetland impacts. Thus, the directives under EO 11990 have been met, and overall wetland impacts would be insignificant.

## 3.12. Socioeconomics

### 3.12.1. Affected Environment

COF is located in Colbert County, Alabama, west of Tuscumbia. Colbert County, along with Lauderdale County to the north, constitutes the Florence Metropolitan Area. The central cities of the metropolitan area are Florence (in Lauderdale County) and Muscle Shoals, Sheffield, and Tuscumbia (in Colbert County). According to the 2000 Census of Population, the total population of the metropolitan area is 142,950, of which 54,984 are in Colbert County. Colbert County has a somewhat greater share of its employment (about 20 percent) in government than the state as a whole (16 percent) and a smaller share (about 20 percent) in services (26 percent statewide). There is a smaller share of Colbert County's workers employed in managerial and professional jobs and other white-collar occupations and more in blue-collar occupations, compared to the state. The latter span the range of skill requirements.

The labor market area is defined to include the adjacent counties, including Tishomingo County, Mississippi, west of the site; also included are Madison and Morgan Counties, in which are located the cities of Huntsville and Decatur. The two latter counties, along with the Florence Metropolitan Area, are likely major sources of employment for any construction activity.

*Population* - As noted above, the population of Colbert County is 54,984, which is an increase of 6.4 percent compared to the 1990 Census count of 51,666. This was a slower rate of growth than the state of Alabama, which increased by 10.1 percent. The labor market area grew faster than the state, reaching a 2000 population of 681,579, an increase of 13.3 percent from the 1990 total of 601,427.

The population in Colbert County is 81.5 percent white and 16.6 percent black or African American. The minority population of the county, including the white Hispanic or Latino population, is 19.1 percent of the total.

*Income and Employment* - Per capita personal income in Colbert County in 2000 was $22,299, almost 95 percent of the state average of $23,521, and almost 76 percent of the national average of $29,469. The level was higher in the labor market area as a whole, $24,884 or 106 percent of the state and 84 percent of the nation. There was considerable variability, however, among the counties in the labor market area, ranging from $17,003 in Tishomingo County, Mississippi, to $28,995 in Madison County. The largest source of earnings in Colbert County in 2000 was government employment, which contributed 29.1 percent of earnings, followed by manufacturing, with 22.3 percent of the total, and services, with 14.1 percent.

With a civilian labor force of 25,245 in 2001, Colbert County had an unemployment rate of 8.4 percent, well above the rate in the labor market area (5.3), the state (5.3), and the nation (4.8). The distribution of jobs by industry in Colbert County is somewhat different from that of earnings. Government is also the largest source of jobs, providing 20.3 percent of the total. However, due to relatively higher wages and fewer part-time jobs, manufacturing provides a smaller share (16.1 percent) of jobs than of earnings (22.3 percent). On the other hand, services provide a larger share of jobs (19.7 percent) than of earnings (14.1 percent).

### 3.12.2. Environmental Consequences

**Construction Impacts**
Under the No Action Alternative, no construction activity would occur. Therefore, there would be no impacts.

*Employment* - Under The Action Alternative, a scrubber system would be installed on Unit 5, and no action would be taken on Units 1 through 4. The construction period for the unit is estimated to be about 36 months, with peak employment levels corresponding with outages in early 2004 and in 2006. Maximum employment at any one time would be close to 575 workers. Employment would peak during the 2006 outage, with a somewhat smaller peak during the early 2004 outage. Between these peaks, employment would generally be in the 100 to 200 range. The peaks themselves would be of short duration, spiking up and back down over a period of about 8 months or less. Related construction activities, such as road grading and widening or office building or demolition, might occur during unit construction. However, these activities would employ only a few additional workers and would be short lived. Therefore, they would not add significantly to the peak employment levels.

Based on experience and on the proximity of the site to Huntsville, as well as to the Florence Metropolitan Area, most of these workers are expected to live in the general area, close enough that they would commute rather than move. However, some would move to the general vicinity of the plant.

*Income* - Total cost of labor for the unit under the Action Alternative is expected to be a few million dollars, somewhere around 1 percent of the annual earnings of Colbert County. However, since many of the workers would commute from other counties, the actual impact on Colbert County would be much less. The expected total cost of labor would be a minor addition to earnings, less than one-tenth of 1 percent of earnings in the labor market area. Construction-related purchases in the area would be minor but, along with spending by workers who temporarily move to the area, would have a small but positive impact on income in the county and surrounding area.

*Population* - Since only a small share of the workers are expected to move into the area, the maximum impact on population under the Action Alternative at any one time would probably be less than 200 workers plus whatever family they brought with them. As noted above, the peaks would be of very short duration, spiking up and back down over a period of about 3 months. Because of this short duration, the number of family members who move with the workers would probably be low. It is likely that the maximum population impact at any one time would be around 300 persons, about one-half of 1 percent of the current population of Colbert County. The distribution of this population among counties and within counties would depend largely on the availability of housing or of sites for trailers. Locations near the site or near shopping and other amenities would generally be preferred.

*Community Services* - Under the Action Alternative, impact on community services, such as police, fire, and medical, would be small because of the small size of the impact on population and because of the short duration of the maximum impact.

**Operational Impacts**
Once the construction is complete, any operational changes would be minor under any of the Action Alternative and would have no noticeable socioeconomic impacts. Under the No Action Alternative, there would be no impacts on operations.

*Environmental Justice* - The proposed actions would physically be a minor addition to an expansive heavy industrial facility having a significant property buffer area. Therefore, there is low potential during construction for important impacts on any of the residents of the surrounding area, and there are unlikely to be any disproportionate impacts to minority or low-income populations. On the other hand, all the residents of the surrounding area, including minority and low-income residents, would benefit from the resulting reduction in $SO_2$.

In general, operational impacts would be minor and not noticeable to residents of the surrounding area. Demographic data for areas around the site indicate that disproportionate impacts to minority or low-income populations would be unlikely. Data from the 2000 Census of Population show that the Block Group (a Census of Population subcounty geographic unit) in which the plant is located has 9.2 percent minority population and a poverty rate of 15.0 percent. This minority population share is lower than the county as a whole, as well as the state average; the poverty rate is slightly higher than the county, but lower than the state level. Areas immediately around the plant site, as shown in Table 3-16, have minority population levels well below the statewide average, with poverty rates slightly higher than the state average.

**Table 3-16. Minority, Low Income, and Total Population Levels for Areas Surrounding Colbert Fossil Plant**

| Distance From Site to Endpoint | Total Population, 2000 | Minority Population, 2000 (%) | Low-Income Population, 1999 (% below poverty level) |
|---|---|---|---|
| 5.8 km (3.6 miles) | 1,661 | 13.5 | 17.7 |
| 11.1 km (6.9 miles) | 8,698 | 12.4 | 16.5 |
| Colbert County | 54,984 | 19.1 | 14.0 |
| Lauderdale County | 87,966 | 12.2 | 14.4 |
| Alabama | 4,447,100 | 29.7 | 16.1 |

Source: Based on data from the U. S. Bureau of the Census, 2000 Census of Population

## 3.13. Noise

### 3.13.1. Affected Environment

The Colbert plant is located approximately 10 miles west of Tuscumbia, Alabama. It is situated in a rural area, between Highway 72 and the Tennessee River. The nearest sensitive receptor is a home located on Plant Entrance Road near the intersection of Old Highway 72. This residence is located very close to the plant boundary, though it is approximately 0.8 miles from the proposed FGD/Limestone Handling Area. It is located approximately 180 feet from Plant Entrance Road, 400 feet from Highway 72, 230 feet from Old Highway 72 and 200 feet from the railroad tracks. In addition, there are numerous homes along Highway 72 between the quarries that would likely be used and Colbert plant. There are also numerous homes along County Road 57 between the Rogers Group Tuscumbia Quarry and Highway 72. Numerous trucks from local quarries currently use

Highway 72, Old Highway 72, and County Road 57, so the homes along these roads are already exposed to intermittent high noise levels.

Ambient noise was measured with a Bruel&Kjaer 2237 Integrating Sound Level Meter on Nov. 25 and 26, 2003. Measurements were taken in three locations: 1) adjacent to Plant Entrance Road near the nearest residence, 2) at the corner of Highway 72 and Plant Entrance Road, and 3) on County Road 57 in front of the Air Evac Lifeteam heliport. All three locations are affected by noise from trucks. Locations 1 and 2 are also affected by railroad noise. Noise levels were measured three to five times at each location and each measurement lasted for five minutes. Leq is the continuous equivalent sound level or the "average" noise level during the measurement period. While Leq is very valuable for describing continuous noises, it is less useful for intermittent noises such as traffic.

Leq smoothes out the discrete high-level events, such as trucks passing, to the point of eliminating the annoyance factor of the events. MaxP is the maximum peak sound level during the measurement, which is an important descriptor for intermittent noises. The average Leq and the maximum MaxP of the measurements are shown in Table 3-17.

**Table 3-17. Average and Maximum Noise Levels**

| Measurement Location | Average Leq (dBA) | Maximum peak sound level (dBA) |
|---|---|---|
| 1) 180 ft from Plant Entrance Road at nearest residence | 54.9 | 89.6 |
| 2) 150 ft from Highway 72 at Plant Entrance Road | 63.5 | 96.7 |
| 3) 150 ft from County Road 57 at Air Evac Lifeteam heliport | 47.7 | 90.9 |

Noise levels were also measured at location 1 while a train passed on railroad tracks approximately 190 feet away. This measurement lasted for 2 minutes and 17 seconds, the time required for the train to pass. The peak noise level was 117.5 dB and the Leq was 84.0 dB. It is estimated that 15 to 30 trains per day use the railroad tracks adjacent to locations 1 and 2.

Average noise levels in rural areas are typically around 40 dB during the day, so noise levels at these three locations are currently well above typical levels for rural areas.

### 3.13.2. Environmental Consequences

**Construction Impacts**

Construction would normally take place during weekday/daytime hours; however, construction could occur during nights or weekends, if necessary to maintain schedule. Noise occurring between 10 pm and 7 am is normally considered more annoying than noise occurring during the day, so the plan to limit construction activities to daytime hours would help to reduce possible noise impacts. The first phase of construction would be site preparation, which would use compactors, front loaders, scrapers, excavators, and graders. This type of equipment is expected to generate noise levels from 79 to 88 dBA at 50 feet.

The next phase of construction includes the building of the limestone preparation area, ball mill, FGD system, new stack, and gypsum handling system. This phase would use concrete mixers, cranes, pumps, generators, and compressors, which would generate noise levels from 76 to 85 dB at 50 feet. The final phase of construction would be clean up and testing which would not use equipment that generates significant noise. In general, noise from construction activities would be similar to noise from current plant operations.

Maximum construction noise of 88 dBA at 50 feet would be around 50 dBA at the nearest residence approximately 0.8 mile away. This would likely be audible over background noise levels between other intermittent noise sources, such as passing trucks and trains, but it would not increase average noise levels significantly**.**

Because of the temporary nature of construction, the similarity of construction noise to plant operating noise, the high noise levels of trucks and trains in the area, and the distance to the nearest receptors, noise impacts from construction are expected to be insignificant.

**Operational Impacts**

Traffic noise impacts were determined by comparing predicted future noise levels with predicted existing noise levels. While the absolute value of these predicted noise levels may be over-estimated, the relative change is still a good indicator of potential impact. FHWA regulations consider an impact exists if predicted future levels “substantially exceed” existing levels, however FHWA does not define “substantially exceed.” Alabama Department of Transportation (TDOT) defines “substantially exceeds” as an increase greater than 15 dBA. For this analysis, three impact levels were used: an increase of 5 dBA or less is defined as “no impact,” an increase of 6 to 15 dBA is defined as a “moderate impact” and an increase greater than 15 dBA is defined as a “substantial impact.”

Operation of the proposed scrubber and ball mill will generate additional noise. The vendor specification for the ball mill is 85 dBA at 3 feet. This noise level would not be audible over background noise levels at the nearest residence 0.8 mile away. The FGD system would include slurry pumps, pump motors, modulating control valves, valve motors, oxidation air system blowers and blower motors, agitation system motors, and induced draft fan motors. The vendor specifications of each of these components require noise levels not to exceed 85 dBA at 3 feet. However, because of the additive effect of noise sources located close to one another, the total FGD operating noise level is likely to be somewhat higher than 85 dBA. If we assume the FGD system generates 95 dBA at 3 feet, the noise level at the nearest residence 0.8 mile away would be approximately 32 dBA, which is not expected to be audible over background noise.

In addition to the operation of the FGD system, another potential noise impact would be from the trucks that deliver limestone to the plant. Limestone would normally only be delivered on weekdays during the day shift. Under Haul Road Alternatives A, B, and C approximately 35 truck loads per day or 4.4 truck loads per hour would be required (Figure 2-1). Depending on which quarry is used, these trucks would either travel on Highway 72 and Plant Entrance Road or County Road 57, Highway 72 and Plant Entrance Road. All three of these roads are currently used by trucks from local quarries and have significant truck traffic. Predicted noise levels are shown in Table 3-18. Details of the calculations are presented in Appendix C.

| Table 3-18. Predicted Noise For Alternatives A, B, and C | | | |
|---|---|---|---|
| **Predicted Noise for Alternative A** | **Highway 72** | **Plant Entrance Road** | **County Road 57** |
| Average existing noise level (Leq) | 63.5 | 49.9 | 47.7 |
| Predicted existing noise | 71.7 | 50.6 | 61.5 |
| Predicted future noise | 71.9 | 54.4 | 62.3 |
| Predicted increase in noise | 0.2 | 3.8 | 0.8 |
| Impact | None | None | None |

Average Leq is a measurement of existing noise levels based on the average of the five-minute measurements taken at each location and adjusted for the distance to the nearest receptor. Predicted existing noise levels at Highway 72 and County Road 57 were considerably higher than the average Leq, though the two values were very similar at Plant Entrance Road. It appears that the FHWA equation over-predicts the amount of noise for heavy trucks on Highway 72 and County Road 57.

Under Haul Road Alternative A, there would be no impact at any of the locations. Under Haul Road Alternatives B and C, there would be no impact along Highway 72 and County Road 57, but there would be a moderate impact on Plant Entrance Road. Based upon this evaluation, this project would not have a significant impact on the noise environment of the area.

## 3.14. Cultural Resources

### 3.14.1. Affected Environment

Human occupation of northern Alabama has occurred from the Paleo-Indian (at least 12,000 years ago) to the present. In northern Alabama, prehistoric archaeological chronology is generally broken into five broad time periods: Paleo-Indian, Archaic, Gulf Formational, Woodland, and Mississippian (Wathall, 1980; McNutt and Weaver, 1985). Prehistoric land use and settlement patterns vary during each period, but short- and long-term habitation sites are generally located on floodplains and alluvial terraces along rivers and tributaries. Specialized campsites tend to be located on older alluvial terraces and in the uplands. European interactions associated with the fur trading industry with Native Americans (primarily the Creek, Chickasaw, Choctaw, and Cherokee) in the area began in the 17$^{th}$ and 18$^{th}$ centuries. Various excursions and temporary settlements by the British, French, and Spanish occurred during this period. The first permanent occupation of northern Alabama by Europeans, European Americans, and African Americans occurred in the late 18$^{th}$ century. Colbert County was officially created in 1870. The agricultural production of the region involved some cotton in the antebellum period, but production focused more on grains and other crops. From the end of the Civil War to the early 1900s, the iron industry and other manufacturing interests moved into the area. When the iron industry began to decline in the late 1920s, the availability of low cost electrical power from Wilson Dam helped to draw new industrial interests. The project area is within the

boundaries of COF, which was approved for construction by Congress in 1951 to provide power for the defense industry during the Korean Conflict (Wild, 2002).

Currently there are 24 historic properties listed in the National Register of Historic Places within Colbert County. None of the listed properties are within the Area of Potential Effect (APE) for the proposed undertaking. The APE for this project was defined as any area where activities associated with the proposed undertaking would have the potential to affect archeological resources. It was determined that the project did not have the potential to increase any additional visual effects that may alter aboveground historic properties characteristics that had not already been compromised by previous plant construction.

An archaeological investigation was conducted on approximately 200 acres of potentially undisturbed land with the APE in December 2003-January 2004. The remaining land within the APE has been previously altered or disturbed by road/power line construction, soil stripping, parking areas, push piles, dumps, or structures. Previously recorded sites and newly identified sites were reviewed. Most of the area surveyed had been previously disturbed. Shovel tests were excavated at 30-meter intervals in areas with low surface visibility, potentially undisturbed soils, and with less than a 10 percent slope. In disturbed areas, shovel tests were conducted in 60-meter intervals. The archaeological investigation was unable to relocate three previously recorded sites; however, two other historic properties were identified within the APE (D'Angelo, 2004) that are eligible or potentially eligible for the National Register of Historic Places.

### 3.14.2. Environmental Consequences

No historic properties would be impacted under the No Action Alternative since the project would not be initiated.

Under the Action Alternative, the phased identification and evaluation procedure would be used to meet the requirements under Section 106 of the NHPA. There are two potentially eligible or eligible historic properties identified in the APE. One site can be avoided by construction activities. The individuals conducting construction activities in that area would be made aware of the site location, and it would be well marked with flagging tape to ensure its protection. However, the other potential historic property would be affected by construction activities. A Phase II site evaluation would be necessary prior to any ground disturbance in the area, so that important archeological information may be gathered prior to the site being impacted. The avoidance of one site and the accumulation of important information at the other site would ensure that impacts to historic properties are not significant.

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# CHAPTER 4

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**Jon C. Riley**

| | |
|---|---|
| Position: | Landscape Architect |
| Involvement: | Visual and Aesthetic Resources |

**George Peck**

| | |
|---|---|
| Position | Biologist |
| Involvement | Aquatic Ecology |

**James Roy Quinn**

| | |
|---|---|
| Position: | Environmental Engineer |
| Involvement: | Wastewater; Surface Water Quality |

**Dave W. Robinson**

| | |
|---|---|
| Position: | Senior NEPA Specialist |
| Involvement: | NEPA Compliance and Document Preparation |

**Barbara Rosensteel**

| | |
|---|---|
| Position: | Biologist |
| Involvement: | Wetlands |

**Ted Stammler**

| | |
|---|---|
| Position | Civil Engineer |
| Involvement | Transportation |

**Cassandra Wylie**

| | |
|---|---|
| Position | Environmental Technician |
| Involvement | Noise |

**Bruce Yeager**

| | |
|---|---|
| Position | Senior NEPA Specialist |
| Involvement | Reviewer |

# CHAPTER 5

## 5. LIST OF AGENCIES AND PERSONS CONSULTED

**Federal Agency**
National Park Service (Natchez Trace Parkway)
United States Army Corps of Engineers
United States Fish and Wildlife Service

**State Agencies**
Alabama Department of Environmental Management
Alabama Department of Conservation and Natural Resources

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# CHAPTER 6

## 6. SUPPORTING INFORMATION

### 6.1. Literature Cited

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## 6.2. Acronyms, Symbols, and Abbreviations

| | |
|---|---|
| **>** | Greater Than |
| **<** | Less Than |
| **=** | Equal To |
| **ADT** | Average Daily Traffic |
| **APE** | Area of Potential Effect |
| **BAP** | Bottom Ash (Boiler Slag) Pond |
| **BMP** | Best Management Practice |
| **BRF** | Bull Run Fossil Plant |
| **CCB** | Coal Combustion Byproduct |
| **CO** | Carbon Monoxide |
| **COF** | Colbert Fossil Plant |
| **CR** | County Road |
| **dB** | Decibel |
| **dBA** | A-weighted Decibel Scale |
| **DSN** | Discharge Serial Number |
| **EA** | Environmental Assessment |
| **EO** | Executive Order |
| **ESP** | Electrostatic Precipitator |
| **FONSI** | Finding of No Significant Impact |
| **FGD** | Flue Gas Desulfurization |
| **gpm** | Gallons per Minute |
| **$H_2SO_4$** | Sulfuric Acid |
| **$IC_{25}$** | An estimate of the effluent concentration which reduces growth by 25 percent of the test organisms in the time period prescribed by the test, expressed as the IC25 |
| **ISC3** | Industrial Source Complex 3 - a USEPA-approved model used to estimate air pollutant concentrations |
| **IBI** | Index of Biotic Integrity |
| **KIF** | Kingston Fossil Plant |
| **km** | Kilometer |
| **kV** | Kilovolt |
| **kWh** | Kilowatt-Hour |
| **L** | Liter |
| **lb** | Pound |

| | |
|---|---|
| **lb/hr** | Pounds per Hour |
| **$LC_{50}$** | An estimate of the effluent concentration which is lethal to 50 percent of the test organisms in the time period prescribed by the test, expressed as the LC50 |
| **Leq** | Continuous Equivalent Noise Level |
| **LOS** | Level of Service |
| **LSFO** | Limestone Forced Oxidation |
| **m** | Meter |
| **MaxP** | Maximum Peak Sound Level |
| **MBI** | Macroinvertebrate Bioassessment Index |
| **MCL** | Maximum Contaminant Level |
| **mg** | Milligram |
| **mgd** | Million Gallons per Day |
| **$mg/m^3$** | Milligram per Cubic Meter |
| **mg/L** | Milligram per Liter |
| **mmBtu** | Millions of British thermal units |
| **MW** | Megawatt |
| **MWh** | Megawatt Hour |
| **NAAQS** | National Ambient Air Quality Standards |
| **NAPAP** | National Acid Precipitation Assessment Program |
| **NEPA** | National Environmental Policy Act |
| **NHPA** | National Historic Preservation Act |
| **$NO_2$** | Nitrogen Dioxide |
| **$NO_x$** | Nitrogen Oxides |
| **NPDES** | National Pollutant Discharge Elimination System |
| **NRHP** | National Register of Historic Places |
| **$O_3$** | Ozone |
| **Pb** | Lead |
| **pH** | Standard Unit of Acidity |
| **PM** | Particulate Matter |
| **$PM_{2.5}$** | Particulate Matter Whose Particles are Less Than or Equal to 2.5 micrometers |
| **$PM_{10}$** | Particulate Matter Whose Particles are Less Than or Equal to 10 micrometers |
| **ppm** | Parts per Million |
| **RFP** | Request for Proposals |
| **SAMI** | Southern Appalachian Mountains Initiative |
| **SCR** | Selective Catalytic Reduction |
| **$SO_2$** | Sulfur Dioxide |
| **SR** | State Route |
| **s.u.** | Standard Unit |
| **TVA** | Tennessee Valley Authority |
| **$\mu g/m^3$** | Micrograms per Cubic Meter |
| **USACE** | United States Army Corps of Engineers |
| **USEPA** | United States Environmental Protection Agency |
| **WET** | Whole Effluent Toxicity |
| **WMA** | Wildlife Management Area |

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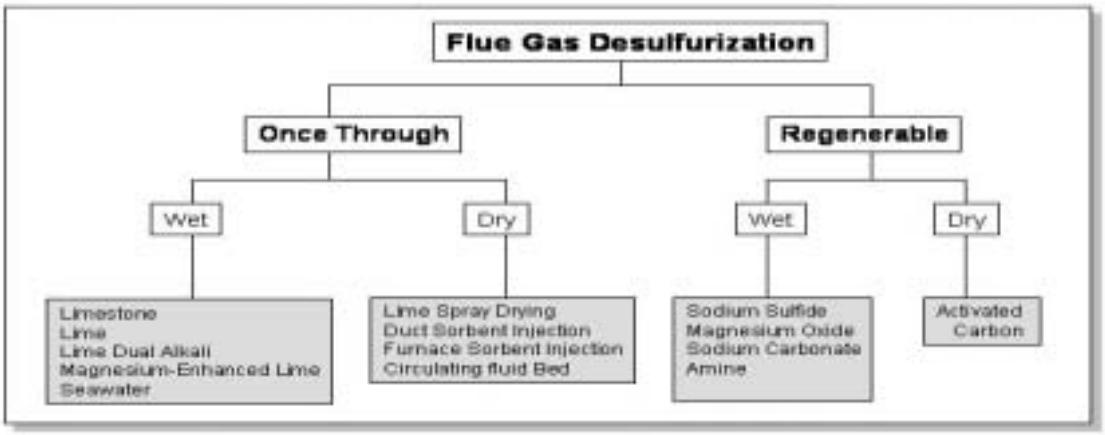
# APPENDIX A - FGD TECHNOLOGIES AND RATIONALE FOR SCREENING AND SELECTION OF TECHNOLOGIES FOR COLBERT FOSSIL PLANT UNIT 5

## *Available FGD Technologies*

Commercially available FGD technologies can be classified as "once-through" or "regenerable", depending on how sorbent is treated after it has sorbed $SO_2$ (Srivastava, 2000). Information about the current utilization of commercially available FGD systems in the utility industry is presented below. In once-through technologies, the $SO_2$ is permanently bound by the sorbent, which must be disposed of as a waste or utilized as a by-product (i.e., gypsum). In regenerable technologies, the $SO_2$ is released from the sorbent during the regeneration step and may be further processed to yield sulfuric acid, elemental sulfur, or liquid $SO_2$. These categories can be further compartmentalized as "wet" and "dry" systems. Figure A-1 lists many of the various technologies currently available for $SO_2$ scrubbing.




Source: adapted from Srivastava, 2000.

**Figure A-1. Flue Gas Desulfurization Technologies**

## Commercial Application of Available FGD Systems in the Utility Industry

In practice, once-through FGD processes represent the vast majority of applications world wide, and regenerable FGD processes, which produce a concentrated stream of $SO_2$ for recovery as elemental sulfur or sulfuric acid, are used only marginally. No significant increase in regenerable FGD capacity has taken place since the early 80's when these technologies were initially introduced. On fossil-fuel-fired electric power plants through 1998, FGD systems were installed to control $SO_2$ emissions from over 226,000 MW generating capacity, worldwide. Nearly 98 percent of the world's total capacity used once-through FGD technologies (Table A-1), primarily because of their high performance in terms of $SO_2$ removal, cost effectiveness, and production in some instances of a saleable by-product, such as gypsum.

**Table A-1. Coal-Fired Electrical Generation Capacity (MW) Equipped with FGD Technology (1998)**

| Technology | United States | Abroad | World Total |
|---|---|---|---|
| Wet | 82,092 | 114,800 | 196,892 |
| Dry | 14,081 | 10,654 | 24,735 |
| Regenerable | 2,798 | 2,394 | 5,192 |
| Total FGD | 98,971 | 127,848 | 226,819 |

Source: adapted from Srivastava, 2000

Table A-2 shows that approximately 69 percent of the wet FGD technology installations in the United States use limestone processes, and approximately 93 percent abroad. The main difference in this pattern is the extent of the application of dolomitic lime and sodium carbonate processes, and the local availability of the needed sorbents.

**Table A-2. Total Capacity (MW) Equipped with Wet FGD Technology (1998)**

| Process | United States | Abroad | World Total |
|---|---|---|---|
| Limestone | 56,560 | 106,939 | 163,499 |
| Lime | 14,237 | 4,338 | 18,575 |
| MEL | 8,484 | 50 | 8,514 |
| Sodium Carbonate | 2,756 | - | 2,756 |
| Seawater | 75 | 1,125 | 1,125 |
| Regenerable (other) | - | 2,423 | 2,423 |
| Total FGD | 82,092 | 114,800 | 196,892 |

MEL – magnesium enhanced lime
Source: adapted from Srivastava, 2000

Table A-3 shows the low utilization of dry FGD technologies world wide, lead by spray dryer applications, which indicates a comparatively low level of experience with utility applications.

**Table A-3. Total Capacity (MW) Equipped with Dry FGD Technology (1998)**

| Process | United States | Abroad | World Total |
|---|---|---|---|
| Spray Drying | 11,315 | 6,904 | 18,219 |
| Dry Sorbent Injection | 2,400 | 1,125 | 3,525 |
| CFB | 80 | 517 | 597 |
| Furnace Sorbent Inj. | 286 | 2,108 | 2,394 |
| Total FGD | 14,081 | 10,654 | 24,735 |

CFB – circulating fluid bed

**Wet Once-through Technologies**

In wet FGD processes flue gas contacts alkaline slurry in an absorber. The absorber may take various forms (spray tower or tray tower), depending on the manufacturer and the desired process configuration. A diverse group of wet FGD processes have evolved to take advantage of the particular properties of various sorbents, and/or byproducts. In general,

the alkaline sorbent contacts the $SO_2$ containing flue gas where the $SO_2$ is reacted chemically to a form that can be easily removed from the system. All wet FGD systems employ a reagent preparation step, a flue gas contact step, a mist eliminator step, and a reactant removal step. Among the typical reagents used in once-through applications, are limestone, lime, ammonia, magnesium-enhanced lime, and seawater. Wet FGD process variables include flue gas flow rate, liquid-to-gas (L/G) ratio, recycle slurry/reagent pH, flue gas $SO_2$ concentration and retention time. Promising technologies in this category include limestone, lime, lime dual alkali, and magnesium-enhanced lime. Use of seawater is obviously not possible at this power plant.

**Limestone** scrubbing is a wet FGD technology that produces a disposable, and in most cases, saleable byproduct (gypsum). A slurry of finely ground limestone and water is recirculated through absorbers where it absorbs sulfur dioxide in the flue gas. Air is bubbled through the calcium sulfate/calcium sulfite slurry to form calcium sulfite, which is then oxidized to calcium sulfate (gypsum). Typical design differences occur in the use of pre-scrubbers, liquid-to-gas contact flow arrangement (countercurrent, co-current, cross current), contactor type (trays, sprays, bubbling), use and location of forced oxidation, and the number of recycle loops. FGD systems that use limestone continually discharge a scrubber slurry from the absorber that is generally 80-90 percent water. The slurry can then be dewatered using a number of processes including thickeners, ponds, hydrocyclones, centrifuges, and vacuum filters. The primary factors affecting cost are process selection, $SO_2$ removal, available space for equipment, and water use characteristics. The concentration of solids and salts in the scrubbing liquid gradually increases over time. The concentration of these solids is maintained at a desirable level by removing a “bleed” stream and constant addition of makeup liquids in the form of water or slurry.

In wet limestone systems, there are two methods for controlling the oxidation of the calcium sulfite to calcium sulfate: natural and forced. Natural oxidation is limited by the oxygen present in the flue gas and results in a waste material for disposal because the low gypsum content. For this reason, TVA has chosen to use forced oxidation, which promotes a much higher sulfate to sulfite solids concentration. Forced oxidation results in a byproduct that can be marketed rather than disposed of in a landfill. In forced oxidation, compressed atmospheric air is injected in to the absorber reaction tank to achieve the conversion.

Sulfur dioxide removal in wet limestone forced oxidation systems can be enhanced by the addition of organic acids. Generally speaking, the addition of organic acids (typically 1,000 to 2,000 ppm) to the limestone slurry increases the limestone dissolution rate, therefore increasing $SO_2$ removal efficiency. TVA has chosen to consider two variations of the wet limestone technology for the initial screening: wet limestone forced oxidation (LSFO) and wet limestone forced oxidation with the addition of organic acids. Wet limestone natural oxidation was discarded as an option because of its inability to produce a salable by-product and offered no advantages over LSFO.

Wet scrubbing with **Lime** is accomplished in a manner nearly identical to that described above for wet limestone. Scrubbing with lime is hampered in its ability to produce a saleable gypsum, and because is generally more expensive than wet limestone without significant performance increase. Lime scrubbing was therefore dismissed as an alternative technology. Seawater scrubbing was dismissed because of the obvious lack of seawater at this location. Limestone Inhibited Oxidation is reported to be particularly well suited for applications with high sulfur coals. However, this approach involves addition of numerous chemical compounds and appears to be relatively difficult to control in actual

practice. Limestone Inhibited Oxidation offers no assurance of meeting the three minimum system criteria stated by TVA and produces a material that has no market potential. This technology was therefore dismissed as a viable technology candidate.

**Lime Dual Alkali** scrubbing occurs in a system arrangement similar to LSFO, but involves the use of sodium sulfite as the absorbing solution. The absorbing solution is re-circulated through the spray tower to remove $SO_2$ from the flue gas stream. The spend solution is then mixed with lime in a separate process loop simultaneously forming a calcium sulfite sludge while regenerating the spent sodium sulfite solution. Advantages as compared to wet limestone with are lower corrosion and erosion potential, and less scaling or plugging. Since sodium sulfite is more reactive than lime or limestone, liquid-to-gas ratio are decreased resulting in lower pumping costs and better load following and turndown capabilities as compared with LSFO. The major disadvantages are the high cost of lime and soda ash reagents and the production of waste requiring disposal. Although this system has been proven at several locations in the U.S., there is no current U.S. vendor and it would be very difficult to obtain guarantees for this process. Despite these apparent drawbacks, Lime Dual Alkali scrubbing was retained as a viable alternative for the initial screening.

The **Magnesium-Enhanced Lime** (MEL) approach is able to achieve high $SO_2$ removal efficiencies in significantly smaller absorber towers than LSFO scrubbers. MEL also allows for a significant decrease in liquid-to-gas ratio as compared with LFSO for a given target $SO_2$ removal. Forced oxidation can be used in MEL to produce a higher quality, brighter gypsum than generated by LSFO. For these reasons, MEL was retained as a viable candidate for the initial screening.

Wet scrubbing with **Ammonia** was also considered. The process is similar to any other wet technology except that highly reactive ammonia (as ammonia hydroxide) is used as the reagent. The ammonia hydroxide reacts with sulfur dioxide to form ammonium sulfite, which is subsequently oxidized to ammonium sulfate. The ammonium sulfate solution is bled from the reactor to process it into either prilled or granular ammonium sulfate. Advantages of this system include a lower liquid-to-gas ratio, the absence of scaling and plugging of the mist eliminator, and the production of a marketable byproduct. Despite a need for market evaluation for the ammonium sulfate, ammonia scrubbing was retained as a viable candidate for the initial screening.

**Wet Regenerable Technologies**

These processes are characterized by their product, which is a concentrated stream of $SO_2$. In each process, the $SO_2$ is released from the sorbent during the regeneration step and may be further processed to yield sulfuric acid elemental sulfur or liquid $SO_2$. The regenerated sorbent is recycled in the $SO_2$ scrubbing step. There are four processes: sodium sulfite, magnesium oxide, sodium carbonate, and amine. As noted above, regenerable FGD technology (wet or dry) are only marginally used in the U.S. or internationally because of their comparatively high O&M cost relative to other FGD processes, and the return from sale of the product does not offset a significant portion of the increased process cost. In fact, some of the existing regenerable-FGD-technology-equipped units have been converted to limestone wet FGD. The basic scrubbing wet regenerable technology components are similar to those for the once-through technologies, differing primarily in the add on equipment needed to separate the $SO_2$ from the chemical matrix used to remove the $SO_2$ from the flue gas and recycle sorbent back to the process.

Of the available wet regenerable technologies, only the sodium sulfite process (the so-called Wellman Lord process) is believed fully demonstrated in the United States and therefore worthy of consideration in the proposed project. Sodium carbonate is used to produce the sodium sulfite solution that is recirculated through a spray dryer to remove $SO_2$ from the flue gas stream. The spent solution is bled to a disposal pond. Advantages are lower corrosion and erosion potential, less scaling or plugging. Since sodium sulfite is more reactive than lime or limestone, L/G ratios are decreased. The major disadvantages are the high cost of soda ash reagents, and the fact that there is at present no vendor of this technology in the United States, making it very difficult to obtain the guarantees required by TVA. Despite these drawbacks, sodium sulfite scrubbing was included in the initial screening.

**Dry Once-Through Technologies**

In dry FGD technologies, $SO_2$-containing flue gas contacts alkaline sorbent, usually in finely divided particulate form. The sorbent can be delivered to flue gas in aqueous slurry form (such as lime spray drying) or as a dry powder (duct sorbent injection, furnace injection, or circulating fluidized bed). $SO_2$ is chemically bound to the sorbent particles, which are removed as a dry waste material downstream of the sorbent's introduction point. The dry waste has properties similar to fly ash and is effectively removed by electrostatic precipitators and baghouses. In general, dry once-through systems deliver lower $SO_2$ removals than those attainable with wet once-through systems.

Promising technologies in this category include lime spray drying and circulating fluidized bed, which were retained as viable candidates for the initial screening. Furnace injection technologies were not further considered since they were not suited for application at TVA power plants, nor could they deliver the minimum required performance.

**Dry Regenerable Technologies**

This category consists solely of activated carbon, which absorbs $SO_2$ on a moving bed of granular activated carbon. The activated carbon is thermally regenerated and the $SO_2$ may then be treated by conventional technologies to produce sulfuric acid. This technology is essentially unproven for application as a "stand alone system" on a large-scale coal-fired generating plant and was not selected as a candidate for the initial screening.

*Screening of Candidate Technologies* - This section summarizes key aspects of technologies discussed that could reasonably be expected to meet TVA's needs for the project. In general, the technologies were required to meet the following criteria at the targeted coal-fired power plants:

- Technology is fully proven on utility coal-fired power plants burning medium to high sulfur coal, and commercially available in the U.S.,
- Performance in terms of $SO_2$ removal capability is meets TVA specification (screening conducted at 90 percent and 98 percent removal), and
- In-service date of December 31, 2007, could be met for COF Unit 5.

These criteria were viewed in the screening evaluation as "pass-fail" tests. In other words, the technology had to meet all minimum requirements in order to be considered in the more detailed economic and engineering evaluations. Table A-4 contains the results of "pass-fail" screening for each plant.

Following the initial screening which identified the technologies that could meet minimum requirements, the promising technologies were then evaluated and ranked in accordance with their performance ($SO_2$ removal capability), retrofitability, process history, secondary environmental risks, and occupational and operational risks. Lime Dual Alkali and Sodium scrubbing were not further evaluated, except as noted below for producing sodium bisulfite that would supply TVA's needs at other plants for $SO_3$ control. The environmental risks category consisted of considerations of waste volumes produced, whether the waste exhibited hazardous properties, the secondary gaseous emissions (i.e., $SO_3$ and $CO_2$), and the salability of any byproducts.

**Table A-4. Initial Screening of FGD Technologies**

| Technology | % $SO_2$ Removal | |
|---|---|---|
| | 90 | 98 |
| LSFO | P | P |
| LSFO wOA[a] | P | P |
| Lime Dual Alkali | F | F |
| Mg Enhanced Lime | P | P |
| Sodium Scrubbing | F | F |
| Ammonia Scrubbing | P | P |
| Lime Spray Dryer | P | F |
| Circulating Fluidized Bed | P | F |

a – with organic acid addition.
b – meet all TVA minimum requirements.
c – do not meet at least one TVA minimum requirement.

Additional environmental information was compiled for technology options passing the initial screening. Table A-5 summarizes key characteristics of each technology for consideration at COF. All of the technologies produce either a non-hazardous waste requiring disposal, or a usable, marketable byproduct. Wet limestone scrubbing, both with and without organic acid addition, produce gypsum. Ammonia scrubbing produces ammonium sulfate, a marketable fertilizer.

**Table A-5. Technology Screening for Colbert Fossil Plant Unit 5**

| Technology Option | Reagent Type | Reagent Use (t/yr) | Water Use (gpm) | Solid Waste Generation (type, t/yr) | Power Use (MW) |
|---|---|---|---|---|---|
| ***Meets 98% $SO_2$ Removal*** | | | | | |
| LSFO wOA | Limestone<br>Organic Acid | 142,209<br>1,560 | 454 | Calcium Sulfate, 216,767 | 7.7 |
| MG Enhanced Lime | Lime | 79,637 | 454 | 213,639 | 6.8 |
| LSFO | Limestone | 142,209 | 454 | Calcium Sulfate, 216,767 | 8.6 |
| Ammonia Scrubbing | Ammonia | 41,444 | 454 | Ammonium Sulfate, 160,899 | 6.4 |
| ***Meets 90% $SO_2$ Removal*** | | | | | |
| Dry FGD | Lime | 108,301 | 341 | 213,110 | 6.8 |
| Circ. Fluid Bed | Lime | 116,037 | 341 | 228,581 | 5.0 |

All of the technologies offer some potential for reducing emissions of elemental mercury. Mercury is found in all coal fuels, usually in very small concentrations. Studies currently underway by TVA include the determination of each technology's cost and ability to remove mercury from flue gas along with the sulfur, but not enough is yet known about this feature to aid in discriminating among the acceptable technologies. TVA expects more than 80 percent of the mercury in the coal will be removed by LSFO (with or without organic acid addition), lime spray dryer, and circulating fluidized bed technologies. Mercury removal performance for the other technologies under consideration is as yet incompletely characterized.

The story is much the same for reducing sulfur trioxide from the flue gas. Sulfur trioxide ($SO_3$) is produced in the furnace and when flue gases pass through the selective catalytic reduction system, which causes a small amount of the $SO_2$ to be oxidized to $SO_3$. There is some data that suggest the wet limestone, lime, and ammonia scrubbing systems remove a greater amount of $SO_3$ from the gas stream than does the dry FGD and circulating fluidized bed technologies. However, as currently designed, $SO_3$ removal performance is probably no higher than 50 percent in any wet FGD system, and could be as low as 25 percent. Lime spray dryers (operating with a downstream baghouse) and CFB technologies have been reported to remove more than 90 percent of $SO_3$ since it readily reacts with calcium oxide to form calcium sulfate.

Figures A-2 and A-3 show preliminary cost estimates for each technology at 90 percent and 98 percent $SO_2$ removal. The data assume equal tons per year removal, and have been converted to allow their comparison in a relative sense. The dollars per ton cost of each technology option has been divided by the dollars per ton cost of the lowest cost option. Expressed in this way, the technology expected to have the lowest cost for the plant has a ratio of 1.0. Other technologies are commensurately higher. For example, a technology with a ratio of 1.4 would be expected to cost 40 percent more than the lowest cost technology. Dry FGD and circulating fluidized bed technologies were believed unable to deliver 98 percent removal. Consequently, Figure A-3 does not contain cost data for those technologies. These estimates suggest LSFO would provide the lowest cost of $SO_2$ removal at Colbert Unit 5, followed closely by LSFO with the addition of organic acid, for both 90 percent and 98 percent removal. Based on current cost and environmental considerations, TVA chose LSFO for implementation at Colbert Unit 5.

**Literature Cited for Appendix A**

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Srivastava, R. K. 2000. Controlling $SO_2$ emissions: a review of technologies. U.S. Environmental Protection Agency. EPA/600/R-00/093. November 2000.

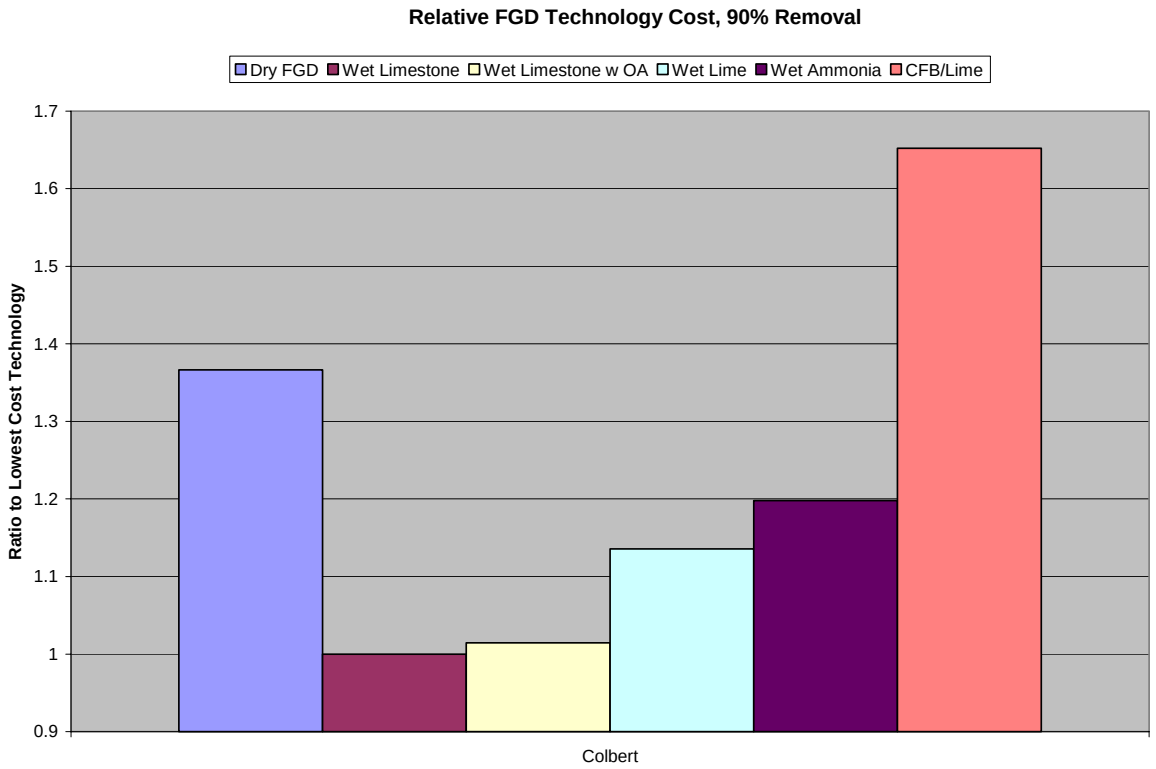


**Figure A-2. Ninety Percent Removal Cost**

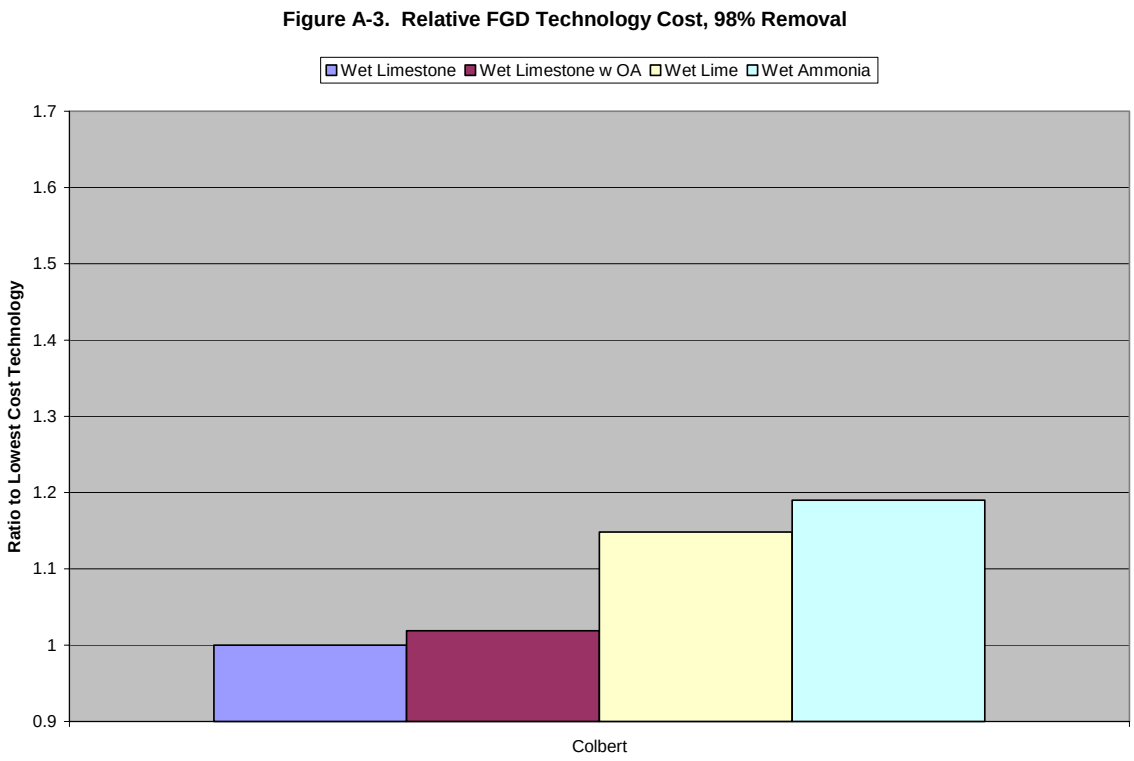


**Figure A-3. Ninety-Eight Percent Removal Cost**

## APPENDIX B - PROJECT DRAWINGS AND DIAGRAMS

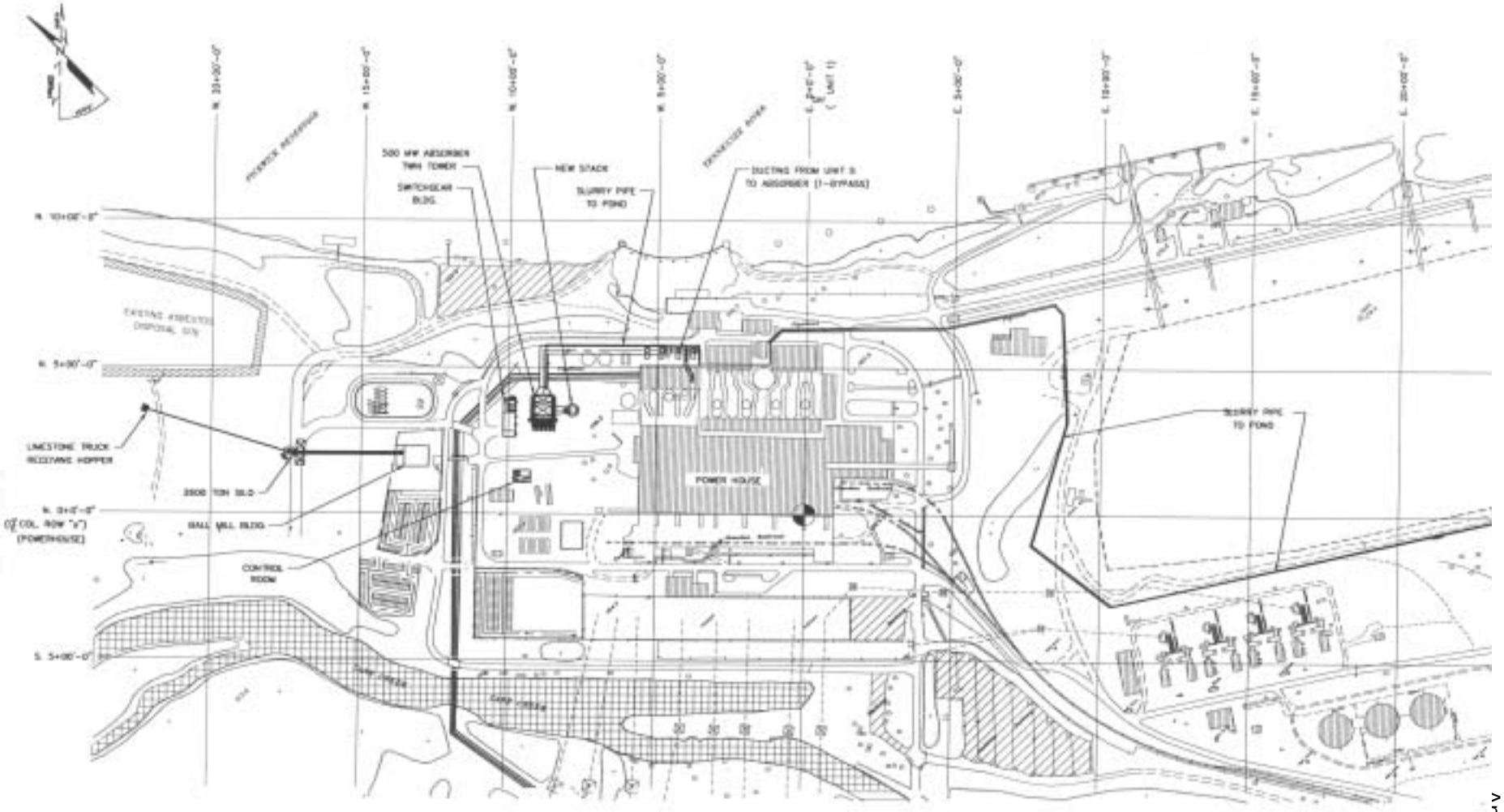


**Figure B-1. Site Arrangement for Colbert 5 Scrubber Project**

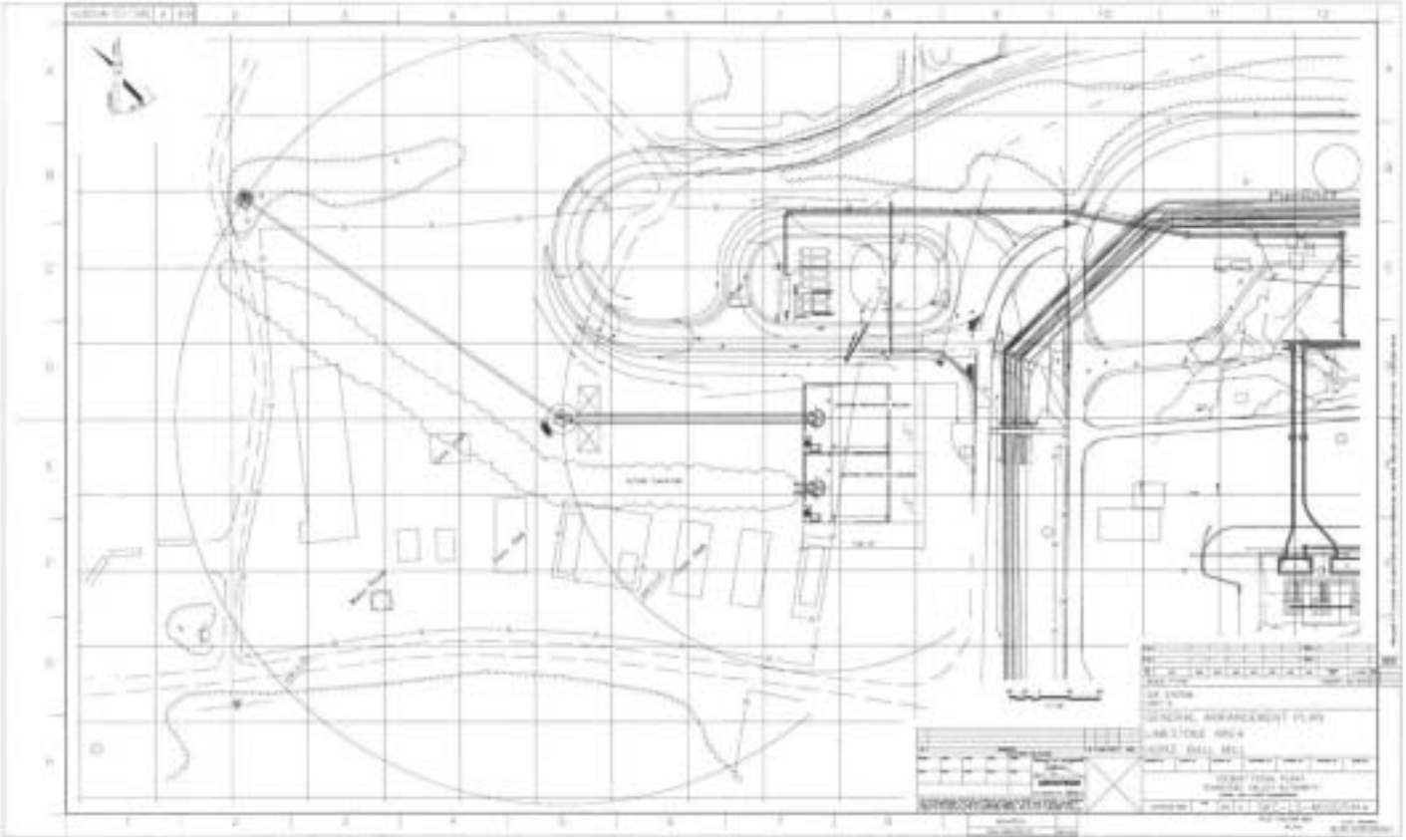

**Figure B-2a. General Arrangement Plan Limestone Area**

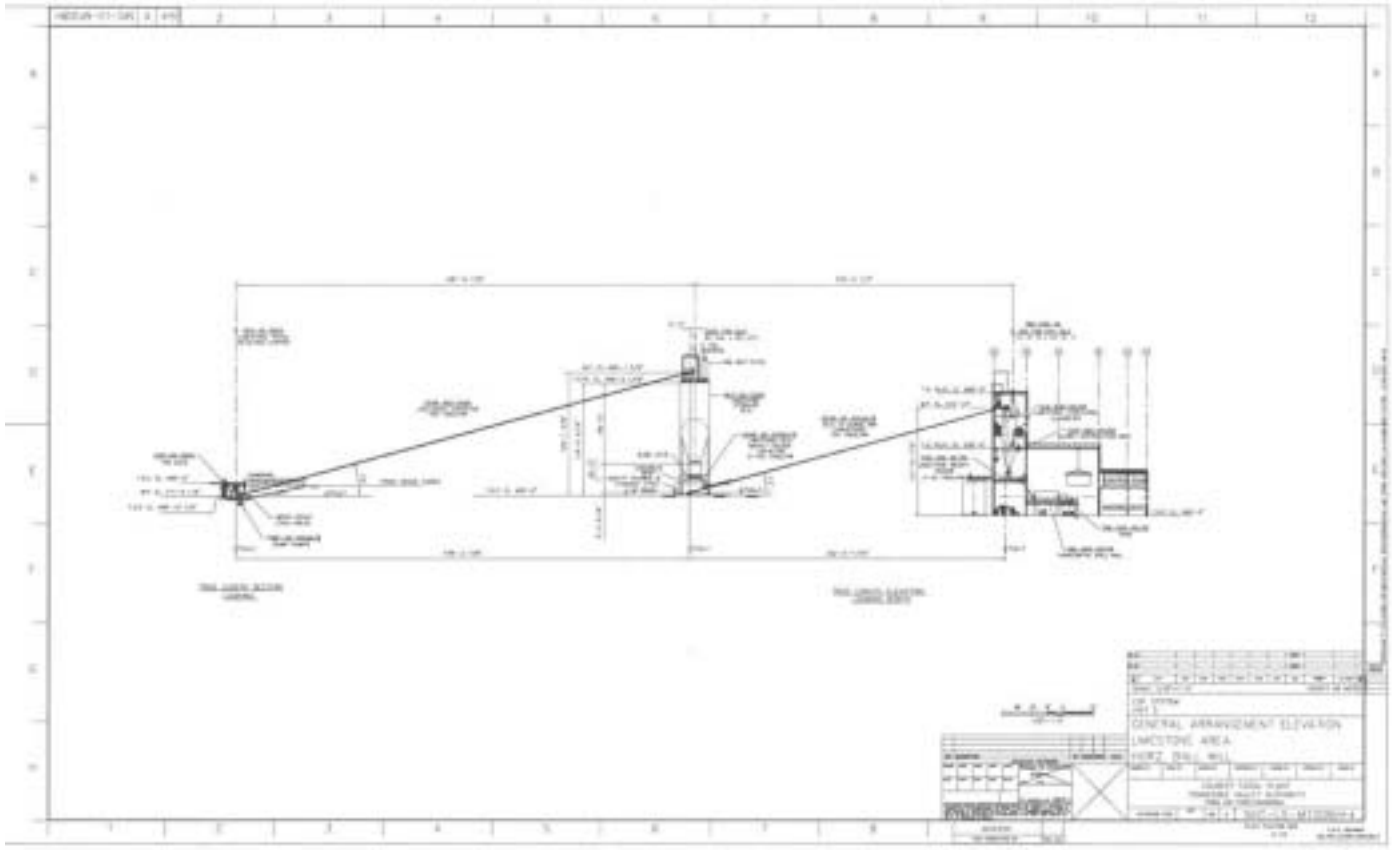


**Figure B-2b. General Arrangement Elevation Limestone Area**

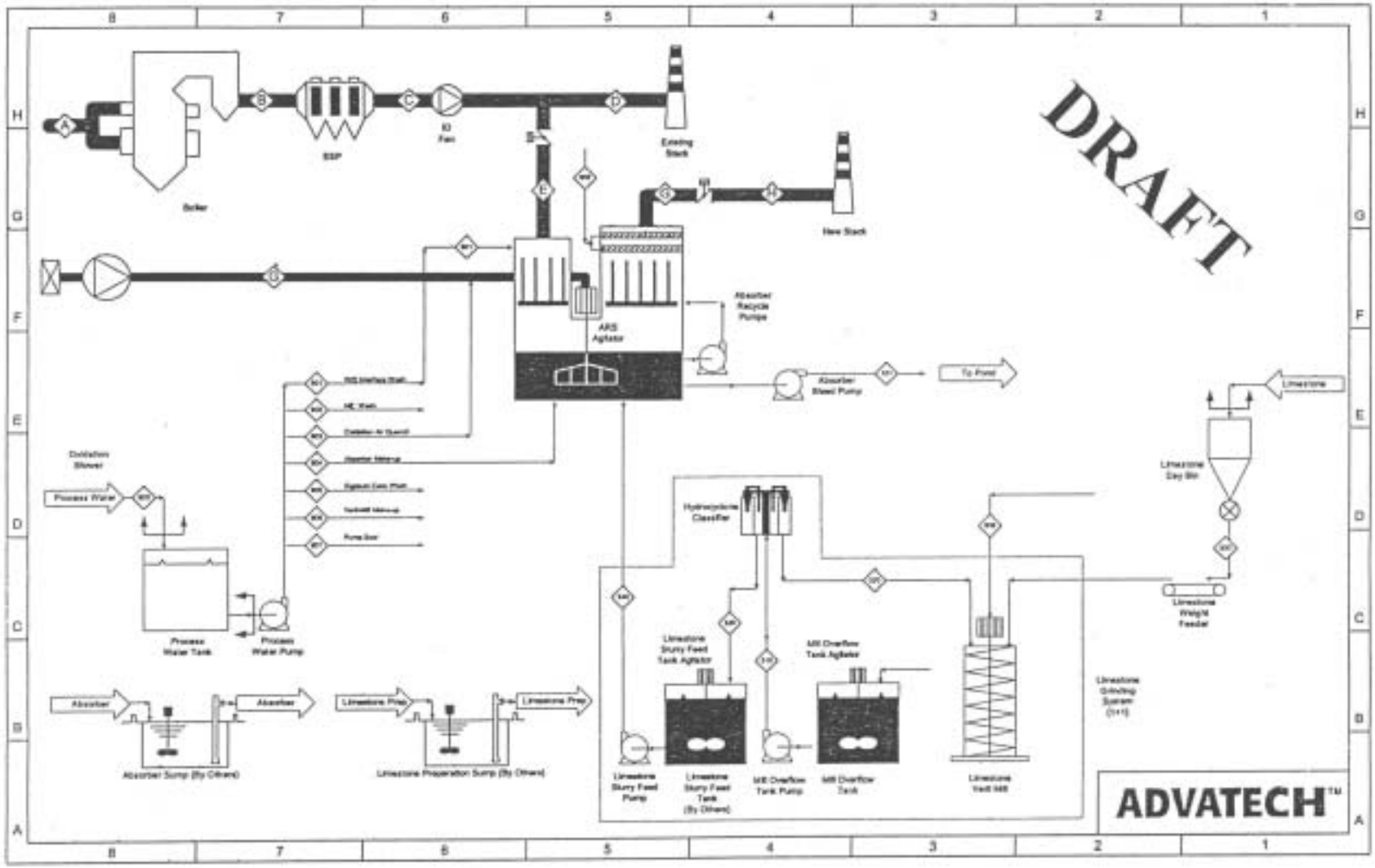


**Figure B-3. Twin Tower Scrubber Flow Diagram**

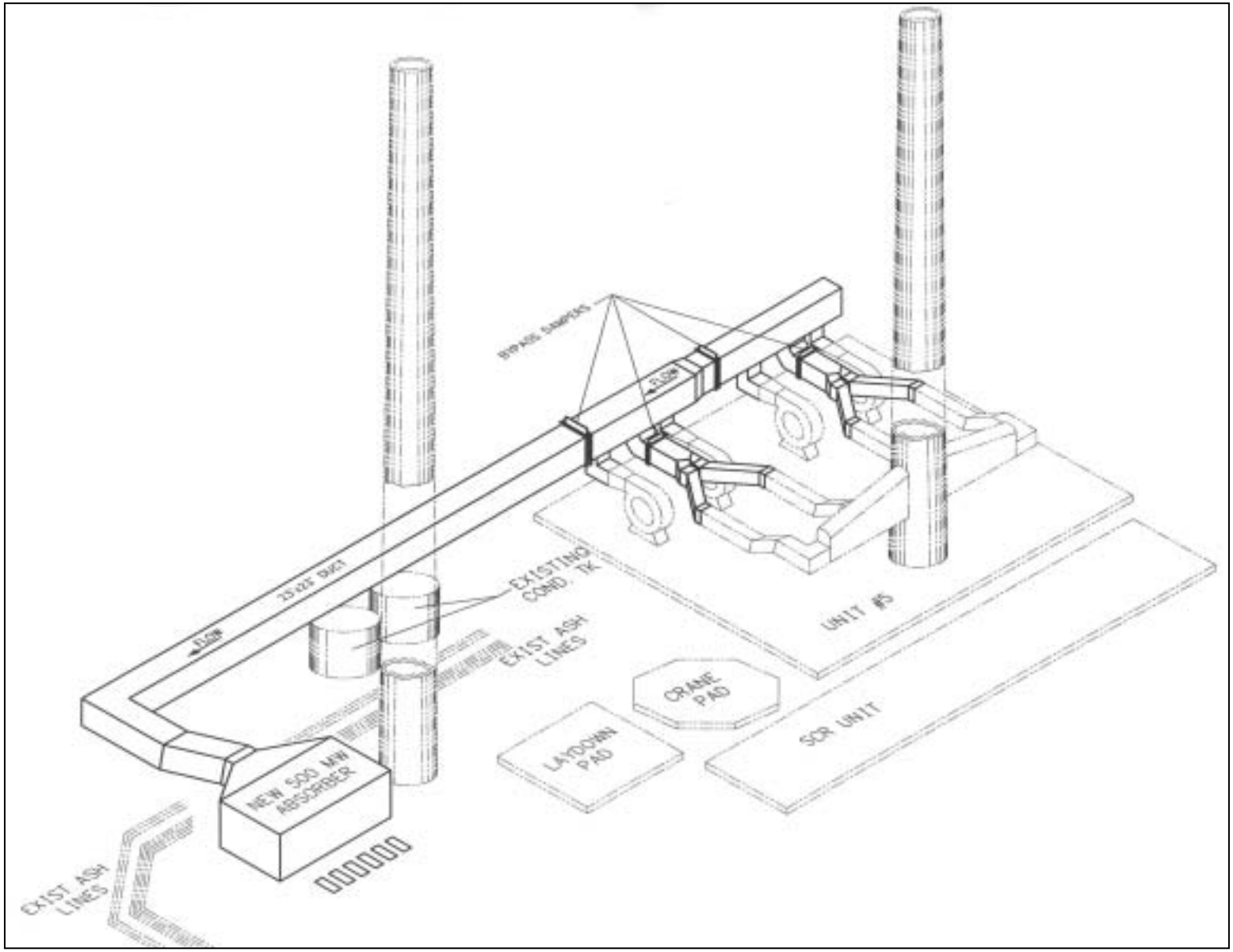


**Figure B-4. 3-Dimensional View of Scrubber Project**

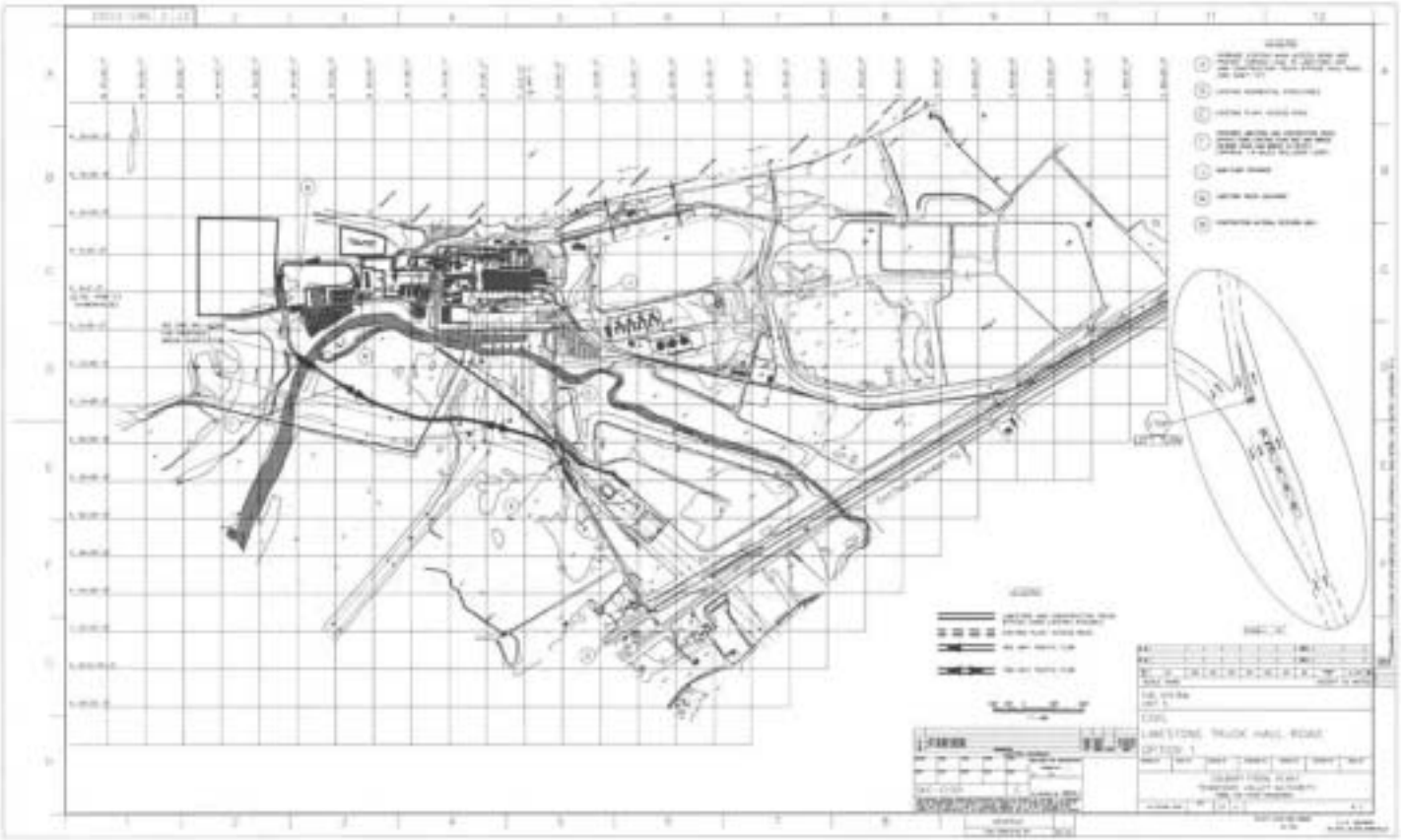


**Figure B-5. Limestone Truck Haul Road**

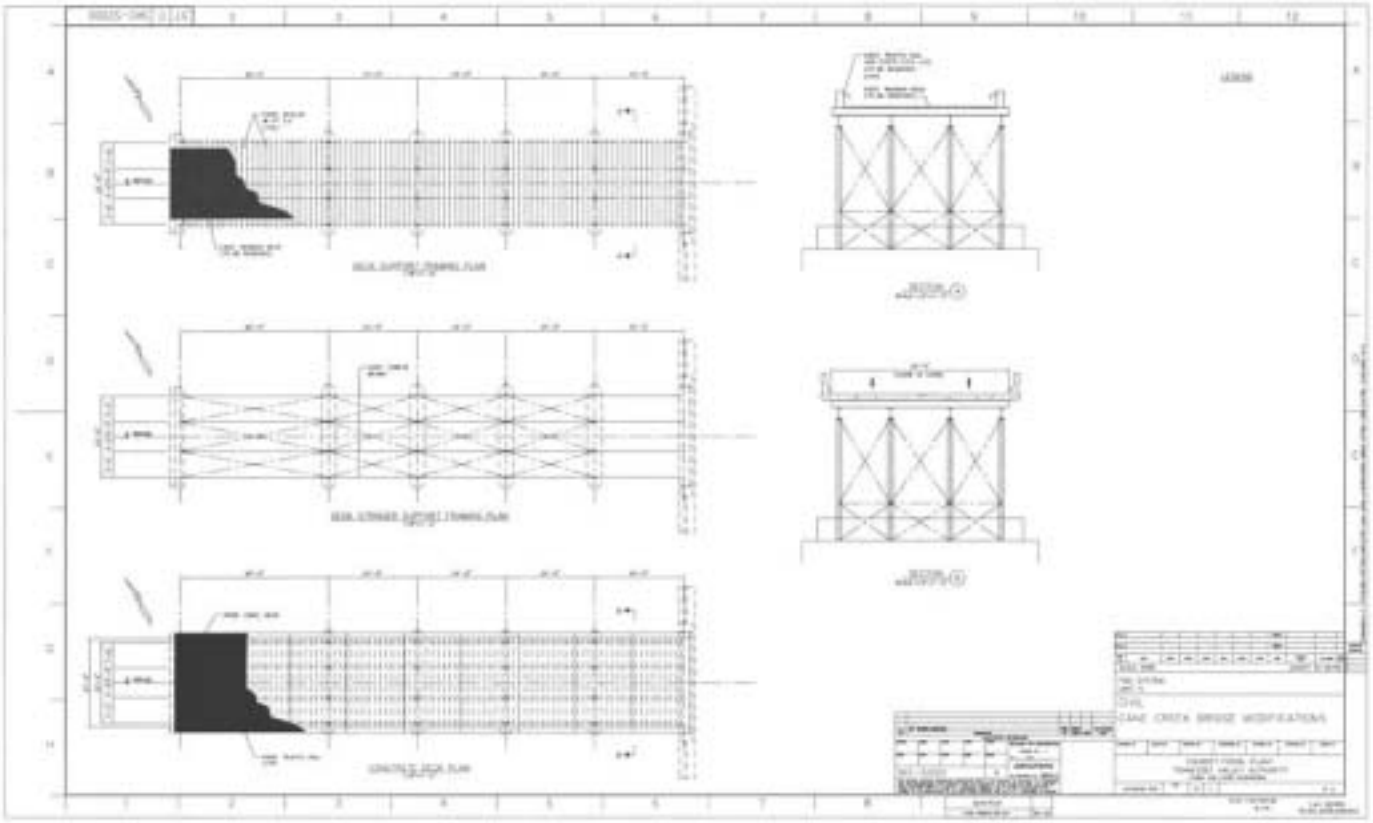

**Figure B-6. Cane Creek Bridge Modifications**

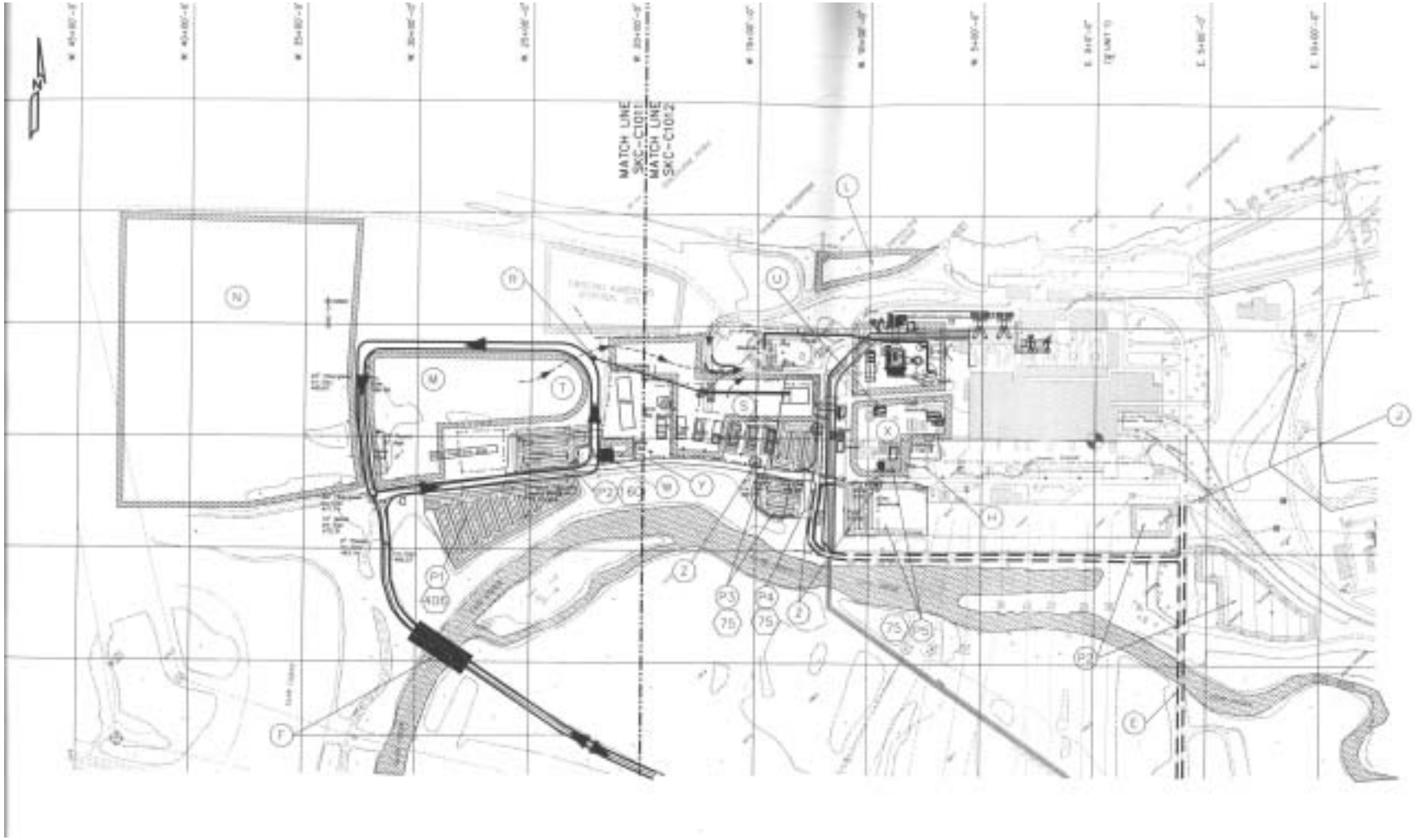


**Figure B-7. Detailed Laydown/Parking Plan for Construction Activities**

# APPENDIX C - DETAILS OF NOISE ASSESSMENT CALCULATIONS

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A screening analysis of potential traffic noise impacts due to the proposed road was done. The Federal Highway Administration noise assessment procedures for traffic noise analysis include 1) identifying activities and land uses that may be affected, 2) predict future traffic noise levels, 3) determine existing noise levels and 4) determine traffic noise impacts.

Traffic noise was predicted using equations for heavy trucks, medium trucks, and cars developed by Federal Highway Administration (FHWA). The procedure first estimates noise emissions for a steady stream of traffic at a reference distance from the road (50 feet), then adjusts this value to account for actual traffic flows, actual distance to receptor and road gradient. Reference mean emission levels for heavy trucks were estimated with the following equation

$L_E$ = 24.6 log (speed in km/hr) + 38.5 dBA

Reference mean emission levels for medium trucks were estimated with the following equation

$L_E$ = 33.9 log (speed in km/hr) + 16.4 dBA

Reference mean emission levels for cars were estimated with the following equation

$L_E$ = 38.0 log (speed in km/hr) – 2.4 dBA

These values assume a steady stream of vehicles, so a traffic adjustment factor for predicted traffic flows during the peak hour of the day was calculated for each vehicle class.

Traffic adj. = 10 log (number of vehicles in peak hour*50 feet/speed in mph) - 32.2 dBA

Noise emissions were also adjusted for the distance to the nearest receptor.

Distance adj. = 10 (1.5) log (50 feet/distance to receptor in feet) = -3.8 dBA

This assumes that the surface of the ground is soft such as grass or vegetation, not hard such as pavement.

Predicted noise for each vehicle class was calculated as

Predicted noise = reference emission + traffic factor + distance factor + gradient factor

Total noise was calculated by adding noise for heavy trucks, medium trucks, and cars; however, simple addition cannot be used for logarithms, so the following equation was used.

Total noise = $10*LOG_{10}((10^{(\text{Heavy truck noise}/10)})+(10^{(\text{Medium truck noise}/10)})+(10^{(\text{Car noise}/10)}))$

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## APPENDIX D - COF U5 FGD COOLING AND PROCESS WATER SUPPLY OPTIONS

| Option # | Water Supply Sources | Total Capacity (gpm) | Normal Demand (gpm) | Warm or Cool Water? | Issue | Feasibility |
|---|---|---|---|---|---|---|
| 1 | Crosstie with existing U5 RCW pumps' discharge | 15,000 | 10,000 | Cool | Plant already has a crosstie with U1-4 for critical cooling needs<br>Plant prefers to operate 2 of the 3 RCW pumps | Not preferable by plant |
| 2 | Add pumps similar to the existing U5 RCW pumps, taking same suction | 2,295 x 2 = 4,590 | 2,295 | Cool | Design engineering would need to investigate space limitations<br>Investigate condenser vacuum problems experienced by plant<br>ADEM water permitting regulations could be a problem | Possible for both process and cooling water |
| 2A | Add only 1 pump similar to the existing U5 RCW pumps, taking same suction. Use third U5 RCW pump for a spare. | 2,295 + 5,000 = 7,295 | 2,295 | Cool | Design engineering would need to investigate space limitations<br>Investigate condenser vacuum problems experienced by plant<br>ADEM water permitting regulations could be a problem | Possible for both process and cooling water |
| 3 | Add pumps similar to the PAF U3 design at intake structure | 2,295 x 2 = 4,590 | 2,295 | Cool | Design engineering would need to investigate sediment flow distribution at intake<br>Could we allow to retrofit these pumps for future U1-4 FGD water requirements?<br>ADEM water permitting regulations could be a problem | Possible for both process and cooling water |
| 4 | Restore clear water pyrite pumps | 1,700 | Unknown | Warm | Mechanical & electrical sides haven't been maintained any during system's ~15 year abandonment<br>Design engineering would need to investigate electrical issues<br>Pump performance testing would need to be conducted for determination of water flows | Possible for process water only |
| 5 | Crosstie with existing U5 fly ash sluice water pumps | 5,200 | Unknown | Warm | Once SCR is in service, pumps will supply water only for washing APH during outages and for backup support to U1-4<br>Pump performance testing would need to be conducted for determination of water flows | Possible for process water only |
| 6 | Any combination of above options 1-5 | --- | --- | --- | --- | |
| 7 | Using any extra station sump capacity | --- | Erratic Flow | --- | Water contains ash, trace amounts of coal, oil, etc. that would not want to be introduced into the scrubber system | Not preferable by plant |
| 8 | Add pumps similar to the design for PAF 1 & 2 scrubber raw water pumps, taking suction from U5 condenser discharge. | 2,295 x 2 = 4,590 | 2,295 | Warm | Design engineering would need to investigate space limitations<br>PAF 1 & 2 scrubber equipment is currently experiencing problems during the summer months due to high temperatures of condenser discharge water. | Possible for process water, but is not a preferable cooling water supply |

**Colbert Fossil Plant Pump Information**

| Pump Name | Pump Capacity (gpm) Each | # of Pumps |
|---|---|---|
| U1 CCW | 76,000 | 2 |
| U2 CCW | 76,000 | 2 |
| U3 CCW | 76,000 | 2 |
| U4 CCW | 76,000 | 2 |
| U5 CCW | 78,000 | 4 |
| U1 - 4 RWP #1 | 4,000 | 1 |
| U1 - 4 RWP #2 | 4,000 | 1 |
| U1 - 4 RWP #3 | 4,000 | 1 |
| U1 - 4 RWP #4 | 4,000 | 1 |
| U1 - 4 RWP #5 | 4,000 | 1 |
| U1 - 4 RWP #6 | 4,000 | 1 |
| U5 RCW | 5,000 | 3 |
| U1 - 4 Ash Sluice Pump #1 | 3,600 | 1 |
| U1 - 4 Ash Sluice Pump #2 | 3,600 | 1 |
| U1 - 4 Ash Sluice Pump #3 | 2,500 | 1 |
| U1 - 4 Ash Sluice Pump #4 | 2,500 | 1 |
| U5 Bottom Ash Sluice | 2,600 | 2 |
| U5 Fly Ash Sluice | 2,600 | 2 |
| U5 Pyrite Clear Water | 850 | 2 |

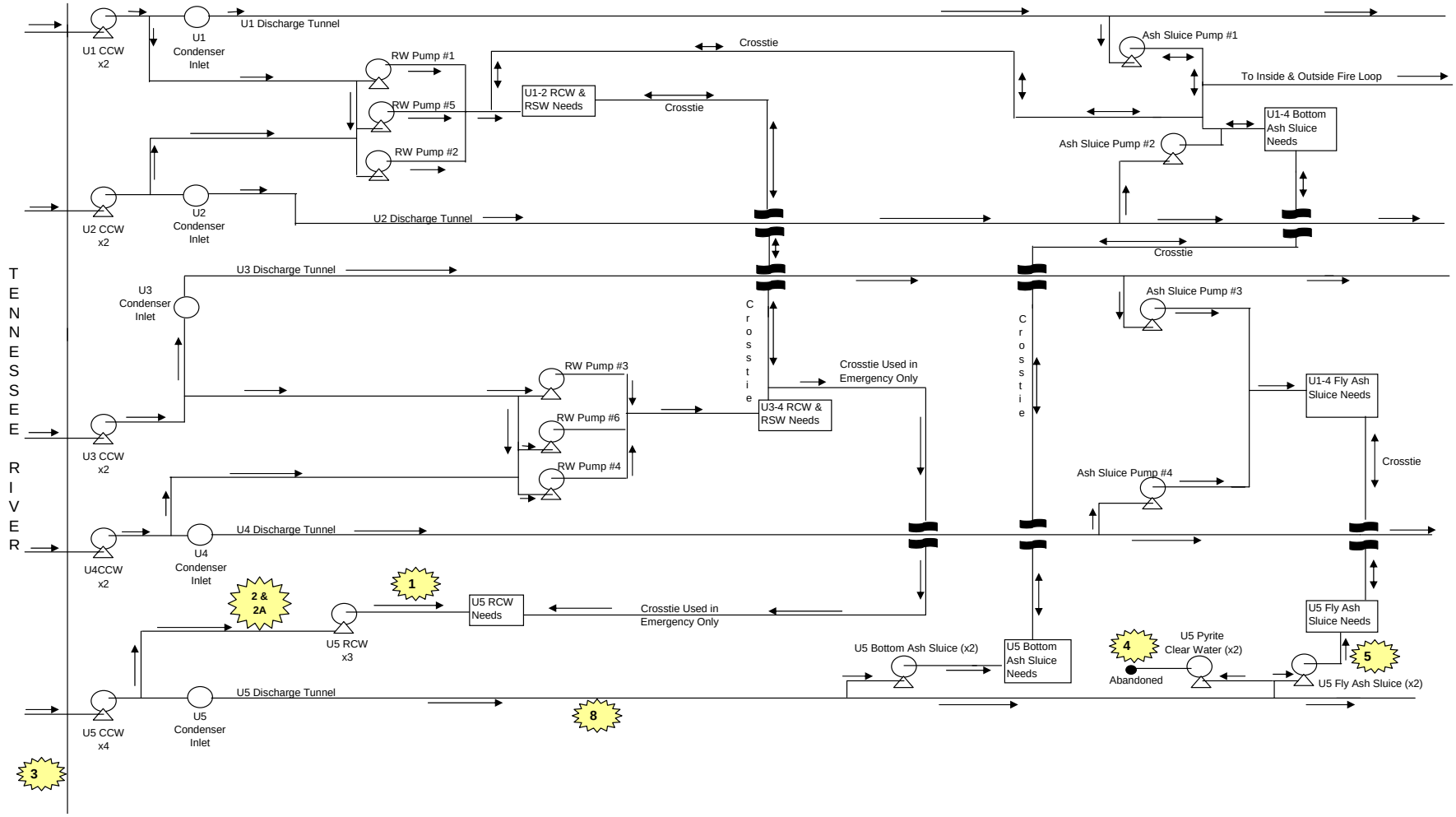


**Figure D-1. COF Raw Water System Diagram**

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# APPENDIX E - WETLAND DETERMINATION DATA FORMS

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# DATA FORM
# ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project/Site: | Colbert Scrubber | | | | | Date: | 13 Nov 2003 |
| Applicant/Owner: | TVA | | | | | County: | Colbert |
| Investigator: | B. Rosensteel, K. McConnell | | | | | State: | AL |
| Request / CEC # | Req # 5750 | | | | | Quad: | Pride |
| | | | | | | Watershed: | Tennessee River/ Pickwick Res. |
| Do normal circumstances exist on the site? | | Yes | x | No | | Community ID: | PEM1 |
| Is the site significantly disturbed (Atypical Situation)? | | Yes | x | No | | Transect ID: | |
| Is the area a potential problem area? (If needed, explain on reverse) | | Yes | | No | x | Plot ID: | W1 |

## VEGETATION

| Dominant Plant Species | Stratum | Indicator | Dominant Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|
| Salix nigra | Sapling | Obl | | | |
| Scirpus cyperinus | Herb | Obl | | | |
| Typha angustifolia | Herb | Obl | | | |
| Eupatorium serotinum | Herb | Fac | | | |
| Solidago canadensis | Herb | Facu | | | |
| Erechtites hieraciifolia | Herb | Fac- | | | |
| | | | | | |

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 83%

Remarks:

## HYDROLOGY

Recorded Data (Describe in Remarks):

- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other
- x No Recorded Data Available

Field Observations:

| | | |
|---|---|---|
| Depth of Surface Water: | - | (in.) |
| Depth to Free Water in Pit: | - | (in.) |
| Depth to Saturated Soil: | - | (in.) |

Remarks: This wetland area was observed to have saturated soil and water on the surface to a depth of at least 3" during a ground survey conducted on August 25th and 26th, 2003. A July 17, 2002, aerial photograph shows an area of open water in this wetland. The primary water sources for this wetland appear to be precipitation and runoff.

Wetland Hydrology Indicators:

Primary Indicators:

- ___ Inundated
- x Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- x Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

- ___ Oxidized Root Channels in Upper 12 Inches
- x Water-Stained Leaves
- ___ Local Soil Survey Data
- x FAC-Neutral Test
- ___ Other (Explain in Remarks)

**SOILS**

Map Unit Name (Series and Phase): Drainage Class:

Taxonomy (Subgroup): Field Observations Confirm Mapped Type? Yes _____ No _____

Profile Description:

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle Abundance/Contrast (%) | Texture, Concretions, Structure, etc. |
|---|---|---|---|---|---|
| 0-3 | | 7.5YR 2.5/1 | | | Silty clay with abundant coal residue |
| 3-6 | | 7.5YR 2.5/1; 5YR 4/6; and 7.5YR 5/6 | | Mixed matrix; none was apparent as mottling | Silt loam |
| 6-10+ | | 7.5YR 6/2 | 7.5YR 5/6 | 20%/ Distinct | Silt loam |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Hydric Soil Indicators:

| | | | |
|---|---|---|---|
| | Histosol | | Concretions |
| | Histic Epipedon | | High Organic Content in Surface Layer in Sandy Soils |
| | Sulfidic Odor | | Organic Streaking in Sandy Soils |
| | Aquic Moisture Regime | | Listed on Local Hydric Soils List |
| | Reducing Conditions | | Listed on National Hydric Soils List |
| x | Gleyed or Low-Chroma Colors | | Other (Explain in Remarks) |

Remarks: The coal ash in the top 6 inches contributes to the black (2.5/1) coloration of the soil.

**WETLAND DETERMINATION**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes | x | No | | Is this Sampling Point Within a Wetland? | Yes | x | No | |
| Wetland Hydrology Present? | Yes | x | No | | | | | | |
| Hydric Soils Present? | Yes | x | No | | | | | | |

Remarks: Emergent wetland occurring in irregularly-shaped depression within an excavated area that is flanked by pine-dominated forest; excavation is located in the area between the active coal ash disposal areas and the Tennessee River on the Colbert Fossil Plant Reservation.

Estimated area of the wetland is 0.75 acres. The wetland boundary was not delineated and flagged.

# DATA FORM
# ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

| | | | | | |
|---|---|---|---|---|---|
| Project/Site: | Colbert Scrubber | | | Date: | 13 Nov 2003 |
| Applicant/Owner: | TVA | | | County: | Colbert |
| Investigator: | B. Rosensteel, K. McConnell | | | State: | AL |
| Request / CEC # | Req # 5750 | | | Quad: | Pride |
| | | | | Watershed: | Tennessee River/ Pickwick Res. |
| Do normal circumstances exist on the site? | Yes | x | No | Community ID: | PEM/SS1 |
| Is the site significantly disturbed (Atypical Situation)? | Yes | x | No | Transect ID: | |
| Is the area a potential problem area? (If needed, explain on reverse) | Yes | | No | x | Plot ID: | W2 |

## VEGETATION

| Dominant Plant Species | Stratum | Indicator | Dominant Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|
| Salix nigra | Sapling/shrub | Obl | | | |
| Platanus occidentalis | Sapling | Facw- | | | |
| Typha latifolia | Herb | Obl | | | |
| Eleocharis obtusa | Herb | Obl | | | |
| Polygonum pensylvanicum | Herb | Facw | | | |

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks: Wetland is primarily a cattail marsh with Salix nigra and Platanus occidentalis at the water's edge, but there is a temporarily flooded, sapling-dominated scrub/shrub wetland area in the western half of the wetland.

## HYDROLOGY

Recorded Data (Describe in Remarks):

- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other
- x No Recorded Data Available

Field Observations:

| | | |
|---|---|---|
| Depth of Surface Water: | 0-4 | (in.) |
| Depth to Free Water in Pit: | 9 | (in.) |
| Depth to Saturated Soil: | 0 | (in.) |

Remarks: This wetland was observed to be almost completely inundated during ground surveys conducted on August 25th and 26th, 2003. A July 17, 2002, aerial photograph shows an area of ponded water in this wetland area. The water sources for this wetland include precipitation, runoff, and possibly groundwater.

Wetland Hydrology Indicators:

Primary Indicators:

- x Inundated
- x Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

- ___ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks)

## SOILS

Map Unit Name (Series and Phase): Drainage Class:

Taxonomy (Subgroup): Field Observations Confirm Mapped Type? Yes _____ No _____

Profile Description:

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle Abundance/Contrast (%) | Texture, Concretions, Structure, etc. |
|---|---|---|---|---|---|
| 0-12 | | N 3/0 (gley) | | | Silty clay combined with coal ash |
| 12+ | | 5YR 6/8 | | | Clay liner |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Hydric Soil Indicators:

| | | | |
|---|---|---|---|
| _____ | Histosol | _____ | Concretions |
| _____ | Histic Epipedon | _____ | High Organic Content in Surface Layer in Sandy Soils |
| _____ | Sulfidic Odor | _____ | Organic Streaking in Sandy Soils |
| _____ | Aquic Moisture Regime | _____ | Listed on Local Hydric Soils List |
| _____ | Reducing Conditions | _____ | Listed on National Hydric Soils List |
| x | Gleyed or Low-Chroma Colors | _____ | Other (Explain in Remarks) |

Remarks: Wetland is on a sinkhole that had been filled with stone and capped with clay. The higher chroma clay layer was encountered at a depth of about 12 inches.

## WETLAND DETERMINATION

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes | x | No | | Is this Sampling Point Within a Wetland? | Yes | x | No | |
| Wetland Hydrology Present? | Yes | x | No | | | | | | |
| Hydric Soils Present? | Yes | x | No | | | | | | |

Remarks: Wetland is located on filled sinkhole in the area indicated as inactive coal ash pond 5. It is a short distance inside the disposal area gate and immediately north of the truck road leading to the dry ash stacking area.

Approximate area is 5 acres. The wetland boundary was not delineated and flagged.

# DATA FORM
# ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

| | | | | | |
|---|---|---|---|---|---|
| Project/Site: | Colbert Scrubber | | | Date: | 14 Nov 2003 |
| Applicant/Owner: | TVA | | | County: | Colbert |
| Investigator: | B. Rosensteel, K. McConnell | | | State: | AL |
| Request / CEC # | Req # 5750 | | | Quad: | Pride |
| | | | | Watershed: | Tennessee River/ Pickwick Res. |
| Do normal circumstances exist on the site? | Yes | x | No | Community ID: | PEM1 |
| Is the site significantly disturbed (Atypical Situation)? | Yes | x | No | Transect ID: | |
| Is the area a potential problem area? (If needed, explain on reverse) | Yes | | No x | Plot ID: | W3 |

## VEGETATION

| Dominant Plant Species | Stratum | Indicator | Dominant Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|
| Salix nigra | Shrub | Obl | Juncus tenuis | | Fac |
| Scirpus cyperinus | Herb | Obl | Juncus scirpoides | | Facw+ |
| Panicum capillare | Herb | Fac | Echinochloa crus-galli | | Facw- |
| Typha angustifolia | Herb | Obl | | | |
| Pluchea camphorata | Herb | Facw | | | |
| Cyperus strigosus | Herb | Facw+ | | | |
| Polygonum hydropiperoides | Herb | Obl | | | |
| Platanus occidentalis | Sapling | Facw- | | | |

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks:

## HYDROLOGY

Recorded Data (Describe in Remarks):

- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other
- x No Recorded Data Available

Field Observations:

| | | |
|---|---|---|
| Depth of Surface Water: | - | (in.) |
| Depth to Free Water in Pit: | - | (in.) |
| Depth to Saturated Soil: | - | (in.) |

Remarks: Soil saturation in upper 12” occurred in isolated locations in the wetland. This area was observed with water over most of the surface on October 28, 2003.

Wetland Hydrology Indicators:

Primary Indicators:

- ___ Inundated
- x Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- x Sediment Deposits
- x Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

- ___ Oxidized Root Channels in Upper 12 Inches
- x Water-Stained Leaves
- ___ Local Soil Survey Data
- x FAC-Neutral Test
- Other (Explain in Remarks)

## SOILS

Map Unit Name (Series and Phase): Drainage Class:

Taxonomy (Subgroup): Field Observations Confirm Mapped Type? Yes _____ No _____

Profile Description:

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle Abundance/Contrast (%) | Texture, Concretions, Structure, etc. |
|---|---|---|---|---|---|
| 0-18” | | N 4/0 | | | Coal ash residue and silt |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
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Hydric Soil Indicators:

| | | | |
|---|---|---|---|
| _____ | Histosol | _____ | Concretions |
| _____ | Histic Epipedon | _____ | High Organic Content in Surface Layer in Sandy Soils |
| _____ | Sulfidic Odor | _____ | Organic Streaking in Sandy Soils |
| _____ | Aquic Moisture Regime | _____ | Listed on Local Hydric Soils List |
| _____ | Reducing Conditions | _____ | Listed on National Hydric Soils List |
| x | Gleyed or Low-Chroma Colors | _____ | Other (Explain in Remarks) |

Remarks: Gray soil color is likely to be due to coal ash residue.

## WETLAND DETERMINATION

| | | | | |
|---|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes | x | No | |
| Wetland Hydrology Present? | Yes | x | No | |
| Hydric Soils Present? | Yes | x | No | |

Is this Sampling Point Within a Wetland? Yes _____ No _____

Remarks: This wetland is located at the base of a high berm in the southwest corner of the inactive coal ash pond 5. Occurs in a wide swale and larger depressions.

Estimated wetland area is 1.7 acres. The wetland boundary was not delineated or flagged.

# DATA FORM
# ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project/Site: | Colbert Scrubber | | | | | Date: | 13 Nov 2003 |
| Applicant/Owner: | TVA | | | | | County: | Colbert |
| Investigator: | B. Rosensteel, K. McConnell | | | | | State: | AL |
| Req. / CEC # | Req # 5750 | | | | | Quad: | Pride |
| | | | | | | Watershed: | Tennessee River/ Pickwick Res. |
| Do normal circumstances exist on the site? | | Yes | x | No | | Community ID: | PSS1 |
| Is the site significantly disturbed (Atypical Situation)? | | Yes | x | No | | Transect ID: | |
| Is the area a potential problem area? (If needed, explain on reverse) | | Yes | | No | x | Plot ID: | W4 |

## VEGETATION

| Dominant Plant Species | Stratum | Indicator | Dominant Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|
| Salix nigra | Sapling | Obl | | | |
| Liquidambar styraciflua | Sapling | Fac+ | | | |
| Sambucus canadensis | Shrub | Facw_ | | | |
| Populus deltoides | Sapling | Fac+ | | | |
| Scirpus cyperinus | Herb | Obl | | | |
| Boehmeria cylindrica | Herb | Facw+ | | | |
| Onoclea sensibilis | Herb | Facw | | | |
| Carex lurida | Herb | Obl | | | |

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks:

## HYDROLOGY

| | |
|---|---|
| | Recorded Data (Describe in Remarks): |
| | Stream, Lake, or Tide Gauge |
| | Aerial Photographs |
| | Other |
| x | No Recorded Data Available |

Field Observations:

| | | |
|---|---|---|
| Depth of Surface Water: | - | (in.) |
| Depth to Free Water in Pit: | - | (in.) |
| Depth to Saturated Soil: | - | (in.) |

Remarks: Depressional area with no apparent surface water outlet.

Wetland Hydrology Indicators:

Primary Indicators:

| | |
|---|---|
| | Inundated |
| | Saturated in Upper 12 Inches |
| x | Water Marks |
| x | Drift Lines |
| | Sediment Deposits |
| x | Drainage Patterns in Wetlands |

Secondary Indicators (2 or more required):

| | |
|---|---|
| | Oxidized Root Channels in Upper 12 Inches |
| x | Water-Stained Leaves |
| | Local Soil Survey Data |
| x | FAC-Neutral Test |
| | Other (Explain in Remarks) |

## SOILS

Map Unit Name (Series and Phase): Drainage Class:

Taxonomy (Subgroup): Field Observations Confirm Mapped Type? Yes _____ No _____

Profile Description:

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle Abundance/Contrast (%) | Texture, Concretions, Structure, etc. |
|---|---|---|---|---|---|
| 0-10 | Layer of coal ash | N 2.5/0 | | | Coal ash |
| 10-12 | A | 7.5YR 6/2 | 7.5YR 4/6 | | Silt loam |
| | | | | | |
| | | | | | |
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| | | | | | |
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| | | | | | |
| | | | | | |

Hydric Soil Indicators:

| | | | |
|---|---|---|---|
| | Histosol | | Concretions |
| | Histic Epipedon | | High Organic Content in Surface Layer in Sandy Soils |
| | Sulfidic Odor | | Organic Streaking in Sandy Soils |
| | Aquic Moisture Regime | | Listed on Local Hydric Soils List |
| | Reducing Conditions | | Listed on National Hydric Soils List |
| x | Gleyed or Low-Chroma Colors | | Other (Explain in Remarks) |

Remarks: Met resistance at 12”; possibly a heavy clay layer or compaction from previous activities in the area.

## WETLAND DETERMINATION

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes | x | No | | Is this Sampling Point Within a Wetland? | Yes | x | No | |
| Wetland Hydrology Present? | Yes | x | No | | | | | | |
| Hydric Soils Present? | Yes | x | No | | | | | | |

Remarks: In a depressional area adjacent to the Tennessee River berm immediately west of the dirt road to the oil barge offloading moors. Prior clearing and disturbance has altered soils and drainage.

Estimated wetland size is 1 acre. The boundary was not delineated or flagged.

# DATA FORM
# ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

| | | | |
|---|---|---|---|
| Project/Site: | Colbert Scrubber | Date: | 16 December 2003 |
| Applicant/Owner: | TVA | County: | Colbert |
| Investigator: | B. Rosensteel, K. McConnell | State: | AL |
| Req. / CEC # | Req # 5750 | Quad: | Pride |
| | | Watershed: | Tennessee River/ Pickwick Reservoir |

| | Yes | No | | | |
|---|---|---|---|---|---|
| Do normal circumstances exist on the site? | x | | Community ID: | PEM1F |
| Is the site significantly disturbed (Atypical Situation)? | | x | Transect ID: | |
| Is the area a potential problem area? (If needed, explain on reverse) | | x | Plot ID: | W5 |

## VEGETATION

| Dominant Plant Species | Stratum | Indicator | Dominant Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|
| Platanus occidentalis | Tree | Facw- | | | |
| Typha angustifolia | Herb | Obl | | | |
| Andropogon glomeratus | Herb | Facw+ | | | |
| Salix nigra | Sapling | Obl | | | |
| Baccharis halmifolia | Shrub | Fac | | | |
| | | | | | |

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks:

## HYDROLOGY

Recorded Data (Describe in Remarks):

- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other
- x No Recorded Data Available

Field Observations:

| | | |
|---|---|---|
| Depth of Surface Water: | 4-18 | (in.) |
| Depth to Free Water in Pit: | 0 | (in.) |
| Depth to Saturated Soil: | 0 | (in.) |

Remarks: Excavated ditch at the base of a waste treatment pond berm.

Wetland Hydrology Indicators:

Primary Indicators:

- x Inundated
- x Saturated in Upper 12 Inches
- x Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- x Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

- ___ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks)

## SOILS

Map Unit Name (Series and Phase): Drainage Class:

Taxonomy (Subgroup): Field Observations Confirm Mapped Type? Yes _____ No _____

Profile Description:

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle Abundance/Contrast (%) | Texture, Concretions, Structure, etc. |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Hydric Soil Indicators:

| | | | |
|---|---|---|---|
| | Histosol | | Concretions |
| | Histic Epipedon | | High Organic Content in Surface Layer in Sandy Soils |
| | Sulfidic Odor | | Organic Streaking in Sandy Soils |
| x | Aquic Moisture Regime | | Listed on Local Hydric Soils List |
| x | Reducing Conditions | | Listed on National Hydric Soils List |
| | Gleyed or Low-Chroma Colors | | Other (Explain in Remarks) |

Remarks: No soil sample was taken. The wetland occurs in a semi-permanently or permanently inundated, excavated ditch that is associated with a waste treatment pond. The aquic or peraquic moisture regime supports a positive hydric soil determination.

## WETLAND DETERMINATION

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes | x | No | | Is this Sampling Point Within a Wetland? | Yes | x | No | |
| Wetland Hydrology Present? | Yes | x | No | | | | | | |
| Hydric Soils Present? | Yes | x | No | | | | | | |

Remarks: Wetland W5 is located adjacent to a waste treatment pond in a transmission line right-of-way approximately 200 feet east of the main entrance road into the Colbert Fossil Plant.