4. ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

This chapter describes the environmental consequences that would likely result from the proposed action as described in Section 2.1. The principal alternatives are the proposed action as modified by conditions (e.g., mitigation) and the no-action alternative (see Section 2.7). Project design alternatives were also considered, and the potential impacts or effects of these alternatives were analyzed and are presented in this chapter. All of the potential impacts are analyzed in relation to the existing resources and environmental conditions described in Chapter 3, the baseline for assessing impacts. Section 4.2 addresses impacts of the proposed action, while Section 4.3 addresses the no-action alternative. Finally, Section 4.4 presents impacts of two project design alternatives. Chapter 5 describes measures to prevent pollution and mitigate impacts. Chapter 6 assesses cumulative impacts, where the impacts of the proposed action could, in conjunction with impacts of other reasonably foreseeable actions or activities, result in additive impacts on a particular resource; the impacts of climate change on a global, national, and regional scale are discussed in this chapter.

4.2 IMPACTS OF PROPOSED ACTION

Impacts of the proposed action, including the connected actions, are presented in the following subsections:

- 4.2.1—Atmospheric Resources and Air Quality.
- 4.2.2—Geology.
- 4.2.3—Soils.
- 4.2.4—Surface Water Resources.
- 4.2.5—Ground Water Resources.
- 4.2.6—Terrestrial Ecology.
- 4.2.7—Aquatic Ecology.
- 4.2.8—Floodplains.
- 4.2.9—Wetlands.
- 4.2.10—Land Use.
- 4.2.11—Social and Economic Resources.
- 4.2.12—Environmental Justice.
- 4.2.13—Transportation Infrastructure.
- 4.2.14—Waste Management Facilities.
- 4.2.15—Recreation Resources.
- 4.2.16—Aesthetic and Visual Resources.
- 4.2.17—Cultural and Historic Resources.
- 4.2.18—Noise.
- 4.2.19—Human Health and Safety.

4.2.1 ATMOSPHERIC RESOURCES AND AIR QUALITY

This section evaluates potential impacts to atmospheric resources that would result from construction and operation of the proposed Kemper County IGCC project power plant, lignite mine, and linear facilities. Subsection 4.2.1.1 discusses temporary effects of construction, including fugitive dust associated with earthwork and excavation. Subsection 4.2.1.2 discusses operational effects, including emissions of criteria pollutants and HAPs.

4.2.1.1 Construction

Power Plant

During construction of the proposed facilities, temporary and localized increases in atmospheric concentrations of NO_x, VOCs, CO, SO_2, and PM would result from exhaust emissions of workers' vehicles, heavy construction vehicles, diesel generators, and other machinery and tools. An average of approximately 45 vehicles would be used for construction activities on the site. Internal combustion engines would be used for activities such as excavation, concrete placement, and structural steel installation. Construction vehicles and machinery would be equipped with standard pollution control devices to minimize emissions.

During construction a variety of equipment including cranes, dump trucks, earth-moving equipment, and other internal combustion engine equipment would be operated for periods of up to 42 months; levels of various construction activities would vary widely during that time. For actual construction, the hours of operation, emission controls, vehicle maintenance, and forms of fuel are not known with certainty at this time. Nonetheless, worst-case annual construction emissions were conservatively estimated (i.e., tending to overestimate) for NO_x, VOCs, CO, SO_2, and PM_{10}, as 155, 8.6, 134, 0.03, and 19.2 tpy, respectively. These emissions represent an upper limit estimate for a year's emissions based on the expected construction activities. By comparison, the worst-case annual emissions from construction would be less than 11 percent of the anticipated annual emissions from normal plant operations (see Appendix C). Several of the conservative assumptions on which the estimated construction emissions were based include:

- The entire plant area (150 acres) and equipment laydown area (70 acres) would require 1.5 ft of fill material. This activity was assumed to occur over a 2-year period.
- The fill material would be transferred four times.
- Forty-five pieces of diesel engine driven equipment would operate for 10 hours per day, 5 days per week, and 52 weeks per year.
- Fifteen pieces of grading equipment would be operating at all times.
- All excavation/fill material would be transported on unpaved roads onsite.

HAP emissions from construction activities would be associated primarily with VOC emissions from diesel equipment. EPA has estimated the fractions of the predominant HAPs in VOC emissions from diesel exhaust as follows (EPA, 2004):

Benzene	0.02
Formaldehyde	0.118
Acetaldehyde	0.053
1,3-Butadiene	0.002
Acrolein	0.003

Using these fractions and the VOC emission estimate of 8.6 tpy, the annual emissions of air toxics in pounds per year (lb/yr) would be as follows:

Benzene	344 lb/yr
Formaldehyde	2,032 lb/yr
Acetaldehyde	913 lb/yr
1,3-butadiene	34.4 lb/yr
Acrolein	51.7 lb/yr

Based on conservative estimates, an upper limit to total annual HAP emissions from construction activities would be less than 2 tpy or approximately 20 percent of annual plant-wide HAP emissions during normal IGCC operations.

Fugitive dust would result from excavation, soil storage/handling, traffic over unpaved onsite roads, and earthwork. Most of this work would occur at the approximately 150-acre principal site of the proposed facilities located on the northeast portion of the property. The temporary impacts of fugitive dust from construction activities on offsite particulate concentrations would be localized because of the relatively rapid settling of larger size fugitive dust particles. To minimize fugitive dust emissions, water spray trucks would dampen exposed soil at the construction site with water as necessary, which is assumed to reduce fugitive dust by 50 percent (EPA, 1985a). Because construction of the facilities would be staggered, the maximum area undergoing heavy earthwork at any one time was assumed to be 5 percent of the total area to be developed (i.e., 7.5 of 150 acres) and the laydown area (3.5 of 70 acres), which would require some improvement prior to use.

Potential impacts of fugitive dust and other pollutants on local air quality were conservatively estimated using standard modeling techniques. The results presented herein represent a reasonable upper bound of possible impacts based on conservative assumptions. The construction activities were modeled using the EPA-approved American Meteorological Society (AMS)/EPA Regulatory Model (AERMOD) air dispersion model, and methods similar to the analyses conducted for plant operations described in the next section. Five years of meteorological data based on site-specific land use were used for modeling the construction activities. The construction activities were modeled as an area source encompassing the extent of the main IGCC facilities.

For the proposed construction activities, modeling results indicated that the greatest concentrations would occur at the proposed construction site, and concentrations would decrease steadily with distance from the site. Consequently, the maximum concentrations in the ambient air would occur at the nearest property boundary, northeast of the power block construction area. For comparison with the NAAQS, total concentrations were obtained by adding maximum modeled concentrations to their corresponding background concentrations as shown in Table 4.2-1.

Table 4.2-1. Estimated Criteria Pollutant Air Quality Impacts from Power Plant Construction Emissions

Pollutant	Averaging Time	Impact from Construction (µg/m^3)	Background Air Quality* (µg/m^3)	Total Impact† (µg/m^3)	NAAQS‡ (µg/m^3)
NO_x	Annual	49	15	64	100
CO	1-hour	1,639	5,635	7,274	40,000
	8-hour	1,162	3,795	4,957	10,000
SO_2	3-hour	0.15	91	91	1,300
	24-hour	0.05	31	31	365
	Annual	0.01	8.0	8	80
PM_{10}	24-hour	39	40	79	150
	Annual	6.1	23	29	50
$PM_{2.5}$	24-hour	4.3	28.9	33.2	35
	Annual	0.7	12.8	13.5	15

*From Pascagoula Monitoring Station measurements from 2005 through 2007 for NO_x, SO_2, PM_{10}. CO from Jackson Station, 2003 through 2005. Short-term values are highest second-highest. Background $PM_{2.5}$ concentrations are conservative estimates from the urban and center city monitor in Merician using the most recent available data (2006 to 2008). The short-term values are the maximum 98th percentile value observed during the 3-year period.

†The sum of the modeled concentration and the ambient background concentration.

‡NAAQS are established in accordance with the CAA to protect public health and welfare with an adequate margin of safety.

Source: ECT, 2009.

The HAPs most associated with diesel emissions were assessed in a similar manner, and the results are shown in Table 4.2-2.

Table 4.2-2. Estimated HAP Pollutant Air Quality Impacts from Power Plant Construction Emissions

Pollutant	Short-Term Impact (µg/m^3)	Screening Level Short-Term Concentration (µg/m^3)*	Long-Term Impact (µg/m^3)	Screening Level Long-Term Concentration (µg/m^3)†
Benzene	0.88	29	0.08	30
Formaldehyde	5.2	49	0.45	9.8
Acetaldehyde	2.3	81,000	0.20	9.0
1,3-Butadiene	0.09	440,000	0.01	2.0
Acrolein	0.13	0.19	0.01	0.02

*Minimum value from Table 2 of: Acute Dose-Response Values for Screening Risk Assessments (http://www.epa.gov/ttn/atw/toxsource/).
†From Prioritized Chronic (Noncarcinogenic) Dose-Response Values for Screening Risk Assessments (http://www.epa.gov/ttn/atw/toxsource/).

Source: ECT, 2009.

As shown in Tables 4.2-1 and 4.2-2, the results for the criteria and HAPs are below levels of concern, i.e., NAAQS or screening air toxic levels. Therefore, no adverse human health effects are expected to occur as a result of the plant construction activities. It should be recognized that the predicted impacts are likely an over-prediction resulting from conservative assumptions. Also, these activities would be temporary, and the activity level on average would be lower than assumed in the modeling.

Surface Lignite Mine

Construction of the mine facilities would occur on portions of the power plant site, as described in Subsection 2.2.1. Construction of facilities and structures would be accomplished using diesel-powered bulldozers, motor graders, trackhoes, and off-road trucks. Construction vehicles and machinery would be equipped with standard pollution-control devices to minimize emissions. Emissions similar to those described for the power plant would occur on a daily basis; however, the total emissions would be less because less construction would be required prior to commencing mining operations.

Construction activities would create short-term adverse effects from land disturbance by exposing soil to wind. However, MDEQ SMCRA regulations would require the mine operator to develop and implement a wind and water erosion control plan to minimize the impacts of soil erosion on undisturbed lands and offsite properties. Measures available to the mine operator to minimize soil erosion impacts include fabric filter fences, hay bales, and application of chemical soil stabilizers or water.

Construction activities would commence in 2011 and conclude in 2013. Exposed land surfaces would reach the maximum disturbance in 2012.

Linear Facilities

Linear facilities would include electrical transmission lines and reclaimed effluent, natural gas, and CO_2 pipelines. Construction of the transmission line facilities would involve clearing, grading, and excavation activities, followed by concrete placement and structure installation. Pipeline construction would involve similar site preparation work, followed by pipe installation, backfilling, and regrading (refer to Subsection 2.3.3). These activities would generate fugitive dust and engine exhaust emissions but would last for only a short period at any given location. In the case of the transmission lines that would be upgraded, the use of the existing rights-of-way would require less site preparation. Compared to the construction of the power plant, the activities would be temporary, more dispersed, and result in much less air emissions. Consequently, the air quality impacts resulting from the construction of the linear facilities would be negligible.

4.2.1.2 Operation

Power Plant

Permanent sources of air emissions from the proposed facilities would include the HRSG stacks, WSA system exhaust, AGR process vents, startup stacks, flares, material handling equipment, and mechanical draft cooling towers, of which the HRSG stacks would generate the most emissions. An auxiliary boiler and two fire-water pumps would also contribute to total emissions but would only be used occasionally.

Mississippi Power has submitted to MDEQ a revised air emissions source construction permit application (Mississippi Power, 2009a). This application is hereinafter referred to as the “revised PSD permit application,” as the relevant federal regulatory driver is the PSD program, as described in Chapter 7. The PSD permit application is too voluminous to append to this EIS, but it is available for public review. The application presents proposed project emissions in detail.

To ensure conservative estimates of air quality impacts, for air quality modeling purposes emissions were based on 100-percent load throughout the year (100-percent annual capacity factor) using the higher of estimated syngas or natural gas emission rates. On this basis, annual emissions from the proposed facilities of criteria pollutants with long-term averaging time NAAQS would include approximately 685 tons of SO_2, 2,214 tons of NO_x, 549 tons of PM, and less than 0.2 ton of lead. Annual emissions of VOCs, a precursor of the criteria pollutant ozone, would be 183 tons. The Kemper County IGCC Project would be a minor source of HAPs. Estimated potential HAP emissions of 4.1 tpy would result from the CT/HRSGs firing syngas exclusively. Exclusive firing of natural gas in the CT/HRSGs would result in up to 9.2 tpy of HAP emissions. Plant-wide emissions of mercury, primarily from the CT/HRSGs firing syngas, have been estimated to be approximately 0.03 tpy. Appendix C provides more detailed information on plant emissions.

Also, analyses of the potential air quality effects of criteria emissions from the proposed IGCC facility were performed for both the 50- and 67-percent CO_2 capture cases. The following discussions present the worst case of the two analyses.

Mobile emission sources would include plant vehicular traffic and personal commuter vehicles. Vehicles, ranging from passenger vehicles to tanker trucks, would be present during operations on the site. These vehicles would be equipped with standard pollution-control devices to minimize emissions. The relatively small amount of traffic would not contribute appreciably to ambient air pollutant concentrations in the area.

Additional PM would be generated from handling, transfer, and storage of coal, process wastes, and by-products. To reduce these particulate emissions, the number of handling and transfer points would be minimized, key drop points and crushers would be equipped with water sprays and/or foggers, much of the coal handling operation would be conducted in full to partial enclosures, and baghouses would be used at the milling and drying operations and crushed coal storage silos.

The potential impacts resulting from the facility emissions were evaluated using state-of-the-art air dispersion modeling techniques. The area surrounding the Kemper County IGCC Project site is designated a PSD Class II attainment area. Class II areas are deemed to be in compliance (attainment) with NAAQS and able to accommodate normal, well-managed industrial growth. Class I areas include national parks and wilderness areas where the air quality is more protected from the effects of industrial growth, i.e., a much smaller degree of air quality deterioration is allowed. Although the Sipsey Wilderness Area located in northern Alabama is more than 200 kilometers (km) from the Kemper County site, the possible impacts at this Class I area were included in the evaluation. Because of the distance of the Sipsey Wilderness Area from the site, the models and techniques were somewhat different from those used in the Class II area analysis. Therefore, the analyses for the Class I and II areas are discussed separately in the following subsections.

Class II Area Impact Analysis

As discussed in more detail in the air modeling sections of the revised PSD air permit application (Mississippi Power, 2009a) and supporting modeling protocol documents (ENSR, 2007a and b), the potential air quality impacts associated with operation of the proposed facilities were evaluated using refined air dispersion modeling techniques that include advanced treatment of atmospheric processes. Refined modeling requires detailed and precise input data, but also provides the best estimates of source impacts. The AERMOD modeling system (EPA 2004a and 2004b), together with 5 years of hourly meteorological data, was used in the refined ambient impact analysis. AERMOD was used to obtain refined impact predictions of concentrations for short-term (i.e., periods equal to or less than 24 hours) and long-term periods (i.e., annual averages). In the analyses, particulate emissions were conservatively assumed to be PM_{10} for comparison with the standards.

The AERMOD meteorological preprocessor AERMET (Version 06341) was used to process surface meteorological data collected at the Meridian Key Field Airport (MEI) (Weather Bureau, Air Force and Navy Station No. 13865) and upper air data from Jackson International Airport (AAB) (Station No. 13817). The surface and upper air data for the years 1991 to 1995 were obtained from the National Climatic Data Center (NCDC). The AERMET files for the years 1991 to 1995 were supplied to Mississippi Power by MDEQ. These data were processed by MDEQ using the land use characteristics of the surface weather station, i.e., Meridian Key Field. Additional AERMET files were produced based on the land use characteristics of the Kemper County IGCC Project site. The final modeling results were based on running both versions of the meteorological data.

Pollutant concentrations were predicted at ground-level locations (receptors) at the plant site boundary and beyond to distances of 20 km. Consistent with the Guideline on Air Quality Models (GAQM) and MDEQ recommendations, the ambient impact analysis was performed for the following model receptors:

- Fence line receptors—Receptors on the site fence line spaced 50 meters apart.
- Receptors beyond the fence line at 50-meter spacing, extending to 500 meters from the fence line.
- Receptors at 100-meter spacing, between 500 meters and 1 km from the fence line.
- Receptors at 500-meter spacing, between 1 and 5 km from the fence line.
- Receptors at 1,000-meter spacing, between 5 and 10 km from the fence line.
- Receptors at 2,000-meter spacing, between 10 and 20 km from the fence line.

Receptor terrain elevations derived from 7.5-minute digital elevation models were extracted using the latest version of AERMAP (Version 09040), the AERMOD terrain-processing program. The elevated terrain option in AERMOD was used to process the terrain data generated by AERMAP.

The effect of wakes produced from building downwash on plume dispersion were considered using EPA's Building Profile Input Program (BPIP) to determine the area of influence for each building. The building downwash analysis was performed using the most recent version of BPIP (Version 04274) with the plume rise model enhancements (PRIME) building downwash algorithms. The results were used as input to AERMOD.

The first step in the modeling process was to model the IGCC power plant sources alone and compare the results to the PSD Class II area significant impact levels (SILs). The SILs are set at levels far below the respective NAAQS (i.e., 1 to 10 percent of the NAAQS). According to EPA guidelines, a preliminary modeling analysis using SILs should include only the emissions associated with the proposed facilities to determine if the facilities would have a significant impact on ambient air quality. If the maximum predicted concentrations are less than the SILs, additional modeling including other sources and background concentrations is not required for regulatory purposes (EPA, 1990).

The proposed facilities would annually emit less than 0.2 ton of lead, which is less than the PSD significant emission rate of 0.6 tpy of lead (40 CFR 52.21). Lead ambient concentrations in recent years have been well below NAAQS, largely because of the decreased use of leaded gasoline in automobiles. Therefore, lead emissions from the proposed facilities were not evaluated further.

Ozone is not emitted directly from a source but is formed in the atmosphere from photochemical reactions involving emitted VOCs and NO_x. Because the reactions involved can take hours to complete, ozone can form far from the sources of its precursors (the VOCs and NO_x that initiate its formation). Therefore, the contribution of an individual source to ozone concentrations at any particular location cannot be readily quantified, and such an analysis is not required by MDEQ.

The full range of operating conditions (i.e., fuel type, load, supplemental duct burner firing, etc.) of the CT/HRSGs was considered. In addition, the full 5 years of meteorology were used in the modeling. A worst-case set of emission parameters was developed for each modeling case. These parameters consisted of the highest pollutant emission rate coupled with the lowest exhaust temperature and lowest exhaust flow rate to conservatively estimate ground level concentrations. The modeled results reported herein represent the highest values obtained for each pollutant and averaging time. As shown in Table 4.2-3, the results indicate that maximum concentrations were predicted to exceed the SILs for all pollutants except CO. Therefore, additional modeling, including other sources and background air quality, was required for SO_2, NO_x, and PM_{10}.

Table 4.2-3. Class II Area SIL Analysis

Averaging Period	μg/m^3				
	SO_2	NO_2	PM_{10}	CO	SIL
1-hour	—	—	—	810.3	2,000
3-hour	43.3	—	—	—	25
8-hour	—	—	—	483.0	500
24-hour	13.6	—	21.4	—	5
Annual	1.9	1.8	3.2	—	1

Source: Mississippi Power, 2009a.

To determine whether or not emissions from the proposed IGCC power plant would cause or contribute to a violation of the NAAQS or any PSD increment, the cumulative impacts of the proposed new sources along with existing sources were estimated with further modeling. The significant impact area (SIA) of the proposed facility was determined for each pollutant and averaging time. The maximum distance at which a significant impact was predicted was used to determine each SIA. All emission sources within the SIA plus another 50 km were included in the inventories of other sources. (It is reasonably assumed that sources beyond this area would not contribute significantly within the SIA.) The information characterizing the other, offsite emission sources was supplied by MDEQ and ADEM.

Because of the large numbers of sources within the SIAs, a screening procedure was used to eliminate smaller sources located outside the SIA that would not be expected to contribute significantly to predicted concentrations within the SIA. The technique commonly referred to as the North Carolina 20D Rule was used to screen the sources in the inventories. The first step in this procedure is to multiply the distance of the source from the edge of the SIA in kilometers by 20 to obtain the value 20D. This defines the threshold value in tpy for each pollutant being studied. Facilities with emissions below 20D are assumed to not be able to contribute significantly within the SIA and are eliminated from the inventory. The complete lists of sources and the results of the screening procedure may be found in Appendix 3 of the revised PSD permit application.

Table 4.2-4. NAAQS Impact Analysis

Pollutant	Averaging Period	Standard* ($\mu g/m^3$)	Modeled Concentration† ($\mu g/m^3$)	Ambient Background Concentration‡ ($\mu g/m^3$)	Total Predicted Ambient Concentration§ ($\mu g/m^3$)	Change in Total Ambient Concentration as a Percentage of Standard
SO_2	3-hour	1,300	30.2	91	121	2.3
	24-hour	365	12.8	31.3	44	3.5
	Annual	80	2.0	8.0	10	2.5
NO_2	Annual	100	2.4	15.1	18	2.4
PM_{10}	24-hour	150	18.3	40	58	12.2
	Annual	50	3.2	23	26	6.4
$PM_{2.5}$**	24-hour	35	2.01	28.9	31	5.7
	Annual	15	0.35	12.8	13.2	2.3

*NAAQS are established in accordance with the CAA to protect public health and welfare with an adequate margin of safety.

†Maximum modeled concentration from the proposed facilities and other offsite sources. $PM_{2.5}$ modeled concentrations are estimated based on the 0.11-ratio of $PM_{2.5}$ to PM_{10}.

‡From Pascagoula monitoring station measurements from 2005 through 2007 (except $PM_{2.5}$). Short-term values are highest 2nd high.

§The sum of the modeled concentration and the ambient background concentration.

** Background $PM_{2.5}$ concentrations are conservative estimates from the urban and center city monitor in Meridian using the most recent available data (2006 to 2008). The short-term values are the maximum 98th percentile value observed during the 3-year period.

Sources: Mississippi Power, 2009a.

The results of the NAAQS modeling are shown in Table 4.2-4. The modeled concentration is the cumulative impact from the IGCC power plant, the coal mining operations, and any existing sources that may possibly impact the SIA. The background air quality levels shown in Table 4.2-4 were obtained from the EPA AirData database available at http://www.epa.gov/air/data/index.html. The background air quality values are conservative, since they are based on values that are likely to be much higher than those found in the rural setting of the proposed IGCC plant. The total impact is the addition of the combined impacts of all sources and the background air quality. The highest change in total ambient concentrations for SO_2, NO_2, PM_{10}, and $PM_{2.5}$ are less than 13 percent of any of the respective standards (as indicated in the rightmost column). Consequently, cumulative air quality impacts from the sum of the proposed facilities along with existing sources and background air quality would not be expected to cause an exceedance of NAAQS.

On May 8, 2008, EPA issued a rule that finalizes several New Source Review (NSR) program requirements for sources that emit $PM_{2.5}$; however, several other NSR program requirements were left unaddressed. The rule contains a transition policy that suggests State Implementation Plan (SIP)-approved states should continue to use PM_{10} as a surrogate for $PM_{2.5}$ to demonstrate compliance with PSD requirements. Mississippi is an SIP-approved state; therefore, MDEQ is allowed to use PM_{10} as a surrogate for $PM_{2.5}$.

Since 1997 it has been EPA's policy that compliance with NSR requirements for PM_{10} may be used as surrogate for compliance with requirements for $PM_{2.5}$ (1997 Memorandum from John S. Seitz: Interim Implementation for the New Source Review Requirements for $PM_{2.5}$ and 2005 Memorandum from Stephen D. Page: Implemetation of New Source Review Requirements in $PM_{2.5}$ Nonattainment Areas). Although this policy still remains in effect, and despite the lack of final rules regarding all of the requirements of NSR for $PM_{2.5}$, the universal use of this policy for all source types has recently been questioned. For the Kemper County IGCC Project, the analysis in this EIS uses PM_{10} as a surrogate for $PM_{2.5}$ because:

- For each source type, the emissions of $PM_{2.5}$ generally correlate with the PM_{10} emissions.
- The $PM_{2.5}/PM_{10}$ ratios with and without particulate control technology applied are reasonably similar.

The project's primary combustion sources would include the IGCC stacks, gasifier startup stacks, auxiliary boiler, and flare systems. Particulate emissions from combustion sources would be largely the result of incomplete fuel combustion. Although definitive particle size distribution data were unavailable for these sources, the particulate emissions are considered to be within the PM_{10} size range, with a high percentage falling in the $PM_{2.5}$ size range. In fact, for some combustion sources all of the particulate might be $PM_{2.5}$.

There are no additional postcombustion controls that would have been evaluated for $PM_{2.5}$ that were not evaluated for PM_{10}. Postcombustion controls for $PM_{10}/PM_{2.5}$ would not be economically feasible for the Kemper County IGCC Project combustion sources, mainly because of the low particulate concentration in the exhaust gas. In the case of the open flare systems, postcombustion controls would not be technically feasible. The BACT proposed for all of the combustion sources was good combustion practices (GCP) with clean fuels also listed for the IGCC units and the auxiliary boiler. The combustion products from the gasifier startup process would pass through the syngas particulate cleanup system providing control before being exhausted from the gasifier startup stacks. Also, the startup stacks would be expected to operate for less than 500 hours per year (hr/yr). Since the proposed BACT would limit the production of particulate products of combustion that comprise the $PM_{2.5}/PM_{10}$ emissions, and $PM_{2.5}$ represents most if not all of the particulate emissions, the efficiency of BACT for both size fractions is considered to be the same.

Regarding fugitive dust and material handling sources, in 2006 EPA updated the AP-42 emission factors for fugitive dust sources including paved and unpaved roads, material handling and storage piles, industrial wind erosion, material transfer operations, and construction and demolition. The uncontrolled $PM_{2.5}$ to PM_{10} ratios across all of these categories ranged from 0.10 to 0.15 (EPA, 1995a). BACT proposed for these sources would consist of BMPs, full and partial enclosures, wet suppression, fogging, covered storage piles, and wetting of material (salt and ash) prior to loading. Although the control efficiencies for some of these methods might be less for the $PM_{2.5}$ fraction than for the PM_{10} fraction (e.g., approximately 40 percent versus approximately 90 percent for wet suppression), they would represent the BACT for the Kemper County IGCC Project and would have been chosen if only $PM_{2.5}$ were considered. There is little information on the efficiencies of other control measures versus particle size fraction. For the material handling processes that would be vented to a baghouse (i.e., the storage silo, coal milling, and drying stacks), the BACT level of 0.005 grain per dry standard cubic foot (gr/dscf) was selected. Since the control efficiencies for baghouses are fairly flat across particle size ranges (e.g., approximately 99 percent for $PM_{2.5}$ and 99.5 percent for PM_{10}), the proposed BACT would be considered appropriate for $PM_{2.5}$ as well as PM_{10} (EPA, 1995b).

The emissions from the cooling towers would be limited to the particulate associated with dissolved solids in liquid droplets that become entrained in the air stream exiting the cooling tower. High efficiency drift eliminators (i.e., 0.0005-percent drift rate) would be BACT for these sources. Drift eliminators would be the only control technology available for wet cooling towers and would be appropriate for controlling both PM_{10} and $PM_{2.5}$. The particle size distribution is dependent on several factors, including the design of the cooling tower and drift eliminators, and the concentration of dissolved solids in the recirculating water (e.g., higher concentrations of dissolved solids may result in fewer particles below 2.5 microns aerodynamic diameter). There is limited information concerning the aerosol size distribution of droplets from cooling towers. However, based on the Reisman and Frisbie Method of "Calculating Realistic PM_{10} Emissions from Cooling Towers" (Reisman and Frisbie, 2002), $PM_{2.5}$ emissions would be a fraction of the PM_{10} emissions.

While the previous discussion suggests the surrogate approach is appropriate for this project, it is expected that EPA Region 4 would make the final determination as to whether it is or is not appropriate for purposes of the PSD permitting process. For this EIS, application of the surrogate policy was supplemented by use of a conservative approach, as described next, to estimate $PM_{2.5}$ impacts, adding to the confidence that all regulatory standards would be protected.

Current research and data indicate that multipliers in the range of 0.06 to 0.11 can be used to infer or scale $PM_{2.5}$ concentrations from PM_{10} data (EPA, 2005). The $PM_{2.5}$ modeled concentrations included in Table 4.2-4 were estimated by applying a multiplier of 0.11 to the PM_{10} modeled concentrations. When using a multiplier of 0.11 for relative $PM_{2.5}$ to PM_{10}, the resulting concentrations of 24-hour and annual $PM_{2.5}$ would not exceed their respective NAAQS standards.

The analyses to assess the possible impacts relative to allowable PSD increments were performed in a manner similar to the NAAQS analysis. The inventory of PSD consuming sources was different than existing sources, and background air quality was not used for the PSD increment analyses. As can be seen in Table 4.2-5, all modeled impacts were found to be less than their respective PSD increments. Except for the predicted 24-hour PM_{10} concentration, which is 71.3 percent of the allowable increment, all other impacts were found to be less than 20 percent of the PSD increments.

Table 4.2-5. Class II Area PSD Increment Impact Analysis

Pollutant	Averaging Period	Allowable PSD Increment ($\mu g/m^3$)	Modeled Concentration* ($\mu g/m^3$)	Impact as a Percentage of PSD Increment
SO_2	3-hour	512	42.1	8.2
	24-hour	91	13.6	14.9
	Annual	20	1.9	9.5
NO_2	Annual	25	2.1	8.4
PM_{10}	24-hour	30	21.4	71.3
	Annual	17	3.3	19.2

*Maximum modeled concentration from the proposed facilities and other PSD consuming sources.

Sources: Mississippi Power, 2009a.

Class I Area Impact Analysis

The nearest Class I area is the Sipsey Wilderness Area located in northern Alabama, approximately 225 km from the IGCC project site. Class I areas have more protective air quality increments than those established for Class II areas. Also, guidance for preparing impact assessments has been established by the Federal Land Managers (FLM), in the form of air quality-related values (AQRVs) (Federal Land Managers' Air Quality-Related Values Workgroup [FLAG]), for the protection of Class I areas (FLAG, 2000). The AQRVs relevant to this analysis are air quality, visibility, and acidic deposition.

Since the Sipsey Wilderness Area is more than 50 km from the site, assessments of the impacts were performed using CALPUFF (Version 5.8, Level 070623), EPA's recommended long-range transport model (Scire *et al.*, 2000). It was not necessary to consider building wake effects because of the distance to the Class I area (i.e., the effects would be negligible). The receptors were obtained from the NPS database of Class I receptors (www2.nature.nps.gov/air/maps/Receptors/index.htm). The CALPUFF model predicted impacts for the 247 closely spaced receptor points covering the Sipsey Wilderness Area for the AQRVs (i.e., air quality, visibility, and deposition).

The meteorological input files, consisting of wind field data, were provided by the Visibility Improvement State and Tribal Association of the Southeast (VISTAS) for the years 2001 to 2003. Wind field data from Version 5 of the Penn State/NCAR Mesoscale Model (MM5) were input to CALMET meteorological processor. The CALMET meteorological simulations used 12-km resolution MM5 data for 2001 and 2002. The 36-km resolution data for 2003 was used since it was the highest resolution available for that year.

Only sources with elevated stacks, i.e., the CT/HRSG stacks, the flares, and the WSA stacks, were included in the modeling since the impact of the other ancillary sources would be expected to have a negligible impact at the distance of the Class I area.

All predicted impacts were found to be well below the SILs for Class I areas (see Table 4.2-6). The impacts ranged from a few percent of the annual SILs to 37.8 percent of the 24-hour SIL for PM_{10}. Since the predicted impacts were below the SILs, no further air quality analysis was required, i.e., the new sources were shown to not contribute significantly at the Class I area and, therefore, could not contribute to an exceedance of the NAAQS or PSD increments.

Table 4.2-6. Maximum Predicted Ambient Air Pollutant Concentrations Due to Emissions from the Proposed Facilities Compared to Class I SILs

Pollutant	Averaging Period	Maximum Impact ($\mu g/m^3$)	SIL ($\mu g/m^3$)	Total Impact as Percent of SIL
PM_{10}	24-hour	0.121	0.32	37.8
	Annual	0.003	0.16	1.9
NO_2	Annual	0.004	0.10	4.0
SO_2	3-hour	0.169	1.00	16.9
	24-hour	0.049	0.20	24.5
	Annual	0.0027	0.10	2.7

Sources: Mississippi Power, 2009a.

Visibility, or background visual range, is defined as the maximum distance a large, black object can be observed on the horizon. The scenic quality of natural landscapes and their color, contrast, and texture, are improved by good visibility. Visibility, as a measure of atmospheric clarity, has been established as an important AQRV of national parks and wilderness areas that are designated as PSD Class I areas. The maximum predicted change in visibility extinction in the Class I area was 7.5 percent. This consisted of a single event (i.e., one daily period) greater than the target threshold value of 5 percent change in extinction predicted in the 2002 model year. The maximum predicted change in extinction for the other model years was 4.6 and 1.9 percent in 2001 and 2003, respectively. The U.S. Department of Agriculture, Forest Service, previously concurred that a single predicted occurrence greater than the target level represented an acceptable impact (Mississippi Power, 2007).

The estimated impacts of acidic deposition at the Class I area from sulfur and nitrogen compounds that would be emitted from the plant were predicted to be well below the deposition analysis threshold (DAT) of 0.01 kilogram per hectare per year (kg/ha/yr) for both sulfur and nitrogen deposition. The maximum predicted impacts were 55 and 50 percent of the sulfur and nitrogen DATs, respectively, at the Sipsey Wilderness Area.

Cooling Tower Fogging, Icing, and Salt Drift Deposition

Besides the emissions from the CT/HRSG units and other plant sources, emissions from the wet cooling towers that would be used were evaluated in terms of potential fogging, icing, and drift impacts. The results, which are presented in full in Appendix N (AECOM, 2009b, c, and d), showed that: (a) visibility for automobiles on nearby roads would not be affected by ground-level plumes, (b) there would be no likelihood for icing of nearby roadways on cold days, and (c) salt deposition resulting from cooling tower drift emissions would be below thresholds that could harm soils and vegetation in the vicinity. The latter topic is discussed further in Subsections 4.2.6 and 4.4.1.

Acid Rain

Acid rain, the name frequently given to describe the phenomenon of acidic deposition, occurs when SO_2 and NO_x are chemically transformed and transported in the atmosphere and deposited on the earth's surface in the form of wet (rain, snow, fog) or dry (particle, gas) deposition. SO_2 and NO_x are readily oxidized in the atmosphere to form sulfates and nitrates. Subsequently, the sulfates and nitrates may form H_2SO_4 and nitric acid when combined with water, unless neutralized by other chemicals present. Acidic deposition contributes to the acidification of lakes and damage to ecological resources. SO_2 and NO_x can be transported by the wind for hundreds of miles from one region to another. Therefore, air over any given area will contain some residual emissions from distant areas and infusions received from nearby areas. This continuing depletion and replenishment of emissions along the path of an air mass makes it extremely difficult to determine relationships between specific sources of emissions and acidic deposition at any particular location.

As a comparison to evaluate acidic deposition, estimated maximum annual SO_2 emissions from the proposed IGCC facility would be 685 tons, which would be approximately two and a half times those of Kemper and Lauderdale Counties' 2001 SO_2 emissions inventory of 277 tons. Annual NO_x emissions from the IGCC facility would be 2,213 tons, or approximately 36 percent of Kemper and Lauderdale Counties' 2001 NO_x emissions of 6,190 tons. The facility's combined SO_2 and NO_x emissions would be approximately 45 percent of the Kemper and Lauderdale County emissions. Even though the facility's emissions are significant in relation to those of the surrounding counties, total emissions of acid-producing pollutants would still be lower than most conventional coal-fired power plants.

The Kemper County IGCC Project would be required to obtain an Acid Rain Phase II permit under Title IV of the CAA. The Acid Rain Program (see Chapter 7) applies to electrical generating units greater than 25 MW. Consistent with this program, the facility would be operated in a manner to reduce acid rain precursors. The Clean Air Interstate Rule (CAIR), established under Section 110 of the CAA, expanded the Acid Rain Program by reducing the cap for SO_2 emissions. CAIR also established a cap-and-trade system for NO_x. The project would be subject to continuous emissions monitoring, recordkeeping, and reporting requirements under the Acid Rain and CAIR Programs. Although the Circuit Court of DC vacated the CAIR on July 11, 2009, and has since remanded the rule to EPA, the court decision did not affect individual states' obligations to eliminate significant contribution to downwind states, ozone, and fine particulate pollution. At the beginning of operation, the IGCC facility would need to hold SO_2 and NO_x emission allowances to cover actual emissions of those pollutants generated from the electrical generating units. Since the proposed facility would operate within its prescribed allowances, appreciable adverse impacts related to acid rain would be limited.

Odors

The proposed facilities would emit some odors that would be noticeable on the site. Sources for these odors would include diesel engine exhaust from trucks, maintenance equipment, and coal yard loaders; the coal handling equipment; H_2SO_4 storage and handling; and ammonia storage and handling. Any of these potential odors should be limited to the immediate site area and should not affect offsite areas.

Surface Lignite Mine

Consultants to Mississippi Power performed a supplemental analysis to evaluate the impact of the lignite mine and the IGCC plant in combination and to show compliance with the NAAQS and PSD increments. DOE has reviewed this information and agrees with the methodology and conclusions. The evaluation was confined to PM_{10} emissions, since PM emissions from earthmoving and mining operations would likely result in the most significant impacts. Also, the emissions were assumed to occur in the section of land that would likely be mined first, i.e., the area directly south of the IGCC plant site. Since this parcel is the one nearest to the proposed IGCC plant, modeling of it would be expected to result in the highest combined air quality impacts.

Conservative estimates of the mining activities and emissions were made based on similar operations at the existing Red Hills Mine in Choctaw County, Mississippi. The primary sources of emissions would be the lignite haul road from the pit to the IGCC plant, the exposed coal mine area (approximately 100-acre extent), and the active coal pit (approximately 16-acre extent). The haul road and grader activities were assumed to occur at least 10 hours per day and 287 days per year. The potential short-term PM_{10} emissions rates for the haul road, exposed mine study area, and coal pit were estimated to be 6.64, 0.52, and 2.50 lb/hr, respectively. Receptor spacing and modeling methodology was consistent with the PSD analysis. The highest predicted impacts are shown in Tables 4.2-7 and 4.2-8. Since the impacts were estimated to be less than the respective NAAQS and PSD increments, the air quality impacts of the IGCC plant in combination with the lignite mine would be in compliance with the standards.

Table 4.2-7. NAAQS Analysis of Lignite Mine Operations and IGCC Plant

Pollutant	Averaging Period	NAAQS ($\mu g/m^3$)	Maximum Model Concentration* ($\mu g/m^3$)	Ambient Background Concentration ($\mu g/m^3$)	Total Impact ($\mu g/m^3$)	Total Impact as Percent of NAAQS
PM_{10}	24-hour	150	22.68	40	62.68	41.8
	Annual	50	6.09	23	29.09	58.2

*Modeled concentration includes lignite mine and IGCC plant.

Source: Mississippi Power, 2009a.

Due to the construction schedule, lignite coal would need to be trucked from the Red Hills Mine located in Choctaw County during the first 6 months of operation of the IGCC power plant. It has been estimated that 50 to 60 trucks per day would be required for delivering lignite. The road distance from the Red Hills Mine to the Kemper County site is approximately 70 miles. Estimates of the air emissions resulting from the operation of the coal haul trucks were made for criteria pollutants and CO_2. Pre-2007 highway emission standards, along with conservative assumptions concerning fuel consumption and average speed, were used to estimate truck engine exhaust emissions of these pollutants. SO_2 emissions were based on the use of ultra-low sulfur diesel fuel (i.e., 0.0015 weight percent sulfur) that would be required in the year 2010. CO_2 emissions were based on an engineering estimate assuming 99-percent conversion of carbon in fuel to CO_2 and 87-percent weight carbon in diesel fuel. The resulting estimated annual emissions were 51 tpy of PM_{10}, 2,030 tpy of NOx, 7,860 tpy of CO, 660 tpy of VOC, 0.02 tpy of SO_2, and 264,500 tpy of CO_2. These emissions also assume an older fleet of trucks than might actually be used, adding to the conservative bias of the estimates.

Linear Facilities

Operation of the linear facilities should not result in any significant or routine air emissions. Only occasional vehicular traffic for service and inspection would be expected. Therefore, no significant air emissions or impacts on air quality would result from these facilities.

Table 4.2-8. PSD Increment Analysis of Lignite Mine Operations and IGCC Plant

Pollutant	Averaging Period	PSD Increment ($\mu g/m^3$)	Maximum Model Concentration* ($\mu g/m^3$)	Total Impact as Percent of Increment
PM_{10}	24-hour	30	25.83	86.1
	Annual	17	6.09	35.8

*Modeled concentration includes lignite mine and IGCC plant.

Source: Mississippi Power, 2009a.

4.2.2 GEOLOGY

4.2.2.1 Construction

Consideration must be given to construction activities associated with any feature of the proposed Kemper County IGCC Project that could impact geological resources. Furthermore, consideration must be given to risks associated with natural seismic activity that could damage or affect the project.

As outlined in Subsection 3.4.4, the only economically significant geological resources known to exist in the project areas (the power plant, mine, and various linear facilities) are sand, clay, and lignite. Construction activities associated with the proposed facilities would have no adverse impact on local geological mineral resources, other than to preclude the use of those geological resources in the immediate areas of the facilities. Sand, clay, and lignite deposits are present in relative abundance in this region of Mississippi, whereas the construction footprint of the power plant, mine, and linear facilities would be relatively small (see Subsection 2.5.1).

Subsection 3.4.5 provided a rigorous description and analysis of local seismic activity and seismic hazard analysis that included site-specific data. Considering site calculations and based on FEMA 450 provisions (BSSC, 2003), it was determined that the site designs would comply with the NEHRP provisions. The overall seismic hazard would be relatively small in the project areas. No impacts would be expected from seismicity with regard to construction of the proposed facilities. Conversely, construction would not be expected to trigger natural seismic events.

4.2.2.2 Operation

There would be some loss of sand and clay deposits as a result of the surface mining process, but these deposits are plentiful in the region. The approximately 12,275-acre area to be mined would represent only a small fraction of the total area where minable lignite is present in east-central Mississippi. Overburden removal would cause a change to current stratigraphy. Backfilling and grading to replace the overburden (associated with reclamation) would be contemporaneous with mining and would restore the land surface to its approximate original contour and elevation. Removal of the two deepest lignite seams (E and F; see Figure 3.4-6) is not currently planned due to economic considerations.

The potential for earthquake damage in the project area is low, as discussed in Subsection 3.4.5. Thus, it is unlikely that the long-term operation of the power plant and surface mine would be affected by earthquakes and natural seismic activity. No impacts related to local geology from O&M of the electrical transmission lines and various pipelines would be expected. The low potential for earthquake hazards and the application of appropriate design standards would result in a low potential for seismic activity to cause damage to the pipelines or other linear facilities.

The Kemper County IGCC Project plans to incorporate carbon capture technology into the plant design, with a goal of 67-percent capture. The captured CO_2 would be piped for eventual use in existing EOR operations, as discussed in Subsection 2.1.2.11. Other than the production of additional oil and gas, no adverse geologic effects would be expected to result from this incremental use of CO_2 for existing EOR operations.

4.2.3 SOILS

4.2.3.1 Construction

Power Plant

Up to approximately 1,100 acres of the total 1,650-acre site would ultimately be disturbed during project construction (including both power plant and mine-related facilities) (refer to Subsection 2.5.1). A portion of these acres would be disturbed only during the construction activities (e.g., equipment laydown) and would not be developed with permanent facilities. The balance of approximately 550 acres would remain undisturbed. Overall, the areas for construction would accommodate access roads; power block, gasification island, and associated cooling towers and flares; makeup water storage pond; byproduct storage areas; permanent mine and coal handling facilities; a portion of the initial mine block; mine-related sediment ponds; and construction parking and laydown areas.

Construction of all of these facilities would require clearing of vegetation and subsequent excavations that would temporarily expose soils to potential erosion by winds and stormwaters. Areas to be disturbed would first be cleared and grubbed removing vegetation, and then topsoil would be stripped and temporarily stockpiled. Silt fencing would encompass the stockpiles except for vehicle access points. Stockpiles would not be located in wetland areas or in areas that would be affected by other construction activities. Topsoil stripped from the construction areas would be stockpiled for reuse or incorporated into landscape features. Unsuitable fill material would be used for onsite landscaping features. Silt fencing (or other, similar measures) would encompass these areas, except for vehicle access points, until the establishment of final vegetation cover.

After site preparation and removal of unsuitable materials in all structural areas, foundations would be constructed. No adverse impacts would be anticipated relative to soil stability or bearing strength because concrete piles would support the power block foundation. Overall settling of the land area would be negligible. Further geotechnical studies would be conducted when designing the byproduct storage areas, as appropriate.

Most of the areas designated for construction of facilities and structures would require grading. The average graded site elevation would be 470 ft-msl, midway between the site's high and low elevations of 520 and 420 ft-msl, respectively.

Surface Lignite Mine

Construction of the mine support facilities (e.g., lignite handling facilities, office, etc.) and structures (e.g., sedimentation ponds) and premining activities to prepare mine block A for lignite extraction would affect the existing soils on approximately 455 acres. Subsection 4.2.3.2 explains NACC's proposal to use selected overburden materials as a substitute for native topsoil and subsoil in the postreclamation landscape. If approved by MDEQ, topsoil in these areas would be comingled with other overburden materials during the construction process.

Soil compaction would result beneath mine facilities and roads occupying approximately 320 acres, although reclamation following the completion of mining operations could reverse this effect. Existing soils within the four sedimentation ponds would be affected by construction; up to 94 acres could be affected by sedimentation pond construction. Construction of the 1-A diversion channel adjacent to Chickasawhay Creek would remove and redistribute the existing native soils from up to 41 acres along the 2.84-mile diversion channel.

Construction activities would create short-term adverse effects from land disturbance by accelerating soil erosion, especially on steeper slopes. However, MDEQ SMCRA regulations would require NACC to develop and implement a wind and water erosion control plan to minimize the impacts of soil erosion. During consultations with DOE, NACC committed to using BMPs to minimize soil erosion impacts, including installation of fabric filter silt fences, hay bales, application of water and/or chemical soil stabilizers, quickly germinating vegetation, and use of diversion structures and sedimentation ponds.

Linear Facilities

Construction of linear facilities (transmission lines and pipelines) would begin with clearing and grading, as described for the other project components. Information on construction methods was provided in Subsection 2.3.3. Construction of transmission lines would not require large excavations, and appropriate BMPs would be used to prevent erosion. Both the temporary and permanent rights-of-way would be revegetated following construction. Thus, impacts to soils would be minimized. During pipeline trenching, soil removed from the trench would be placed alongside and then used to fill the trench and restore natural grades and contours. BMPs for construction would minimize temporary impacts to soils. As shown in Subsection 2.3.3, the rights-of-way would be restored as closely as possible to original conditions.

4.2.3.2 Operation

Power Plant

Once constructed, the IGCC facility would have some potential to impact soils on the plant site and in the vicinity. First, as with any large industrial facility, stormwater runoff from impervious areas (e.g., parking lots) would potentially carry oil or grease onto soils. Spills of fuel, oil, and chemicals would also potentially impact soils if allowed to run off. However, in these cases, proper systems for stormwater management as well as containment or enclosure of fuel and chemical storage areas would minimize the potential to impact soils. In the event of spills, the facility would be required by regulation to implement measures spelled out in SPCC plans, the purpose of which would be to minimize impacts to surroundings, including soils.

Second, sulfur and nitrogen can be added to soil as a result of atmospheric deposition. Sulfur and nitrogen deposition in soil can have beneficial effects to vegetation if they are currently lacking these nutrients. At levels above requirements for specific plant species, gaseous emission impacts on soils can cause acidic conditions to develop. Acidic conditions in the soil can cause the leaching of basic cations essential for plant life and in extreme circumstances can transform aluminum to a more soluble form where toxicity can occur (Goldstein *et al.*, 1985).

Nitrogen deficiency is common in nonagricultural areas, and, therefore, much of the atmospherically deposited NO_x is biologically assimilated. There is a limited soil adsorption mechanism for nitrate, so unutilized nitrate will be leached through the soil (Johnson and Reuss, 1984). Both of these factors indicate that nitrate does not play a significant role in soil acidification and that sulfate is more of a concern. Atmospheric deposition of nitrogen can facilitate eutrophication of the soil and vegetative community. Critical loads of nitrogen, above which eutrophication caused a change in vegetative species present in calcareous forests was found to be 15 to 20 kg/ha/yr (Thimonier *et al.*, 1994).

Sulfur deposition can facilitate soil acidification. Sulfur exists in the soil predominantly in the form of sulfate. The maintenance of sulfate in soil solution facilitates the loss of cations. Therefore, the more sulfate that is adsorbed to soil particles, the more buffered the soils will be (Johnson and Reuss, 1984). The soil is a much larger sink for sulfate than vegetation (Johnson and Reuss, 1984). Sulfate can be adsorbed on the surface of reactive clays and iron/aluminum oxides within the soil, which often releases hydroxide, further buffering the soil (Johnson and Reuss, 1984). Soils found in the southeastern United States that have high adsorption rates for sulfates include ultisols and certain suborders of inceptisols and entisols (Psamments) (Johnson and Reuss, 1984). The high iron and aluminum content of the spodic (B_h) horizon of spodosols likely adsorbs the sulfate anion to a large extent, similar to the phosphate anion. The development of acidic conditions in the southeast is thought to be well buffered by the high rates of sulfate adsorption (USGS, 1999).

Dissolution of sulfate and nitrate can also facilitate the formation of nitric acid and H_2SO_4 in rainwater, which elevates hydrogen concentrations within the soil. Soils that are well buffered due to the addition of acidifying hydrogen ions have a high cation exchange capacity, often imparted by surface or subsurface clays and a high base saturation. Barton *et al.* (2002) found soils with a base saturation of 12 to 19 percent and reactive clays to be buffered to acidic inputs, whereas soils with a base saturation of 3 to 7 percent show the effects of soil acidification. In addition, organic horizons of wetland histosols buffer acidic inputs and retard the depletion of cations from the mineral horizons (Koptsik *et al.*, 1998).

As presented previously in Subsection 4.2.1.2, project emissions of sulfur and nitrogen compounds would result in worst-case impacts that would be well below NAAQS. Thus, it can be concluded that air pollutant-related impacts on plant site and area soils would be minimal.

Surface Lignite Mine

Lignite extraction is proposed to occur on up to 10,224 acres. Another 2,048 acres immediately adjacent to the extraction areas would be disturbed by mining operations. Therefore, the total mining-related disturbance would affect up to 12,272 acres through the end of the Kemper County IGCC Project, including the land disturbed during construction (see Table 2.4-2). Prime farmland soils occur on approximately 211 acres or 11 percent of this total disturbance.

At the Kemper County site, the mine operator is proposing to use selected overburden materials as a substitute for topsoil because the topsoil layer (i.e., the A horizon) is thin (see Subsection 3.5.2), a procedure specifically approvable by MDEQ SMCRA Regulations. In support of the proposed substitution, the mine operator has provided the following justification:

> *"Through three decades of experience on the parts of mine operators and regulatory agencies pursuant to the federal SMCRA and MSMRA, certain soil properties (both physical and chemical) have been identified as especially important for consideration during the processes of evaluating materials for use in the top 4 ft of reclaimed soils (premining) and monitoring reclamation success (postmining). For the purposes of this discussion, key soil properties are those soil properties that have been identified as important to consider in selecting 'best available materials' for reclamation of the postmining surface as required by SMCRA, MSMRA, and their implementing regulations. As discussed in Section 3.4, Geology, a total of 18 continuous (from the*

surface to a depth of 10 ft below the lowest mineable lignite seam) overburden cores were collected within the proposed project area for analyses by Energy Laboratories, Inc., College Station, Texas. To compare key properties of existing (native) soils to those of materials potentially available for use in the top 4 ft of reclaimed soils, data for each overburden core were depth-weighted to produce values for the topsoil, subsoil, oxidized overburden, and unoxidized overburden intervals, respectively defined as follows: zero (surface) to 1 ft, 1 to 4 ft, surface to base of oxidation, and base of oxidation to total depth. Table 4.2-9 summarizes maximum, minimum, and weighted mean values for key soil properties for each of these four intervals.

Weathering and leaching are among the important processes contributing to soil conditions measurable in terms of key soil properties. Logically, the effects or expression of these processes generally decrease with increasing depth below the surface. For the most part, increased expression of these processes equates to undesirable soil properties such as low (acid) soil reaction (pH) values, low base saturation, dense layers (pans) formed by accumulation of fine soil particles, and/or chemical compounds, etc. Briefly summarized, the data presented in Table 4.2-9 indicate that the effects of weathering and leaching are quite evident in the near-surface (topsoil and subsoil) materials, somewhat evident in the oxidized overburden, and not evident in the unoxidized overburden. Thus, the unoxidized overburden, with its near-neutral pH, high base saturation, and moderate textures, appears to be the 'best available material,' with the exception of one key property, pyritic sulfur content. When exposed to air and water (i.e., weathering), pyritic sulfur oxidizes, often creating acid drainage and/or acidic soils, both of which are undesirable conditions prohibited by both SMCRA and MSMRA. While not as desirable in terms of pH and base saturation, the oxidized overburden does not contain pyritic sulfur and is also superior to the unoxidized overburden in terms of texture. Compared to the topsoil and subsoil, the oxidized overburden is equivalent or superior in terms of all key soil properties. A detailed accounting of these comparisons will be the basis for a proposal (in the surface mining permit application) to use oxidized overburden as a topsoil and subsoil substitute, i.e., the top 4 ft of postmining (reclaimed) soils.

The proposed land reclamation procedure would involve placement and grading of select (oxidized) overburden to the final 4 ft of the reclaimed surface on the approximate original (i.e., premining) contour. Although soil compaction would be minimized through placement of the select overburden as the final step of truck/shovel topsoil substitute removal and placement operations, ripping and other tillage operations would be implemented as necessary. To verify the absence of acid-forming, toxic-forming, and combustible materials and identify any fertilizer and/or soil amendment needs, the reclaimed soils would be sampled and analyzed for the key properties listed in Table 4.2-9, as well as the major plant nutrients (i.e., nitrogen, phosphorus, and potassium). For most grass and legume species, the reclaimed soil layer (upper 6 inches) would be maintained above 6.0 pH. The rooting zone (upper 4 ft) would consist of a balanced mixture of particle sizes (sand, silt, and clay) to optimize important plant growth factors (e.g., cation exchange capacity and moisture movement, storage, and availability).

BMPs such as those described in Subsection 4.2.3.1 would minimize losses by erosion. For establishment of immediate cover, a properly prepared seedbed would be planted to warm-season grasses (e.g., common Bermuda grass) or cool-season grasses (e.g., tall fescue, ryegrass, wheat) depending on the season. As the vegetative cover becomes permanent, perennial legumes (e.g., clovers, lespedeza, and other locally adapted species) would be included to maintain and enhance long-term soil productivity, especially on areas proposed for agricultural postreclamation land uses. Based on the premining land use/and or landowner preferences, seedlings of loblolly pine or other tree species would be planted on reclaimed land designated for forestry, which is the predominant land use in both premining and postreclamation landscape (see Section 3.12 and 4.12)" (NACC, 2009).

Table 4.2-9. Minimum, Maximum, and Weighted Mean Values for Selected Parameters*: Topsoil†, Subsoil‡, Oxidized Overburden§, and Unoxidized Overburden**

		Topsoil	Subsoil	Oxidized Overburden	Unoxidized Overburden
pH (s.u.)	Minimum	4.3	4.3	4.3	5.7
	Maximum	6.6	5.2	5.8	7.1
	Weighted mean	4.8	4.6	4.9	6.5
Sand content (percent)	Minimum	17.0	10.3	11.3	27.3
	Maximum	57.0	63.0	76.9	59.0
	Weighted mean	34.1	34.2	42.7	39.8
Clay content (percent)	Minimum	15.0	13.7	8.2	10.9
	Maximum	53.0	56.0	40.5	24.7
	Weighted mean	30.1	31.3	24.8	19.0
Acid-base accounting††	Minimum	-4.0	-6.0	-4.7	-9.1
	Maximum	52.0	-0.3	10.4	9.3
	Weighted mean	1.4	-2.9	-0.8	1.0
Pyritic sulfur (percent)	Minimum	0.0	0.0	0.0	0.1
	Maximum	0.0	0.0	0.0	0.5
	Weighted mean	0.0	0.0	0.0	0.3
Base saturation (percent)	Minimum	31.0	20.7	38.2	74.3
	Maximum	100.0	89.0	86.3	99.8
	Weighted mean	60.3	43.0	64.6	93.0
Cadmium (ppm)	Minimum	0.0	0.0	0.0	0.0
	Maximum	0.2	0.5	0.2	0.4
	Weighted mean	0.1	0.1	0.1	0.2
Selenium (ppm)	Minimum	0.2	0.2	0.0	0.4
	Maximum	1.4	1.1	0.7	0.9
	Weighted mean	0.6	0.6	0.4	0.6

*Based on data from 18 continuous cores (surface to 10 ft below lowest mineable seam) collected throughout the mine study area and analyzed by Energy Laboratories, Inc., College Station, Texas.

†As represented by the 0- to 1-ft interval of 18 continuous cores collected throughout the mine study area.

‡As represented by weighted means of data from 1 to 4 ft for each of the 18 continuous cores collected throughout the mine study area.

§As represented by weighted means of data from the oxidized interval (surface to base of oxidation) for each of the 18 continuous cores collected throughout the mine study area.

**As represented by weighted means of data from the unoxidized interval (base of oxidation to total depth) for each of the 18 continuous cores collected throughout the mine study area.

††Tons of $CaCO_3$ per 1,000 tons.

Source: NACC, 2009.

Under this proposed soil substitution alternative, the existing topsoil and subsoil would be comingled with oxidized overburden during the overburden removal step in the lignite extraction process. It would become part of the topsoil and subsoil substitute proposed by NACC.

Within areas of upland soils to be mined, DOE concludes the proposed use of oxidized overburden would be a reasonably similar and practical substitute for the premining surface soils. The physical and chemical characteristics are comparable. The use of fertilizer, lime, and tillage; recontouring the land to optimally stabilize slopes; and revegetating the graded surfaces quickly are management procedures that would be needed to ensure successful reclamation.

Most of the prime farmland soils are moderately well drained soils on stream terraces. What makes these soils prime has more to do with the landscape position than any unique biological, chemical, or physical characteristics. DOE concludes the oxidized overburden, placed in a similar landscape configuration, would likely have soil-water conditions similar to the existing soils.

Although impacts to the morphology and composition of these prime farmland soils would be irreversible and permanent, their productivity could be fully replaced (and possibly exceeded) by a comparable acreage of reclaimed land. Historical cropland on prime farmland soils, as defined by MDEQ SMCRA Regulations, is nonexistent within the project area.

Following regulations and guidelines established by the FFPPA (USDA, 1984), a farmland conversion impact rating (Form AD-1006) was prepared for the soils in the project area (Figure 3.5-2 and Table 3.5-1) by a consultant to NACC. Based on the 4,710.2 acres of prime farmland soils in the 31,260-acre project area and local soil resource considerations, a rating of 19 (out of 100) was assigned by the Kemper County NRCS staff for land evaluation criteria, and a score of 77 (out of 160) was estimated for the site assessment, resulting in a total point score of 96 (out of 260) for potential prime farmland conversion impact, which is below the 160-point score USDA threshold requirement for additional project alternatives to be considered (NACC, 2009).

Upon completion of reclamation, soils in the mine study area would be comprised of up to 10,224 acres of oxidized overburden in areas where lignite extraction occurs and up to 2,047 acres of disturbed existing soils in areas occupied by mine support facilities or structures. Open water areas also could be present should NACC and landowners reach agreements to leave sedimentation ponds in place for private recreation and/or water supply purposes. Postreclamation wetland (hydric) soils are addressed in Subsection 4.2.9.

Linear Facilities

As discussed elsewhere, rights-of-way would be graded to natural (or close to natural) contours and would be revegetated. Impacts on soils resulting from operation of the linear facilities would, therefore, be minimal.

4.2.4 SURFACE WATER RESOURCES

Surface water resources would be impacted by project construction and operation directly (e.g., undermining of a surface water body) and indirectly (e.g., deposition of sediments and air pollutants). The characteristics of existing water bodies of particular interest were presented in Section 3.6.

4.2.4.1 Construction

There are three sources of impacts to surface waters that could potentially occur during construction of the various project components:

- Impacts resulting from construction and mining that displace existing surface waters.
- Impacts due to changes in stormwater quantities and/or qualities discharged offsite.
- Impacts due to disturbance of existing wetlands and/or waters of the United States.

The first two listed are addressed in this subsection. The latter are addressed in Subsection 4.2.9.1. All construction activities related to the proposed action would have the potential to deliver sediments from ground disturbances and airborne dust and petroleum products or other contaminants used during construction. These construction related impacts would be minimized or eliminated through implementation of BMPs, an SPCC plan, a stormwater pollution prevention plan (SWPPP), and NPDES discharge permit controls and monitoring.

Power Plant

As discussed previously, plans would be implemented to: (a) characterize and properly handle excavated soils and water from dewatering (if required), and (b) establish effective stormwater quantity and quality controls (SWPPP) as well as SPCC procedures. An SWPPP, including a detailed erosion and sediment control plan, would be prepared in accordance with and consistent with applicable regulatory requirements. The plan would form the basis for ensuring adequate protection of the surrounding surface waters during construction. Essentially, there would be three potential sources of impacts to surface waters during facility construction that would be addressed in the SWPPP:

- <u>Impacts Due to Direct Disturbance of Existing Surface Waters</u>—Some drainage features onsite would be filled or relocated, and stormwater management ponds would be built as part of the initial site work. Modification of drainage features would be done in accordance with stormwater management regulations to minimize adverse impacts to surface waters. The stormwater conveyance/management functions these existing features are providing would be maintained or enhanced by the new stormwater management system.
- <u>Impacts Due to Significant Changes in Stormwater Quantities and/or Qualities Discharged Offsite</u>—Stormwater ponds and sediment control facilities would be developed and installed to accommodate construction activities and achieve an acceptable transition from predevelopment conditions to the final facility stormwater management system. Key construction period controls would include:
    - Existing vegetation would be left in place wherever possible and disturbed soils compacted as necessary to prevent significant erosion.
    - Temporary and permanent swales, sediment control basins, and/or stormwater ponds would be installed as required prior to the initiation of construction (as stated in the general permit and regulations) to ensure adequate stormwater facilities are in place at all times. These facilities would be modified and/or expanded as needed during construction.

  - All temporary and permanent swales would be compacted as required and lined with grass, mulch, and/or staked straw bales to reduce water velocities and promote the settling of suspended sediments.

  The implementation of these plans in accordance with the approved stormwater systems and the application of BMPs would minimize potential impacts to any onsite or nearby offsite surface waters or wetlands during facility construction.

- <u>Impacts Due to Accidental Spills of Onsite Chemicals, Lubricants, or Other Potential Contaminants</u>—SPCC procedures would be developed and strictly followed. These procedures would be designed to minimize the opportunity for accidental spills and ensure that adequate systems were in place to contain any accidental spills.

The implementation of these procedures in accordance with the approved SWPPP and the application of BMPs would minimize potential impacts to any onsite or nearby offsite surface waters during facility construction. Impacts would also be minimized by the lack of surface water features and associated aquatic resources on the power plant site. The site is well drained by multiple ravines containing small ephemeral and intermittent streams that drain to Chickasawhay Creek. Control of construction stormwater runoff and delivery to drainage ravines would minimize impacts of sedimentation in downstream receiving water bodies.

<u>Surface Lignite Mine</u>

Construction required to be completed prior to commencement of mining operations would include assembly of the dragline, construction of the lignite handling plant and mine infrastructure facilities, and developing the water management system for initial mine block A. Construction associated with mine blocks B1 through G is addressed in Subsection 4.2.4.2.

The most prominent water management features would include construction of diversion channel 1A to reroute Chickasawhay Creek and sedimentation ponds SP-2, SP-3, SP-7, and SP-10. Other surface water control structures would include collection channels in active mining areas to route runoff from land disturbed by mining to sedimentation ponds. Minor structures such as berms, roadside ditches, and culverts also would be used within active mining areas to collect and route rainfall runoff into sedimentation ponds (NACC, 2009).

The 1A diversion channel would be designed and sized to safely convey the flows resulting from the 100-year storm event within the banks of the diversion channel to protect adjacent mining areas from flooding. Diversion channel 1A would originate in the southwest quarter of Section 9 and terminate in the northeast quarter of Section 29, both in Township 9 south, Range 14 west. Slopes and vegetative ground cover of diversion channel 1A would meet MDEQ SMCRA Regulations that require nonerosive velocities and adequate freeboard. Ground cover within the channel would include grass and hydrophytic trees that normally volunteer along the diversion channel banks. Trees would be planted to provide a protective canopy over the diversion channel. As explained in Subsection 2.3.2.4, the diversion channel would maintain water flows and quality in Chickasawhay Creek by routing the creek away from mining areas (NACC, 2009).

Design, sizing, and construction of diversion channel 1A as previously described would minimize impacts on the surface water resources downstream in Chickasawhay and Okatibbee Creeks and Okatibbee Lake. The subbasin drainage network within the mine study area and the associated water budget would not change due to the diversion channel. Potential water quality impacts in the form of increased turbidity, lower DO, and increased summer water temperature would be minimized by proper channel design, establishing grass cover in the channel bed and slopes (with sodding providing additional temporary benefits as compared to planting), and planting trees to provide shade over time, respectively.

Construction of the four sedimentation ponds would protect downstream water quality by reducing suspended solids and turbidity in rainfall runoff from mining and facilities areas located upstream of these structures through natural settling, augmented by flocculent additions when necessary. Runoff from active mining and facilities areas generated by storm events of less than 6.5 inches (i.e., the 10-year, 24-hour event) would be detained in accordance with MDEQ SMCRA Regulations. The retained runoff would be discharged from sedimentation ponds as soon as the NPDES permit effluent criteria for TSS are met, usually within a couple of days after the storm has passed. The maximum allowable discharge schedule is 10 days. Runoff from storm events in excess of 6.5 inches does not need to be contained and would pass through the spillways of the sedimentation ponds (NACC, 2009).

The effects attributable to construction of sedimentation ponds SP-2, SP-3, and SP-7 would be to control discharges from three intermittent streams: Tompeat Creek and two unnamed tributaries to Chickasawhay Creek. Approximately 1,350 acres of watershed on the mine study area would be controlled by these three structures, which equates to approximately 1.4 percent of the Okatibbee Lake watershed. No changes to the subbasin watershed acreages or boundaries would occur. Therefore, the principal effects would be changes in the flow patterns of the three streams during and after rainfall events to correspond with the MDEQ SMCRA-required 10-day maximum discharge release schedule. Runoff from storm events greater than 6.5 inches would pass over emergency spillways in the sedimentation ponds. The effects of constructing sedimentation pond SP-10 would be limited to the immediate area, because flow in Chickasawhay Creek would be routed through diversion channel 1A prior to construction of this structure.

In addition, the water budget in the SP-2 and SP-3 watersheds would change through the construction of approximately 300 acres of mine support facilities where lesser evapotranspiration would occur. These areas occupy less than 0.5 percent of the Okatibbee Lake watershed.

Water quality parameters that could be influenced by the surface water management system would include TSS, DO, and temperature, with TSS and DO controllable through pond and spillway designs. The likelihood of releases of pollutants due to spills (e.g., diesel fuel) during construction would be lessened by the MDEQ SMCRA requirement to prepare and implement an SPCC plan.

Separately, mine dewatering activities described subsequently in Subsection 4.2.5.1 would contribute flow to the surface water system. The average annual flow increase would be less than 2 cfs, or approximately 1 percent of the average flow into Okatibbee Lake.

Linear Facilities

As with the construction of the facilities on the power plant site, detailed erosion and sediment control plans, including SWPPP and BMPs, would be prepared to address stormwater and sediment control during construction of the transmission lines and pipelines. These plans would form the basis for ensuring adequate protection of the surface waters that would be intersected or nearby during construction.

Direct impacts to surface waters would be avoided or minimized by various measures. In the case of transmission lines, designs could allow for spanning intersected surface waters. In the case of the pipelines, construction methods could be used to install the pipes beneath streams, thereby avoiding construction in the streams themselves. Construction of the reclaimed effluent, natural gas, and CO_2 pipelines would potentially cause temporary direct impacts to streams that they cross. Impacts would vary depending on the construction method ultimately selected and approved. For most ephemeral and intermittent streams, the impacts would be short-termed and minimal. Open-cut trenching of ephemeral and intermittent streams would have the least impact if conducted during periods of low- or no-flow. Any time flow was present, sedimentation BMPs would be used to reduce transport of sediment downstream. For perennial streams, open-cut trenching might not be feasible, depending on the size of the stream. Open-cut trenching in perennial streams could cause extensive downstream sedimentation, which would be more difficult to control. Other crossing methods, such as jack-and-bore and directional drilling, would have less impact on perennial streams. Permit conditions should specify use of applicable construction BMPs and require restoration to preexisting conditions. Permit conditions could also require crossing methods other than open-cut trenching in perennial streams, or otherwise sensitive streams, to reduce impacts from linear facility construction.

Impacts associated with construction of electric transmission lines would result from clearing of vegetation, particularly shrubs and trees, from the riparian corridor and streambanks, and from physical crossings necessary to move equipment and materials along the corridors during construction. Heavy equipment operated in the riparian corridor could permanently alter the stream channel, riparian wetlands, topography, and flow paths. Such impacts would be detrimental to stream function and could be long-term. However, such impacts could be avoided or minimized by using proper crossing BMPs. Using temporary, stable crossings, properly constructed and removed, impacts would be temporary and minimal. Uncontrolled sedimentation resulting from excavation and grading in the riparian corridor could have long-term effects on habitat and biota downstream of the crossings. Appropriate soil erosion and sedimentation control BMPs would minimize impacts to surface waters during construction of the linear facilities.

Vegetation (especially trees and shrubs) removal within the riparian corridors of streams could potentially result in impacts on stream ecology. Tree and shrub removal would increase water temperature, decrease organic matter input, and increase sediment loading. Removal of trees and shrubs from streambanks could also lead to streambank erosion. The impacts of vegetation removal during construction on surface waters could be reduced by leaving some woody vegetation on streambanks.

4.2.4.2 Operation

The power plant and linear facilities should have minimal direct impacts on surface waters during operation. The surface lignite mine would have greater direct impacts on streams during operation due to active mining of the channels and associated channelization and diversion of flow. The degree of impacts would vary based on the active area of mining and number of diversions, total length of streams impacted, and length of channelization required at any given time.

Power Plant

The plant would be a zero-discharge facility with no cooling tower blowdown or other process wastewater discharges offsite. The only discharge from the power plant site would be stormwater runoff. Permitting and technology-based NPDES controls for stormwater discharges would be adequate to protect receiving waters. The facility would be operated under an NPDES general permit and an SWPPP in accordance with NPDES requirements.

Operation of the power plant would have other impacts to surface waters. These would include indirect impacts caused by deposition of air pollutants and impacts associated with the use of reclaimed effluent from the Meridian wastewater treatment system.

O&M of stormwater management facilities on the power plant site in accordance with the operational procedures and design elements would ensure that stormwater quality and quantities would be maintained within approved regulatory limits designed to minimize impacts to the site and surrounding waters during operations. All stormwater management facilities and operational characteristics would comply with applicable stormwater management regulations. The primary goals under these regulations would be to implement stormwater measures that would provide the recharge, water quality, and channel protection in accordance with the applicable design criteria. Additionally, storm drain conveyance systems would also be installed to safely and adequately convey the required design storm events through the property. The combination of these measures would be designed to minimize stream channel erosion, pollution, siltation, and sedimentation during plant operation. The potential sources of impacts to surface waters during facility operations would include:

- <u>Potential Impacts Due to Direct Discharge of Process Effluents</u>—Process effluents generated by facility operations would be managed onsite, as described in Subsection 2.6.2. Because there would be no direct discharge of process wastewater to any surrounding surface waters, there would be no surface water impacts associated with the direct discharge of any process waters during facility operations.
- <u>Potential Impacts Due to Changes in Stormwater Quantities and/or Qualities Discharged Offsite</u>—The facility would include stormwater management designed and installed to ensure that the water quality volume, ground water recharge, and channel protection volume would all be provided for in approved stormwater facilities, and that safe and adequate conveyance systems are provided for handling of larger storm events within approved limits. O&M procedures designed to ensure the continued effectiveness of this system would be established and strictly followed. Based on the installation of a sound stormwater management system and proper O&M of these facilities, impacts to any surrounding surface waters as a result of facility operations would be minimized.
- <u>Potential Impacts Due to Accidental Spills of Onsite Chemicals, Lubricants, or Other Potential Contaminants</u>—The facility would be designed to include spill containment and control features as developed under the overall SPCC plan. Properly followed, these procedures would be designed to minimize the opportunity for accidental spills and identify the appropriate procedures to be followed in case of an accidental spill.

As discussed in Subsection 4.2.1.2, some portion of the emissions of mercury from the IGCC stacks would deposit to the ground surface and could potentially make its way to surface waters. However, power plant mercury emissions would be minimized by control equipment. The maximum total deposition is predicted to be less than 12 percent of the total ambient deposition measured at a site in Florida (see Subsection 4.2.19.2). Also, the maximum wet deposition is predicted to be approximately 2 percent of the measured wet deposition at a site in Mississippi. Therefore, it is reasonable to conclude that the project would not contribute substantially to surface water mercury concentrations in the vicinity of the site.

The power plant would make use of reclaimed effluent from two Meridian POTWs to satisfy cooling and other plant water needs. Use of wastewater from the POTWs would reduce flows in Sowashee Creek, a tributary of Okatibbee Creek with its confluence located downstream of Okatibbee Lake. Sowashee Creek is impaired due to pathogens and biological impairments. It is currently on the 303(d) list for not meeting the Aquatic Life Support designated use, and is part of the Fecal Colifrom TMDL for Okatibbee Creek. Showashee Creek is impaired due to wastewater discharges and urban runoff. Removing a source of pollutants and stressors by routing a portion of the Meridian POTW effluent to the IGCC facility should improve the water quality of Sowashee Creek downstream of Meridian. It should also improve the water quality of Okatibbee Creek downstream of the Sowashee Creek confluence.

The mean effluent discharge rate for the period 1996 through 2008 was 10.67 cfs. Table 4.2-10 provides the historical effluent discharge rates for this same period by month and year (MDEQ, 2009). Sowashee Creek flows for roughly the same period (1998 to 2008) are provided for comparison in Table 4.2-11. Sowashee Creek flow data are provided by the USGS gauging station at Meridian (#02476500). USGS gage 02476500 is located upstream of the main Meridian POTW. Based on the averages in Table 4.2-11, the flow in Sowashee Creek upstream of the POTW is at times less than the discharge rate of the POTW effluent. For example, for September of 2006 the mean monthly average discharge was 2.77 cfs. At times, the POTW effluent discharge rate has exceeded the upstream discharge of Sowashee Creek. Therefore, the POTW effluent dominates the flow volume during low-flow conditions.

The existing 7Q10 flow for Sowashee Creek is 0.5 cfs (Telis, 1991). The 7Q10 flow is based on discharge data collected during the 1951 through 1986 climatic years (*ibid*). The data were obtained from USGS gauging station 02476500 upstream of the main Meridian POTW. The smaller East Meridian POTW was not yet in operation as of 1986. Therefore, the POTW effluent did not contribute to the 7Q10 flow. Given that the POTW increases the discharge of Sowashee Creek above background, reducing the effluent volume would not decrease the 7Q10 flow reported by Telis.

Table 4.2-10. Meridian WWTP Monthly Average Effluent Discharge (cfs)—1996 to 2008

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
2008	9.59	13.17	10.86	10.32	9.93	9.33	8.31	9.45	8.51	6.27	5.62	9.22	9.22
2007	11.82	11.05	8.96	8.88	9.05	8.73	10.20	8.80	8.77	8.06	6.81	7.07	9.02
2006	10.38	12.61	13.04	10.57	12.41	8.90	8.34	8.68	8.23	9.35	8.02	8.49	9.92
2005	10.38	11.84	16.56	17.04	11.40	12.38	15.89	10.83	13.69	9.35	8.02	8.49	12.16
2004	12.18	14.30	12.50	5.96	8.85	11.26	10.66	13.68	10.57	11.51	15.19	13.31	11.66
2003	10.99	13.63	14.58	14.48	14.89	14.90	15.67	13.48	11.22	10.58	10.40	10.66	12.96
2002	12.86	12.77	13.59	11.19	9.86	9.41	10.86	10.24	10.55	14.19	14.10	13.57	11.93
2001	11.54	12.15	15.60	13.91	10.86	13.37	10.23	10.80	15.58	10.69	9.50	12.70	12.24
2000	8.53	8.73	9.25	11.47	9.04	9.38	9.79	9.59	9.01	8.12	8.91	8.67	9.21
1999	10.68	11.88	12.49	10.97	9.07	10.04	10.04	9.69	8.67				10.39
1998	11.73	12.77	11.45	12.63	10.55	10.68	10.69	9.84	9.35	8.68	8.56	8.85	10.48
1997	9.59	10.75	10.86	9.64	9.62	10.26	10.44	9.92	8.19	8.00	9.02	9.33	9.64
1996	9.76	8.76	10.72	11.88	10.52	10.07	10.23	10.54	9.62	8.79	9.10	8.26	9.86

Source: MDEQ, 2009

Table 4.2-11. Sowashee Creek Mean Monthly Discharge Data for the Period 1998 through 2008 from USGS Gauging Station 02476500

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
1998	350.9	131.3	115	77.2	13.5	28.6	25.7	8.69	3.53	3.61	12.6	16.4	66
1999	104	75.5	139.7	31.1	5.95	9.33	15.9	3.26	4.45	17.6	2.98	10	35
2000	19.3	11.1	26.2	64.7	6.39	4.88	0.965	2.07	1.73	1.25	11.4	15.2	14
2001	64.2	71.4	167.7	101.8	18.1	87.8	9.33	32.7	78.7	82.4	150	200.9	89
2002	177.1	124.3	144.4	50.5	12.2	9.58	17.5	2.52	90.1	131.3	73.5	221.5	88
2003	95.3	261.8	160.7	594.3	97.9	101.8	156.2	52.9	11.6	52.8	77.9	59.4	144
2004	93.5	308.8	98.5	25.1	61.9	87.3	108.5	29.5	30.9	61.2	270	152	111
2005	89.4	251.9	180.1	254	32.4	102.5	154.8	85	48.7	10.7	12.6	35.3	105
2006	97.5	215.6	164.1	35.5	116.1	7.78	3.25	2.57	2.77	10.1	8.83	34.8	58
2007	46.7	39	14.1	10.8	5.37	4.47	30	3.87	4.42	10.6	8.26	20.7	17
2008	44.4	224.2	64.7	45.3	67.9	48	26.2	150.6	26.6				
Avg	107	156	116	117	40	45	50	34	28	38	63	77	

Source: MDEQ, 2009.

Surface Lignite Mine

Operation of the lignite mine would remove and replace stream segments, change the overall water budget of the mine study area, change flow patterns in certain streams, and change onsite and downstream surface water quality. The following subsections describe these changes.

Stream Channel Removal and Replacement

The conceptual mine plan presented in Subsection 2.4.2 would result in the removal of 56.5 miles of existing stream channel, of which 24.25 miles is classified as perennial and 31.9 miles is classified as intermittent or ephemeral (NACC, 2009). Final determination of the stream channel segments and lengths to be removed, if any, would be made by USACE during its evaluation of NACC's CWA Section 404 permit evaluation and MDEQ during its mine permit application. Similarly, USACE and MDEQ would divide the type and amount of stream channel establishment in the reclaimed landscape necessary to mitigate for the removal of existing stream channels approved by either agency. Subsection 2.4.2.2 discusses these requirements. Subsections 4.2.7 through 4.2.9 address the effects of stream removal on the aquatic ecosystems, floodplains, and wetlands, respectively.

Hydrologically, stream channel removal creates the need for alternate routing of surface water flows across the mine study area. The conceptual mine plan proposes two methods: diversion channels and sedimentation ponds for collection, treatment, and discharge. Table 2.4-1 and Figures 2.4-2a through 2.4-2g identified and illustrated the locations of the proposed diversion channels, which would divert upstream flows in Chickasawhay, Penders, and unnamed creek channels. Tompeat and Bales Creeks, as well as flows in all intermittent and ephemeral channels, would be routed into sedimentation ponds for treatment and discharge using collection channels within active mining areas. Subsection 4.2.4.1 addresses the effects of diversion channels and the collection, treatment, and discharge flow routing methods.

Stream Flow Patterns

Stream flow patterns would change due to the presence of sedimentation ponds SP-7, SP-8, and SP-9. In addition, the collection of stormwater runoff and treatment in these and all other sedimentation ponds will affect stream flow rates during mining.

Modeling done by Tetra Tech, a consultant to NACC, provided estimated responses of the watersheds for the different periods of the mining operations depicted in Figures 2.4-2a through 2.4-2g. Rainfall runoff simulations were performed for 24-hour storm events with return periods of 2, 10, 25, 50, and 100 years. Simulations were performed using the USACE Hydrologic Engineering Center's HMS model (Version 3.3). Tables 4.2-12 through 4.2-18 present their results at evaluation points located on the named creeks at the downstream mine boundary, respectively. Figure 3.6-2 shows the location of the points where watershed modeling results are reported. The modeling is based on the conceptual mine plan presented in Subsection 2.4.2. Changes in the mine plan or in the postreclamation land uses or conditions would result in changes to the estimates provided.

Table 4.2-12. Storm Event Runoff Comparison—Mine Block A

Storm event (year)	2	10	25	50	100
Chickasawhay Creek					
Rainfall depth (inches)	4.4	6.5	7.3	8.1	8.9
Mining peak runoff (cfs)	4,366	8,985	11,958	14,163	15,972
Premining peak runoff (cfs)	4,755	10,020	12,146	14,328	16,503
Change (%)	-8.2	10.3	-1.5	-1.2	-3.2
Mining runoff volume (ac-ft)	3,711	7,088	9,073	10,551	12,057
Premining runoff volume (ac-ft)	3,554	7,059	8,477	9,933	11,420
Change (%)	+4.4	+0.4	+7.0	+1.7	+5.6
Tompeat Creek					
Rainfall depth (inches)	4.4	6.5	7.3	8.1	8.9
Mining peak runoff (cfs)	464	941	1,345	1,623	1,909
Premining peak runoff (cfs)	688	1,401	1,687	1,980	2,278
Change (%)	-32.6	-32.8	-20.3	-18.0	-16.2
Mining runoff volume (ac-ft)	240.2	479.9	831.7	973.6	1,118
Premining runoff volume (ac-ft)	353	695	834	976	1,121
Change (%)	-32.0	-30.9	-0.3	-0.2	-0.3

Source: NACC, 2009.

Table 4.2-13. Storm Event Runoff Comparison—Mine Blocks B and C

Storm event (year)	2	10	25	50	100
Chickasawhay Creek					
Mining peak runoff (cfs)	3,993	8,315	10,063	11,868	13,675
Premining peak runoff (cfs)	4,755	10,020	12,146	14,328	16,503
Change (%)	-16.0	-17.0	-17.1	-17.2	-17.1
Mining runoff volume (ac-ft)	3,085	6,122	7,435	8,887	10,379
Premining runoff volume (ac-ft)	3,554	7,059	8,477	9,933	11,420
Change (%)	-13.2	-13.3	-12.3	-10.5	-9.1
Tompeat Creek					
Mining peak runoff (cfs)	223	438	523	786	1,240
Premining peak runoff (cfs)	688	1,401	1,687	1,980	2,278
Change (%)	-67.6	-68.7	-69.0	-60.3	-45.6
Mining runoff volume (ac-ft)	34	112	278	436	574
Premining runoff volume (ac-ft)	353	695	834	976	1,121
Change (%)	-90.4	-82.4	-66.7	-55.3	-48.8
Bales Creek					
Mining peak runoff (cfs)	653	1,336	1,611	1,891	2,379
Premining peak runoff (cfs)	1,018	2,086	2,517	2,959	3,408
Change (%)	-35.9	-36.0	-36.0	-36.1	-30.2
Mining runoff volume (ac-ft)	321	689	917	1,149	1,384
Premining runoff volume (ac-ft)	544	1,076	1,292	1,513	1,739
Change (%)	-41.0	-36.0	-29.0	-24.1	-20.4

Source: NACC, 2009.

Table 4.2-14. Storm Event Runoff Comparison—Mine Blocks C and D

Storm event (year)	2	10	25	50	100
Chickasawhay Creek					
Mining peak runoff (cfs)	3,810	8,109	9,889	11,715	13,551
Premining peak runoff (cfs)	4,755	10,020	12,146	14,328	16,503
Change (%)	-19.9	-20.0	-18.6	-18.2	-17.9
Mining runoff volume (ac-ft)	3,080	6,117	7,347	8,655	10,118
Premining runoff volume (ac-ft)	3,554	7,089	8,477	9,933	11,420
Change (%)	-13.3	-13.7	-13.3	-12.9	-11.4
Tompeat Creek					
Mining peak runoff (cfs)	223	438	523	610	697
Premining peak runoff (cfs)	688	1,401	1,687	1,980	2,278
Change (%)	-67.6	-68.7	-69.0	-69.2	-69.4
Mining runoff volume (ac-ft)	34	65	77	224	376
Premining runoff volume (ac-ft)	353	695	834	976	1,121
Change (%)	-90.4	-90.6	-90.8	-77.0	-66.5
Bales Creek					
Mining peak runoff (cfs)	948	1,924	1,611	1,891	2,178
Premining peak runoff (cfs)	1,018	2,086	2,517	2,959	3,408
Change (%)	-6.9	-7.8	-36.0	-36.1	-36.1
Mining runoff volume (ac-ft)	382	750	798	1,025	1,256
Premining runoff volume (ac-ft)	544	1,076	1,292	1,513	1,739
Change (%)	-29.8	-30.3	-38.2	-32.3	-27.8

Source: NACC, 2009.

Table 4.2-15. Storm Event Runoff Comparison—Mine Blocks C, D, and E

Storm event (year)	2	10	25	50	100
Okatibbee Creek					
Mining peak runoff (cfs)	4,782	9,545	11,470	13,444	15,537
Premining peak runoff (cfs)	4,819	9,728	11,717	13,758	15,804
Change (%)	-0.8	-1.9	-2.1	-2.3	-1.7
Mining runoff volume (ac-ft)	5,064	9,948	11,898	13,941	16,069
Premining runoff volume (ac-ft)	5,119	10,136	12,163	14,242	16,362
Change (%)	-1.1	-1.9	-2.2	-2.1	-1.8
Chickasawhay Creek					
Mining peak runoff (cfs)	3,810	8,109	9,889	11,715	13,551
Premining peak runoff (cfs)	4,755	10,020	12,146	14,328	16,503
Change (%)	-19.9	-20.0	-18.6	-18.2	-17.9
Mining runoff volume (ac-ft)	3,080	6,117	7,347	8,664	10,118
Premining runoff volume (ac-ft)	3,554	7,059	8,477	9,933	11,420
Change (%)	-13.3	-13.7	-13.3	-12.9	-11.4
Tompeat Creek					
Mining peak runoff (cfs)	223	438	523	610	697
Premining peak runoff (cfs)	688	1,401	1,687	1,980	2,278
Change (%)	-67.6	-68.7	-69.0	-69.2	-69.4
Mining runoff volume (ac-ft)	34	65	77	224	376
Premining runoff volume (ac-ft)	353	695	834	976	1,121
Change (%)	-90.4	-90.6	-90.8	-77.0	66.5
Bales Creek					
Mining peak runoff (cfs)	653	1,336	1,611	1,891	2,178
Premining peak runoff (cfs)	1,018	2,086	2,517	2,959	3,408
Change (%)	-35.9	-36.0	-36.0	-36.1	-36.1
Mining runoff volume (ac-ft)	321	635	798	1,025	1,256
Premining runoff volume (ac-ft)	544	1,076	1,292	1,513	1,739
Change (%)	-41.0	-41.0	-38.2	-32.3	-27.8

Source: NACC, 2009.

Table 4.2-16. Storm Event Runoff Comparison—Mine Blocks D, E, and F

Storm event (year)	2	10	25	50	100
Okatibbee Creek					
Mining peak runoff (cfs)	4,782	9,545	11,794	13,812	15,868
Premining peak runoff (cfs)	4,819	9,728	11,717	13,758	15,840
Change (%)	-0.1	-1.8	-0.1	0	0
Mining runoff volume (ac-ft)	5,064	9,933	12,430	14,523	16,657
Premining runoff volume (ac-ft)	5,119	10,136	12,163	14,242	16,362
Change (%)	-1.1	-2.0	+2.2	+0.6	+1.8
Chickasawhay Creek					
Mining peak runoff (cfs)	4,386	9,149	12,110	14,279	16,452
Premining peak runoff (cfs)	4,755	10,020	12,146	14,328	16,503
Change (%)	-7.8	-8.7	-0.3	-0.3	-0.3
Mining runoff volume (ac-ft)	3,215	6,386	8,435	9,881	11,358
Premining runoff volume (ac-ft)	3,554	7,059	8,477	9,933	11,420
Change (%)	-9.5	-9.5	-0.5	-0.5	0.5
Tompeat Creek					
Mining peak runoff (cfs)	688	1,401	1,687	1,980	2,278
Premining peak runoff (cfs)	688	1,401	1,687	1,980	2,278
Change (%)	0	0	0	0	0
Mining runoff volume (ac-ft)	353	695	834	976	1,121
Premining runoff volume (ac-ft)	353	695	834	976	1,121
Change (%)	0	0	0	0	0
Bales Creek					
Mining peak runoff (cfs)	1,018	2,086	2,517	2,959	3,408
Premining peak runoff (cfs)	1,018	2,086	2,517	2,959	3,408
Change (%)	0	0	0	0	0
Mining runoff volume (ac-ft)	544	1,076	1,292	1,513	1,739
Premining runoff volume (ac-ft)	544	1,076	1,292	1,513	1,739
Change (%)	0	0	0	0	0

Source: NACC, 2009.

Table 4.2-17. Storm Event Runoff Comparison—Mine Block G

Storm event (year)	2	10	25	50	100
Okatibbee Creek					
Mining peak runoff (cfs)	4,819	9,625	11,834	13,863	15,931
Premining peak runoff (cfs)	4,819	9,728	11,717	13,758	15,840
Change (%)	0	-1.6	+1.0	+0.76	+0.6
Mining runoff volume (ac-ft)	5,066	9,961	12,414	14,509	16,644
Premining runoff volume (ac-ft)	5,119	10,136	12,163	14,242	16,362
Change (%)	-1.0	-1.7	+2.0	+1.9	+1.7
Chickasawhay Creek					
Mining peak runoff (cfs)	3,237	6,660	12,246	14,509	16,809
Premining peak runoff (cfs)	4,755	10,020	12,146	14,328	16,503
Change (%)	-31.9	-33.54	+0.8	+1.3	+1.9
Mining runoff volume (ac-ft)	2,693	5,372	8,695	10,152	11,638
Premining runoff volume (ac-ft)	3,554	7,059	8,477	9,933	11,420
Change (%)	-24.2	-23.9	+2.6	+2.2	+1.9
Tompeat Creek					
Mining peak runoff (cfs)	686	1,398	1,684	1,976	2,274
Premining peak runoff (cfs)	688	1,401	1,687	1,980	2,278
Change (%)	0	0	0	0	0
Mining runoff volume (ac-ft)	351	691	829	970	1,115
Premining runoff volume (ac-ft)	353	695	834	976	1,121
Change (%)	0	0	0	0	0
Bales Creek					
Mining peak runoff (cfs)	1,018	2,086	2,517	2,959	3,408
Premining peak runoff (cfs)	1,018	2,086	2,517	2,959	3,408
Change (%)	0	0	0	0	0
Mining runoff volume (ac-ft)	544	1,076	1,292	1,513	1,739
Premining runoff volume (ac-ft)	544	1,076	1,292	1,513	1,739
Change (%)	0	0	0	0	0

Source: NACC, 2009.

Table 4.2-18. Storm Event Runoff Comparison—After Mining

Storm event (year)	2	10	25	50	100
Okatibbee Creek					
After mining peak runoff (cfs)	4,819	9,778	11,717	13,758	15,840
Premining peak runoff (cfs)	4,819	9,728	11,717	13,758	15,840
Change (%)	0	0	0	0	0
After mining runoff volume (ac-ft)	5,119	10,136	12,163	14,242	16,362
Premining runoff volume (ac-ft)	5,119	10,136	12,163	14,242	16,362
Change (%)	+1.3	+0.9	+0.8	+0.7	+0.6
Chickasawhay Creek					
After mining peak runoff (cfs)	4,755	10,020	12,146	14,328	16,503
Premining peak runoff (cfs)	4,755	10,020	12,146	14,328	16,503
Change (%)	0	0	0	0	0
After mining runoff volume (ac-ft)	3,554	7,059	8,477	9,933	11,420
Premining runoff volume (ac-ft)	3,554	7,059	8,477	9,933	11,420
Change (%)	0	0	0	0	0
Tompeat Creek					
After mining peak runoff (cfs)	688	1,401	1,687	1,980	2,278
Premining peak runoff (cfs)	688	1,401	1,687	1,980	2,278
Change (%)	0	0	0	0	0
After mining runoff volume (ac-ft)	353	695	834	976	1,121
Premining runoff volume (ac-ft)	353	695	834	976	1,121
Change (%)	0	0	0	0	0
Bales Creek					
After mining peak runoff (cfs)	1,018	2,086	2,517	2,959	3,408
Premining peak runoff (cfs)	1,018	2,086	2,517	2,959	3,408
Change (%)	0	0	0	0	0
After mining runoff volume (ac-ft)	544	1,076	1,292	1,513	1,739
Premining runoff volume (ac-ft)	544	1,076	1,292	1,513	1,739
Change (%)	0	0	0	0	0

Source: NACC, 2009.

These estimates illustrate the mine operator's capability to use the flood storage capacity contained in the sedimentation ponds to reduce peak flood responses. Storms of less than 6.5 inches (i.e., the 10-year, 24-hour storm event) could be managed to significantly reduce peak flood flows, with storms of more than 6.5 inches attenuated to a lesser degree.

The postreclamation modeling results shown in Table 4.2-18 demonstrate existing stream flow responses to storm events could be replicated provided the land is specifications used as the model input parameters. These specifications provide the NACC reclamation design team with potential reclamation objectives going forward. Because a site-specific reclamation plan has not been developed, it is not possible to conclude at this time whether stream flow responses to storm events would mimic the conditions specified in the modeling.

Water Quality Changes

Potential surface water quality impacts attributable to the mining operation would include increased sediment loading, acid or toxic mine drainage, and increased concentrations and loadings of metals and dissolved solids in runoff from disturbed and reclaimed areas. MDEQ SMCRA and CWA regulations would require the mine operator to collect runoff from all active mining areas, route these volumes to sedimentation ponds, monitor water quality, and treat the water if necessary prior to discharge. All water discharged would be subject to the technology-based numerical effluent standards contained in 40 CFR 434, Subpart C, for TSS, total iron, total manganese, pH, and settleable solids, as well as aquatic life and water quality-based effluent limitations, pursuant to Section 402 of the federal CWA.

Tetra Tech prepared a mass balance analysis to project changes in water quality using TDS as an indicator parameter. The results of that analysis are presented in Table 4.2-19. Their discussion of these results follows. The use of TDS as the indicator parameter allows assessment of the general water quality effects due to changes in nontoxic pollutants, such as heavy metals that are assessed separately in the following.

Table 4.2-19. Mass Balance Analysis Results—TDS Concentration (mg/L)

Mass Balance Location	Acres of Total Drainage Area	Acres Disturbed by Mining*	Assumed Disturbed TDS†	Assumed Baseline TDS	Estimated Resulting TDS
Okatibbee Creek at SW-12†	40,262	828	500	50	59
Chickasawhay Creek at Penders Creek	21,529	7,553	500	50	207
Tompeat Creek at SW-13	2,464	1,791	500	50	378
Bales Creek at SW-14	3,840	1,020	500	50	169
Cumulative maximum impact	68,095	11,375	500	50	125

*Assuming all mine areas are in disturbed condition.
†Receiving stream segment standard for drinking water

Source: NACC, 2009.

> *"The TDS concentrations measured at the 14 surface water-monitoring stations from May to October of 2008 varied from 23 to 325 mg/L. For this worst-case assessment, a low value of 50 mg/L was chosen as an indicator of the natural water quality of the local streams. For the water released from sedimentation ponds, a concentration of 500 mg/L was assumed. This value is higher than those values normally observed in outflows from sedimentation ponds at the Red Hills Lignite Mine in Choctaw County, Mississippi, and at other lignite mines in the Gulf Coast Region. At the Red Hills Lignite Mine, concentrations of TDS at the sedimentation ponds has not reached 400 mg/L. The concentration of TDS in the receiving streams, under these scenarios, would increase from the assumed value of 50 mg/to 400 mg/L. Even with the worst-case scenario, the resulting TDS concentrations would fall below monthly average state water quality criteria for Mississippi.*
>
> *When the total drainage area of the creeks affected by the active mining operations is used in assessing the impact of the mine, the resulting TDS concentration would result in an increase from 50 mg/to 125 mg/L. This increase falls within the normal variations observed under natural conditions. Any small increases in TDS concentration would be further reduced within short distances downstream from the sedimentation ponds due to normal dispersion and dilution processes. Concentrations would approach baseline levels well before the streamflow reached the upper reaches of Lake Okatibbee.*
>
> *Actual results measured at surface water monitoring stations downstream of the Red Hills Lignite Mine indicate that the TDS concentration lies consistently within the range of 50 to 300 mg/L, although values below 120 mg/L are predominant. Discharge limitations for pH, TSS, total iron, and manganese required by the NPDES permit are within the range of the natural*

> *conditions of the local streams. Therefore, compliance with the applicable effluent limitations of the NPDES permit, coupled with the small proportional contribution of actively disturbed mine areas to the cumulative streamflow of the watersheds feeding Lake Okatibbee, would preclude any adverse impacts on the downstream water quality of the streams and of Lake Okatibbee. Monitoring data from the Red Hills Lignite Mine in Choctaw County, Mississippi, indicate that actual TDS concentrations should be much less than those estimated by the worst-case scenario"* (NACC, 2009).

The data presented in Table 4.2-19 project a cumulative maximum impact of drainage from 68,095 acres containing 125 mg/L TDS. The total drainage area addressed in the analysis represents approximately 69 percent of the Okatibbee Lake watershed. Given that MDEQ reported Okatibbee Lake TDS concentrations of 14 to 42 mg/L, the level of TDS in Okatibbee Lake would increase over time. However, Okatibbee Lake TDS levels would remain well below the MDEQ potable water standard of 250 mg/L and the MDEQ aquatic life support standard of 750 mg/L.

With respect to acid-forming or toxic-forming materials (AFM and TFM), Subsection 3.4.3 presents site-specific geochemical analyses that substantiate a low probability of encountering significant acid mine drainage (AMD) or toxic material drainage (TMD). The analyzed overburden materials did not contain AFM or TFM. Further, even if AFM or TFM should be encountered, the MDEQ SMCRA Regulations include specific provisions for preventing and controlling AMD and TMD.

Similarly, Tables 3.4-3, 4.2-9, 4.2-17, and 4.2-23 present site-specific analyses of metals, including lignite leachate test results, and overburden analyses that demonstrate a low probability of elevated heavy metals concentrations or loadings resulting from the mine discharges. Manganese, iron, and aluminum are present in Okatibbee Lake at elevated levels due to erosion and leaching of the natural clay soils upstream; the federal CWA water quality-based effluent limitations would limit concentrations (and loadings) resulting from mine discharges. Monitoring of these parameters in mine effluent and at downstream locations is recommended to confirm these conclusions.

Design and operation of the sedimentation ponds would control the level of settleable solids, TSS, pH, and DO in the mine water discharges. The use of flocculants and pH modifiers (e.g., lime) could be required to meet the technology-based effluent limitations. Spillway and outfall channels would be capable of oxygenating mine discharges.

Nutrient concentrations and loadings in surface water runoff from reclaimed lands would increase during efforts to revegetate mined lands. Use of BMPs, such as soil testing to determine fertilizer requirements, would minimize these effects. Subsection 3.10.2 documents that there are currently limited areas in the mine study area where fertilizers are used. Phosphorus would be the nutrient of concern because monitoring by consultants to the mine operator did not, on average, detect phosphate in existing streams monitored at 14 stations. In contrast, organic and inorganic nitrogen was detected at all 14 locations, in some events at elevated levels. Thus, phosphorus is the nutrient limiting algal production.

Effects on Okatibbee Lake

In summary, flow volumes into Okatibbee Lake would increase during mining due to reduced evapotranspirative losses, mine dewatering, and depressurization (see Subsection 4.2.5.2). Peak flow rates would decrease due to the detention of mine water runoff in the sedimentation ponds. In the postreclamation condition the reclaimed land uses would be the principal determinant of changes in the flows to the lake. Because mining would disturb less than 2 percent of the lake contributing watershed at any given time and the total mine disturbance would be less than 12 percent of the watershed, flow volume changes would be small.

Water quality effects would be limited to TSS, turbidity, and TDS based on the available data. The TDS analysis presented previously indicates an increasing level of TDS in the lake would be measurable but would not cause the lake water to exceed drinking water or aquatic life support criteria. With respect to TSS and turbidity, water currently flowing into the lake from the mine study area is turbid, ranging from 25 to 143 nephelometric turbidity unit (NTU) on average. The numerical TSS effluent limitation imposed by 40 CFR 34, Subpart C, would help to control TSS levels in the lake.

Linear Facilities

Once constructed, the only types of impacts to surface waters that could potentially result from operations of transmission lines and pipeline facilities would be potential impacts from maintenance activities and changes in stormwater quantities and/or qualities discharged offsite.

Operational activities along the linear facility corridors would include equipment maintenance and repairs and vegetation management. Application of BMPs would reduce impacts to streams intersected by the linear corridors. Permanent crossings would be designed and constructed according to regulatory requirements and in a manner that would not prevent fish passage or alter channel hydraulics. Permit conditions could be used to ensure that impacts associated with permitted permanent crossings were minimized.

Continual periodic vegetation maintenance along the corridors would result in permanent impacts to the riparian habitat of streams, resulting in increased water temperatures, decrease in organic matter input, and increased sediment loading. Minimizing the cleared corridor width would reduce impacts, particularly water temperature increases. Maintaining shrubby vegetation on streambanks would reduce the risk of erosion. The project’s linear facilities’ permanent, new ground-level features would be limited (e.g., foundations supporting the new or replacement transmission line structures, minimal aboveground facilities associated with the pipelines). The total horizontal surface area of these foundations and other facilities would be minimal.

4.2.5 GROUND WATER RESOURCES

4.2.5.1 Construction

Power plant and surface lignite mine construction activities potentially affecting ground water resources would include impacts to shallow perched aquifers from site excavation and grading and construction ground water use. Shallow perched aquifers, where present, could be permanently removed or disturbed due to site grading, excavation, and compaction. It is also possible that short-term dewatering activities might be necessary at some locations. Impacts from dewatering would be relatively localized and would not cause long-term impacts to the local ground water resources or to other users of ground water.

Construction of the mining facilities would require intermittent use of ground water from a single well completed in the Lower Wilcox aquifer located near the mine office and shop facilities. The average withdrawal rate during the construction period would be approximately 0.01 MGD (7 gpm), with peak short-term pumping rates of up to 100 gpm. Predicted drawdowns at a distance of 0.5 mile from the supply well would be less than 1 ft for both peak short-term and average long-term use. Similarly, construction of the power plant facilities would also require intermittent use of ground water from a well completed in the Lower Wilcox aquifer to facilitate drilling of deep production wells into the Massive Sand aquifer and for other construction activities. Total pumpage would be expected to average approximately 0.02 MGD (14 gpm), with peak short-term pumping rates of up to 100 gpm. Again, predicted drawdowns at distance of 0.5 mile from the supply well would be less than 1 ft for both peak short-term and average long-term use. The effect of construction ground water use would be limited to insignificant declines in the local potentiometric surface in the Lower Wilcox aquifer. None of the private water supply wells in the project locality would be adversely affected from construction activities.

Construction activities for the various linear facilities (e.g., clearing, grading, shallow excavation, shallow horizontal drilling, potential localized dewatering of trenches, etc.) would not be expected to adversely impact ground water resources or any ground water users. Any effects would be highly localized and short-termed.

4.2.5.2 Operation

Power Plant

Operation of the IGCC power plant could potentially impact ground water resources as a result of direct ground water use, onsite management of solid wastes, and spills.

Ground Water Use

Ground water from the shallower Lower Wilcox aquifer using two or more onsite wells would be the water source for potable uses. The potable water demands (an estimated 3,000 gpd) would be low, such that no impacts would occur to the aquifer or other ground water users.

Reclaimed effluent from two Meridian POTWs would constitute the main supply of water for cooling and other process uses at the generating facility (see Subsection 2.5.2). Use of reclaimed water would minimize the withdrawal and consumption of Massive Sand aquifer ground water. However, in the event that sufficient quantities of reclaimed water were not available, up to 1 MGD of ground water would be pumped from an onsite well field to supply cooling water. The well field would consist of two wells screened in the Massive Sand aquifer of the Tuscaloosa Group. At the power plant site, the Massive Sand is approximately 290 ft thick at a depth of approximately 3,360 ft bls, as further described in Subsection 3.7.3.

Ground water flow modeling was performed to facilitate evaluation of potential impacts from the withdrawal of 1 MGD of ground water from the Massive Sand aquifer. The quasi three-dimensional Modular Three-Dimensional Finite Difference Ground Water Flow Model (MODFLOW), developed at USGS by McDonald and Harbaugh (1988, 1996), was applied for this ground water modeling exercise; the model was created using Groundwater Vistas software. The model was based on a 34,960-mi^2 area in northeastern Mississippi that was previously modeled by Eric W. Strom of USGS (Strom, 1998), as described in the USGS WRIR 98-4171 (i.e., the Strom Model).

ECT obtained a copy of the original Strom Model MODFLOW files, which were used as the base for an *expanded* model. The Strom Model is constructed with six layers, each layer representing a regional aquifer, as follows: layer 1 is the Coffee Sand aquifer; layer 2 is the Eutaw-McShan aquifer; layer 3 is the Gordo aquifer; layer 4 is the Coker aquifer; layer 5 is the Massive Sand aquifer; and layer 6 is the Lower Cretaceous aquifer. In the extreme northeastern corner of Mississippi, layers 4 and 5 of the Strom Model represent the Iowa aquifer and the Devonian aquifer, respectively; the Coker and Massive Sand aquifers do not extend to that area.

The boundaries for each aquifer/model layer are defined by both the depositional extent of the aquifer and by the location of the freshwater-saltwater interface in the aquifer, which is defined by Strom as a TDS concentration of 10,000 mg/L (see Subsection 3.7.1). The freshwater-saltwater interface represents no-flow lateral boundaries in the Strom Model for all of the aquifers/layers; all model cells located beyond the no-flow boundaries are inactive. However, the proposed well field for the power plant would be located approximately 4 miles south of (beyond) the published freshwater-saltwater interface for the Massive Sand aquifer (layer 5) and, thus, would be situated in an inactive portion of layer 5 in the Strom Model. Therefore, for the expanded model boundaries, it was necessary to modify the Strom Model by extending layer 5 (the Massive Sand aquifer) further to the southwest, as shown in Figure 4.2-1. No other changes were made to model boundaries or cell input parameters relative to the Strom Model.

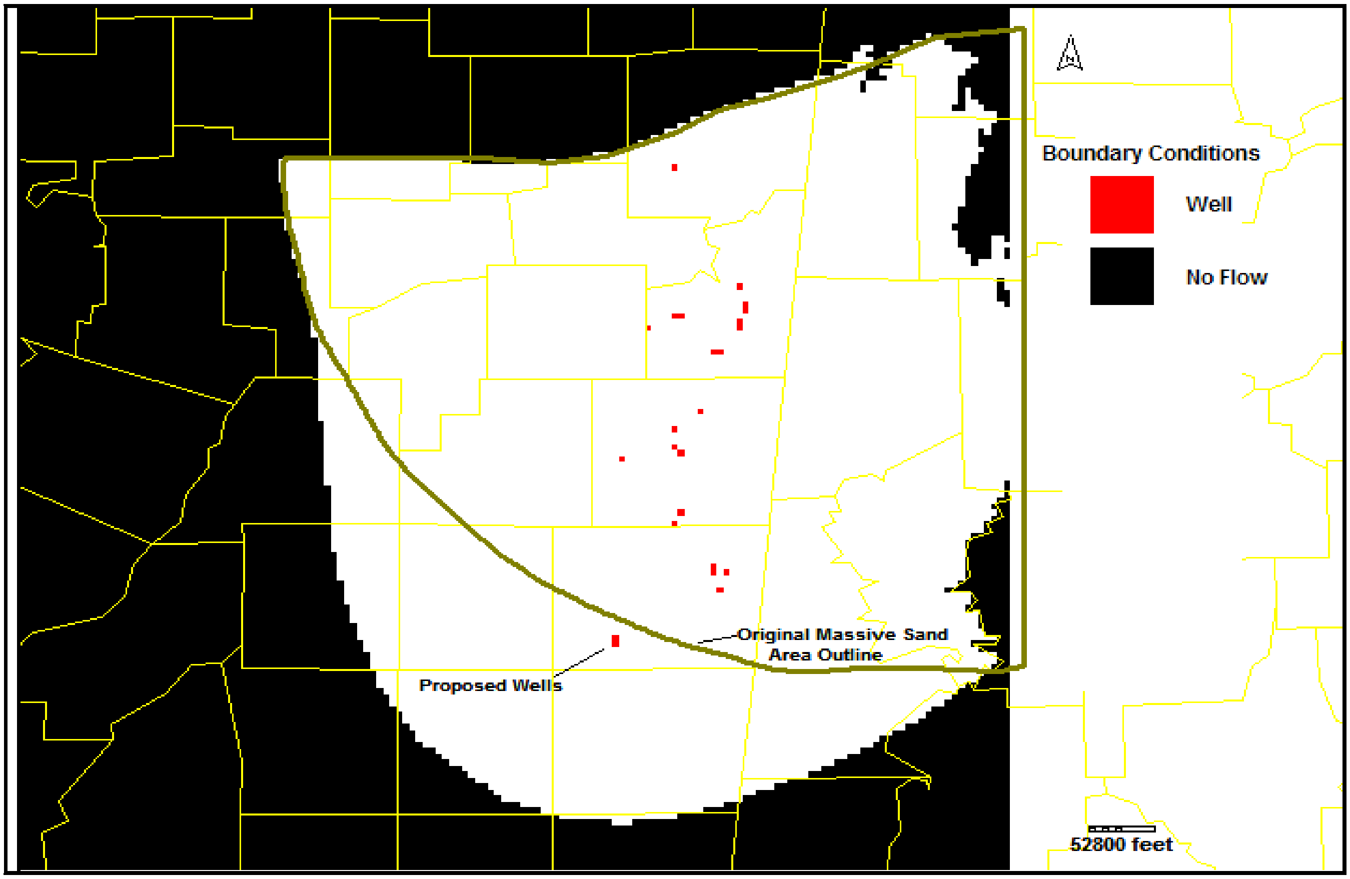


Figure 4.2-1. Massive Sand (Layer 5) Active Cell Extension toward the Southwest over the Site Proposed Wells Located Southwest of the Saltwater-Freshwater Interface

Sources: Strom USGS, 1998. ECT, 2009 Strom_transexp_V5b2.gvw.

Strom’s calibrated transient model includes pumping stresses for numerous wells through 1995, which is the last year modeled by Strom. The expanded model continued the 1995 pumping stresses forward in time (1996 through 2010) and then added a constant 1-MGD ground water withdrawal from the Massive Sand aquifer at the power plant site for a 40-year period. As such, the expanded model was used to simulate the effects of the proposed 1-MGD ground water withdrawal over the projected 40-year life of the facility. A more detailed description of the expanded ground water model is provided in Appendix O.

Figure 4.2-2 depicts the potentiometric surface drawdown estimated in the Massive Sand aquifer after 40 years of constantly pumping at the 1-MGD rate. The estimated drawdowns are widespread, yet of a low magnitude. The expanded model estimated approximately 6 ft of drawdown at the nearest existing user of the Massive Sand aquifer, which is located approximately 9.5 miles northeast of the proposed power plant in the town of De Kalb. The MDEQ water well database (MDEQ, 2008a) suggests that several wells using the Massive Sand aquifer exist near the towns of Electric Mills and Scooba. Three of those wells are owned by the town of Scooba, and two are owned by the Potterville Water Association, which suggests that all five of these Massive Sand wells are used for public supply. Those wells are located approximately 21 to 22 miles east-northeast of the power plant site. Less than 5 ft of drawdown is predicted in the Massive Sand (layer 5) at those well locations. These estimated drawdowns (6 ft or less) would not be expected to cause any adverse impact to the existing users of the Massive Sand aquifer, as this small change in static head in deep wells would result in no measurable change in pump performance or power requirements.

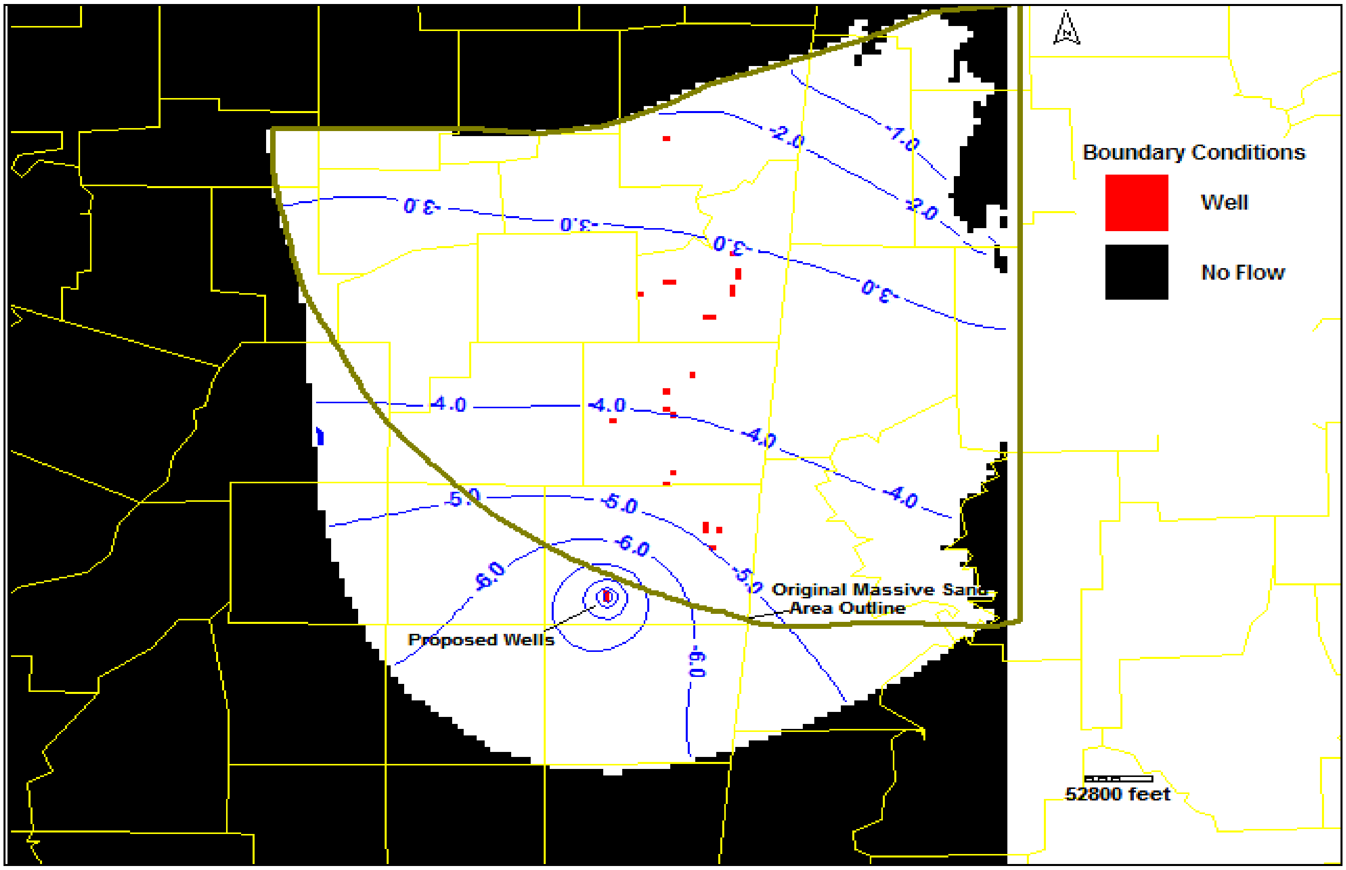


Figure 4.2-2. Predicted Drawdown in the Massive Sand (Layer 5) at the End of 40 Years of Pumping Based on 1.0 MGD Total Withdrawal from the Massive Sand

Sources: Strom USGS, 1998. ECT, 2009 Strom_Transexp_V5b2.gvw.

Smaller drawdowns would occur in the underlying and overlying aquifers; the expanded model estimates for maximum drawdowns were 3.5 ft or less in the underlying Lower Cretaceous aquifer (layer 6), 3 ft or less in the overlying Coker aquifer (layer 4), and 1.5 ft or less in the shallower Gordo and Eutaw-McShan aquifers (layers 3 and 2, respectively). The MDEQ water well database (MDEQ, 2008a) suggests that, within 20 miles of the power plant site, no existing users of the water are present in the overlying Coker aquifer or the underlying Lower Cretaceous aquifer. The withdrawal of 1 MGD of ground water from the Massive Sand aquifer would not cause any adverse impact to existing users of the water from the various underlying and overlying aquifers.

The shallower Lower Wilcox aquifer is not included in the Strom Model or the expanded model. The base of the Lower Wilcox aquifer is separated from the top of the Eutaw-McShan aquifer by more than 1,400 ft of sediments that form an effective confining unit (see Table 3.7-8). No measurable drawdown would occur in the Lower Wilcox aquifer from the proposed withdrawal of 1 MGD of ground water from the Massive Sand. Accordingly, there is no potential for any impact to the even shallower surface features (e.g., wetlands, streams, etc.) from the proposed withdrawal of 1 MGD of ground water from the Massive Sand aquifer. Similarly, that withdrawal would not be expected to have any measurable influence on land surface subsidence.

As more fully described in Appendix O, the Strom Model and the expanded model boundary conditions and other factors tend to result in somewhat overestimated drawdowns. Actual drawdowns would probably be somewhat less than those described here, which adds conservatism to this analysis of potential impacts.

Consideration was also given to the potential effects of the proposed withdrawal of 1 MGD on ground water quality. The Massive Sand aquifer at the site is known to be saline, as described in Subsection 3.7.2.2 (e.g., the TDS concentration is 23,000 mg/L). As such, the site is situated on the saltwater side of the freshwater-saltwater interface, defined by 10,000 mg/L TDS. The estimated drawdowns do not suggest the likelihood of inducing any measurable saltwater migration into freshwater portions of any aquifer.

Onsite Solid Waste Management

Gasification ash and other byproducts and solid wastes generated by the IGCC facility would be marketed for beneficial use or managed onsite (see Subsection 2.6.3). Any ash material managed onsite would be placed in designated ash management units constructed in accordance with MDEQ solid waste disposal regulations to ensure ground water protection.

Spills or Releases of Potentially Harmful Chemicals

As described in Chapter 2 (e.g., Subsection 2.5.3), fuels and other potentially harmful chemicals would be stored in properly designed and constructed tanks and enclosures. In the unlikely event of a fuel spill or release of other potentially harmful chemicals, assessment and recovery of the spill or release would be conducted in accordance with MDEQ requirements. This would minimize the potential for impacts to ground water resources resulting from a spill.

Surface Lignite Mine

Pit Water Control

Mine pit water control would include dewatering operations and depressurization operations. The overburden material of the middle Wilcox Group consists mainly of interbedded clay, sand, and shale. In general, most of the overburden sediments have low permeability, making advanced dewatering (using wells) impractical and unnecessary. However, one overburden sand interval (the JS) was identified as having sufficient thickness and permeability to warrant advance dewatering. In addition, one underburden sand interval (the GS) would likely require depressurization. Potential impacts from these operations are described herein.

Dewatering Operations—As described in Subsection 3.7.3, the JS sand overlies the J lignite seam, has a representative maximum thickness of approximately 50 ft, and has an average thickness of 20 to 25 ft where the sand is present. Although the transmissivity of the sand is variable, current indications are that advanced dewatering would assist in maintaining highwall stability and minimizing the volume of water that would need to be handled in the pit. Because pit lengths, sand dimensions, and hydraulic properties would vary, an estimated maximum pit inflow rate and pumping rate from wells was calculated for the longest pit with the thickest sands. Therefore, the ground water impacts described herein represent the maximum impact from mine dewatering operations.

Using proprietary ground water modeling software designed specifically for mining applications and based on the Theis (1935) equation, pumping of dewatering wells was simulated to achieve a dewatering goal of 5 ft of saturated thickness (in the well bore) for the longest pit with the thickest interval of sand. Forty-three wells having a spacing of 300 ft and an initial pumping rate of 10.3 to 11 gpm were simulated parallel to a 12,700-ft pit having a saturated sand thickness of 50 ft. A transmissivity value of 590 gallons per day per foot (gpd/ft) (79 ft^2/day) and a storativity value of 0.15 were applied in this simulation (Table 4.2-20). Based on the model output, a maximum combined pumping rate of approximately 450 gpm would be necessary to achieve the dewatering goals. As the sand dewatered during the year or so it would take to achieve the dewatering goals, dewatering well yields would decline to 1 gpm or less per well.

Table 4.2-20. Worst-Case of JS Dewatering Model Input Parameters

Transmissivity	Storativity	Specific Yield	Saturated Thickness	Well Radius	Well Efficiency
590 gpd/ft (79 ft^2/day)	0.15	0.15	50 ft	1 ft	80%
Output parameters					
Drawdown (ft)	20	15	10	5	2
Distance from wellfield (ft)	660	776	893	1,050	1,159

Source: ECT, 2009.

Table 4.2-20 shows the model output results in terms of water level drawdown in the JS as a function of distance from the dewatering well field. A potentiometric surface decline (drawdown) of 5 ft would likely extend a maximum of 1,000 ft from the dewatering well field (where the JS sand is present). This 5 ft of drawdown would not be expected to extend beyond the mine study area. Due to the small number of actively used water wells within the mine study area, it is unlikely that these dewatering operations would adversely impact ground water supplies. However, if an existing supply became unusable due to mining operations, NACC would have to provide at its expense alternative water supplies as required by MDEQ SMCRA Regulations. Alternative sources would include the Lower Wilcox aquifer; connection to a local water supply corporation; and, possibly, tapping deeper or other sand intervals within the middle Wilcox aquifer.

The remaining water in the JS sand interval would passively drain into the mine pit. The rate of mine pit inflows from passive dewatering was estimated based on models and methods described in the U.S. Departments of Army, Navy, and Air Force Dewatering and Ground Water Control Report TM 5-818-5 (Departments of the Army, the Navy, and the Air Force, 1983). Because pit lengths, sand dimensions, and hydraulic properties would be highly variable, an estimated maximum pit inflow rate was calculated for the longest pit and greatest sand thickness. Based on these calculations, the maximum pit inflow rate would be approximately 200 gpm (Table 4.2-21). Typical pit inflow rates from the overburden in most mine pits would be less than 100 gpm.

Table 4.2-21. Input Parameters of JS Dewatering System Based on U.S. Army and Navy Model

Permeability	Saturated Thickness	Length of Pit	Seepage Face	Height of Water Above Aquifer Bottom	Height of Water at Well Bore
33 gpd/ft^2 (4.4 ft/day)	33 ft	14,533 ft	5.5 ft	50 ft	33 ft
Output parameters					
Artesian inflow	Artesian water level inflow	Pit inflow			
1,338,118 gpd	1,021,953 gpd	316,165 gpd			
		219 gpm			

Note: gpd/ft^2 = gallon per day per square foot.
ft/day = foot per day.

Source: ECT, 2009.

Depressurization Operations—The GS sand interval underlies the G lignite seam throughout approximately half of the proposed mine study area. Because the clays separating the G lignite seam from the GS sand interval are thin and the artesian pressure exerts an upward force on the confining clay that is greater than the clay's weight, depressurization of the GS sand would be necessary to conduct safe mining operations.

An analytical ground water model based on the Theis (1935) equation was used to estimate the pumping rate and artesian pressure decline needed to depressurize the GS sand. The goal of this depressurization is to bring artesian water levels down below the bottom of the G seam to prevent upward artesian pressure from causing the pit floor to heave. Actual water levels in the depressurization well bores would be below the top of the GS sand, while a minor amount of upward artesian pressure would be present between wells. The GS sand averages approximately 14 ft in thickness and has a maximum thickness of 50 ft where it is present in the proposed mine area. While GS sands up to 50 ft thick exist in isolated areas within the study area, that thickness is not persistent across the study area. Therefore, a more representative maximum thickness of 25 ft was used in these simulations. As with the dewatering calculations (see Subsection 4.2.5.2), the longest pit in the area of greatest representative sand thickness (25 ft) was used to estimate the maximum potentiometric surface declines (drawdowns).

Table 4.2-22. Worst-Case GS Depressurization Model Input Parameters

Transmissivity	Storativity	Sand Thickness	Available Drawdown	Well Radius	Well Efficiency
930 gpd/ft (124 ft^2/day)	0.00055	25 ft	100 ft	1 ft	75%
Output parameters					
Drawdown (ft)	20	15	10	5	2
Maximum distance beyond mine property boundary (ft)	2,500	4,000	5,400	10,000	14,000

Source: ECT, 2009.

The model was run using 51 simulated wells at a spacing of 250 to 300 ft. Storage and transmissivity values (Table 4.2-22) were based on the results of aquifer testing, as described in Subsection 3.7.3. To achieve the depressurization goals, the wells would need to be pumped for approximately 180 days prior to mining in the area. The initial pumping rate for each well was estimated to be from 4 to 14 gpm, with an average of approximately 6 gpm for each well, totaling approximately 315 gpm. As depressurization progressed, well yields would decline to approximately 1 gpm per well.

Table 4.2-22 shows the model output results in terms of water level drawdown in the GS as a function of distance from the mine study area boundary. A potentiometric surface decline (drawdown) of 5 ft was estimated to extend a maximum of 10,000 ft beyond the mine boundaries, and 15 ft of drawdown was estimated to extend a maximum of 4,000 ft beyond the mine boundaries. The actual extent of drawdown in the GS would obviously be limited to the actual physical extent and thickness of the GS sand interval; the GS might not be laterally continuous in some areas.

Actively used ground water wells do exist within the mine study area and in the immediately surrounding areas, as described in Subsection 3.7.2.1. Therefore, some nearby wells in the Middle Wilcox aquifer would experience drawdown from the GS depressurization pumpage. Actual impacts to a ground water user’s well would be relative not only to the amount of drawdown experienced, but also to the specific circumstances of a given well (e.g., well depth, pump setting, etc.). The amount of drawdown at a given well could cause adverse impacts to that water user via diminution of supply. At other wells, the drawdown effects could be insignificant.

If an existing supply became unusable, alternative supplies would be available, as described previously. Any impacts to other water users from mining activities would be mitigated by NACC, the mine operator, as required by the SMCRA Regulations.

Long-Term Effects of Mining on Ground Water Availability

Following mine reclamation, ground water movement and levels in replaced spoil would be dependent upon the final topographic configuration, recharge, and hydraulic characteristics of the reclaimed spoil materials. Postmining ground water movement patterns would likely approximate premining conditions since postmining and premining topography would be similar. However, the structure of the replaced overburden deposits would be substantially different than that of the natural overburden sediments. The natural layering of the undisturbed overburden sediments would not exist in the replaced overburden. Consequently, the perched aquifers and water tables observed in the natural overburden would probably be less common in the mixed mine spoil deposits. It would be unlikely that existing springs and seeps associated with these perched zones would develop in their current locations, although spring and seeps might occur at new locations during the postmining period where subsurface conditions were favorable.

During reclamation backfilling, the redistribution of sediments could result in increases in porosity, and changes in storage characteristics, horizontal and vertical hydraulic conductivities, and recharge capacity of overburden materials. Removal and redeposition would probably result in mixing of soils and material from the deeper excavated strata and stratigraphic changes, which would likely increase vertical hydraulic conductivity and porosity. As a consequence, local recharge characteristics in spoil materials could be slightly enhanced relative to premining conditions. However, the regional effect on recharge to aquifers would be negligible, as the disturbed areas of the mine would represent a small fraction of the total outcrop recharge area of the Middle Wilcox aquifer in Kemper and Lauderdale Counties.

Changes in the hydraulic characteristics of the replaced overburden could affect future use of replaced overburden as a source of ground water supply. However, currently, the undisturbed overburden Wilcox in the proposed mine study area is limited as water-supply source, supplying only small well yields and spring flows (i.e., 12 wells and no springs currently being used within the mine study area). With abundant alternative ground water supplies available from the Lower Wilcox aquifer and from local public water supply corporations, the impact of changes in hydraulic properties of the overburden in the mine study area would likely be insignificant.

Ground Water Use for Mining

Ground water would be used for nondrinking water requirements of the mine office and shop facilities, including fire suppression and makeup water for the truck wash bay. The long-term average withdrawal rate during the mining period would be approximately 0.01 MGD, with peak short-term pumpage of up to 100 gpm. The effect of pumpage would be limited to declines in the local potentiometric levels in the Lower Wilcox aquifer. Predicted drawdowns beyond a distance of 0.5 mile from the supply well would be on the order of 1 ft or less for both peak short-term usage and long-term average pumpage. None of the private water supply wells in the project locality would be adversely affected.

Mining Effects on Ground Water Quality

Mining operations would be conducted to minimize potential impacts to local ground water quality in laterally adjacent overburden sediments outside the mine study area. As discussed in Subsection 3.4.3, approximately 20 percent of the unoxidized overburden core samples showed pyritic sulfur contents in excess of 0.5 percent. All of the pyritic sulfur observed in the core samples was associated with unoxidized sediments. The oxidized overburden materials containing no acid-forming pyritic sulfur would be handled by truck/shovel operations and used in reconstruction of postmining soils. Special handling techniques would be applied to unoxidized overburden known to contain AFM or TFM to prevent acid or toxic drainage. These techniques would include special placement of AFM or TFM spoils at depths that would preclude seepage, acid neutralization by mixing with a source of alkalinity, or other approved methods. Application of these techniques would reduce potential geochemical problems.

Ground water quality in the Lower Wilcox aquifer, the principal water supply aquifer in Kemper and Lauderdale Counties, would not be expected to be adversely impacted by mining operations. The Lower Wilcox aquifer is separated from the deepest lignite seam to be mined (the G seam) by approximately 100 to 180 ft of sediments primarily composed of clay, silty clay, sandy clay, interbedded sands, and lignite. Although interbedded sands exist, most of the sediments in this interval have relatively low permeabilities and act as aquitards that minimize vertical flow. This is also evident by ground water elevation data (Figure 3.7-5), which show appreciably higher levels in the GS sand than in the Lower Wilcox aquifer. If the sediments between the GS and the Lower Wilcox were relatively permeable, then their ground water elevations would be similar, reflecting good hydrologic connection; that is not the case. The combined effects of multiple low-permeability layers between the GS sand and the Lower Wilcox would likely limit downward migration of any potentially degraded ground water from the overlying reclaimed spoil areas.

Postmining ground water quality in the reclaimed mine study area cannot be predicted with certainty but, based on past histories of other similar mines, would likely have higher TDS than premining ground water. Therefore, development of shallow freshwater wells in mine spoil deposits might not be feasible in the foreseeable future. However, sufficient fresh water would be available from the Lower Wilcox aquifer and public water systems during and after mining.

Water Quality Effects from Lignite Storage

Life-of-mine lignite storage would be located near the mine facilities. The lignite storage would be necessary for the supply of lignite during inclement weather where lignite delivery from the pit was not possible. Lignite contained in the storage area could also be used for blending to meet power plant fuel specifications.

Leachate would be occasionally produced from precipitation infiltrating through the lignite pile. The leachate would eventually seep at the base of the pile, and some would infiltrate into the underlying sediments. Any surface flow would be routed to a mine sedimentation pond for treatment before being discharged in accordance with the facility NPDES permit. Results of EPA Method 1312 synthetic precipitation leaching procedure (SPLP) tests performed on three lignite samples are presented in Table 4.2-23. Trace element concentrations of the leachate samples are either below EPA drinking water MCLs or below the laboratory detection limit for EPA Method 1312. Considering the relatively benign characteristics of the lignite leachate, no adverse impacts to ground water or surface water quality would be expected.

Table 4.2-23. SPLP Test Results for Three Lignite Leachate Samples

Parameter	Laboratory Detection Limit	SPLP No. 1	SPLP No. 2	SPLP No. 3	EPA MCL
Arsenic (mg/L)	0.05	ND	ND	ND	0.01
Barium (mg/L)	0.01	0.15	0.26	0.14	2.0
Cadmium (mg/L)	0.02	ND	ND	ND	0.005
Chromium (mg/L)	0.05	ND	ND	ND	0.10
Lead (mg/L)	0.05	ND	ND	ND	0.015
Mercury (mg/L)	0.0002	ND	ND	ND	0.002
Selenium (mg/L)	0.05	ND	ND	ND	0.05
Silver (mg/L)*	0.005	ND	ND	ND	0.10
Boron (mg/L)†	0.01	0.28	0.51	0.35	—
Copper (mg/L)	0.010	ND	ND	ND	1.3
Molybdenum (mg/L)†	0.05	ND	ND	ND	—
Nickel (mg/L)†	0.02	ND	ND	ND	—
Vanadium (mg/L)†	0.02	ND	0.08	ND	—
Zinc (mg/L)*	0.025	0.031	0.051	0.021	5.0
pH (s.u.)*	—	7.39	7.27	7.32	6.5 - 8.5

*Secondary drinking water standard.
†No EPA drinking water standard established.

Source: NACC, 2009.

Linear Facilities

Operation and maintenance of the various linear facilities would not be expected to adversely impact the ground water resources of the area. As described in Subsection 4.2.6, vegetative growth would be managed by a variety of methods, including targeted use of EPA-approved growth regulators and herbicides. Judicious selection and proper application of such growth regulators and herbicides would reduce any potential for impacts to ground water quality. In the unlikely event of a fuel spill or other release of potentially harmful chemicals, assessment and recovery of the spill or release would be conducted in accordance with MDEQ requirements.

4.2.6 TERRESTRIAL ECOLOGY

This section addresses potential impacts to terrestrial ecological resources located on the power plant site, surface lignite mine study area, and the linear facilities associated with the preferred alternative for the project. The assessment of impacts associated with the construction and operation of linear facilities focuses on the approximately 156 miles of corridors that were fully defined and field-surveyed.

4.2.6.1 Construction

Clearing of vegetation would be performed as necessary to construct the mine facilities, power plant, and rights-of-way for linear features (typically right-of-way vegetation removal is accomplished by shearing at the surface and leaving root structures and soils as undisturbed as possible for new construction and existing line upgrades), including access roads and three electrical substations.

Impacts to remaining terrestrial ecological resources associated with the project construction would depend primarily on the location and extent of surface disturbance and, to a lesser degree, clearing and construction techniques. Fugitive dust from clearing operations could affect otherwise undisturbed vegetation in the vicinity of the project site. Dust particles can accumulate on leaf surfaces, thereby reducing evapotranspiration and photosynthesis and potentially causing decline in vigor of some plants in extreme situations. However, it is not likely that dust accumulation associated with clearing and/or construction would have adverse impacts on adjacent vegetation resources due to its temporary nature, the fact that periodic rainfall would wash the dust off the leaves, and implementation of BMPs including watering of dirt access roads in active construction areas. Potential erosion and sediment transport on exposed ground at construction sites would be controlled by a variety of temporary and permanent measures, as discussed in Subsection 4.2.3.1. These erosion and sediment control methods would be implemented during and after construction and include seeding and/or mulching along newly exposed areas; silt screens and hay bales along the sloped edges of surface water features and wetlands; and redirection of stormwater runoff by the construction of swales, basins, and berms. An evaluation of potential and expected impacts on vegetation and wildlife components resulting from construction is presented in the following paragraphs.

Power Plant

Vegetation

The power plant and associated onsite facilities, construction laydown areas, sedimentation ponds, and byproduct storage area would occupy approximately 739 acres of land (approximately 45 percent of the total power plant area). To the extent practicable, the plant and associated facilities would be situated near to each other to reduce impacts to the natural terrestrial ecosystems remaining on the approximately 1,646-acre site. The lignite mine facilities and structures would occupy 342.5 acres or 21 percent of the power plant site. The remaining 564 acres of the power plant site (34 percent of the total power plant area) would not be impacted by construction. Table 4.2-24 lists specific displacements of terrestrial ecological resources by construction of the power plant and the lignite mine portion that is located on the power plant site. Figure 4.2-3 illustrates the location of the vegetation/land use impacts for the power plant and the lignite mine. Wetland and aquatic resources exist on 445 acres or approximately 27 percent of the site. Wetlands include forested wetlands (palustrine forested), shrub wetlands (scrub shrub), and herbaceous wetlands (palustrine emergent). Aquatic resources include intermittent streams (riverine), manmade ponds, and ditches. Of this total of 445 acres of regulated wetland/aquatic resources on the site,

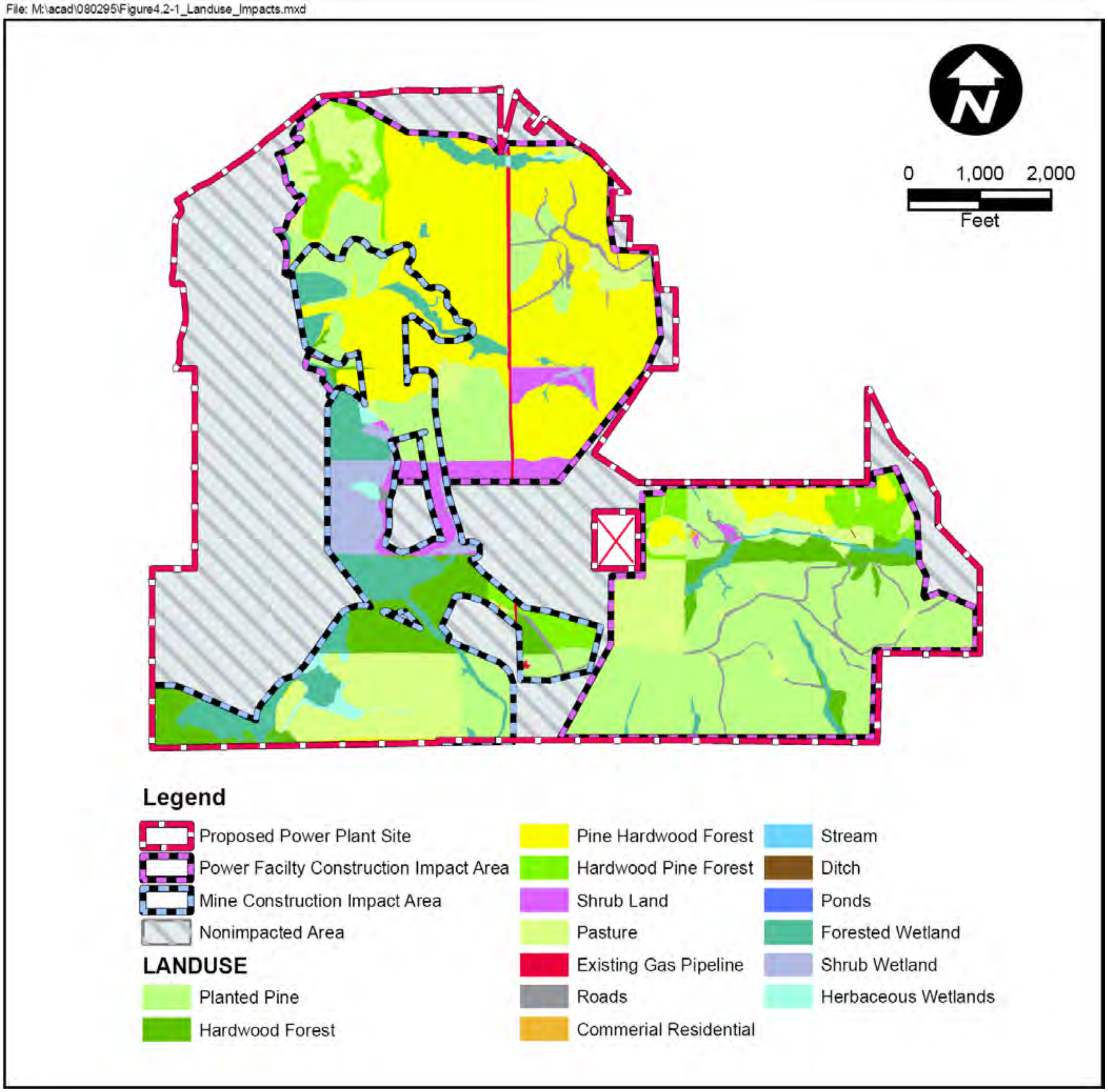


Figure 4.2-3. Vegetation/Land Use Impacts on the IGCC Power Plant Site
Source: ECT, 2009.

29.5 acres or 0.07 percent of regulated wetland/aquatic resources would be impacted by construction of the power generating station; the lignite mine-related facilities (including the onsite portion of the initial mine block) would impact approximately 103 acres or 23 percent of onsite wetland/aquatic resources. Approximately 312 acres or 70 percent of wetland/aquatic resources would not be impacted by construction associated with either the power plant or mine. The upland communities that would be impacted are primarily forested; much of the forest is planted pine or pine and hardwood mixed communities that have been logged in the past.

Table 4.2-24. Vegetation/Land Use Impacts for the Power Plant Site

Vegetation/ Land Use Type	Total Area (Acres)	Impact Area Due to Power Generating Facility Construction (Acres)	Impact Area Due to Lignite Mine Construction (Acres)	Unimpacted Area (Acres)
Shrub wetland	76.13	1.23	26.38	48.52
Herbaceous wetland	35.54	3.66	8.11	23.76
Forested wetland	330.67	24.51	68.85	237.31
Ditches	0.08	0.05	0.00	0.03
Existing gas pipeline	8.48	5.15	0.53	2.81
Hardwood forest	104.01	23.40	52.26	28.35
Hardwood pine forest	101.41	44.91	11.17	45.32
Pasture/hay fields	177.99	83.51	57.50	36.98
Pine hardwood forest	336.71	247.35	48.42	40.94
Planted pines	351.76	266.11	54.34	31.31
Ponds	2.10	0.00	0.00	2.10
Residential/commercial	1.91	0.56	0.09	1.25
Roads	27.08	14.34	2.17	10.57
Shrubland	91.78	24.58	12.61	54.59
Streams	0.28	0.00	0.03	0.25
Total	1,646	739.40	342.50	564.10

Source: ECT, 2009.

Wildlife

Site preparation and construction activities would result in the removal or alteration of up to approximately 1,100 acres of wildlife habitat out of the total Kemper County site acreage of approximately 1,650 acres. Much of this area is comprised of pasture and second-growth forest/pine plantations. Clearing and construction would generally result in a permanent loss of native habitats within the power plant area. The loss of this low-quality and fairly common habitat would not be important from a regional perspective. Site surveys by Vittor and ECT revealed the site's habitats do not serve as critical breeding, nesting, staging, or roosting habitats for migratory birds protected by the Migratory Bird Treaty Act. Therefore, adverse impacts to these species are expected to be minimal.

Most wildlife located within the proposed construction area would be mobile and would relocate to suitable onsite or adjacent offsite habitats. Small, less mobile, or fossorial individuals of a species might be lost. However, the construction area of the power plant site does not represent unique wildlife habitat for this region of Mississippi, nor does it harbor rare or unique wildlife species.

Indirect effects to wildlife might result from increased human presence, traffic, and noise during construction. This might cause some wildlife species to relocate farther onsite or to offsite habitats. This would be a temporary impact to wildlife during construction (approximately 3.5 years). An increase in mortality to some wildlife species would occur during this period due to increased traffic on surrounding roadways.

The construction of the power plant would result, however, in the suspension of hunting leases on the property and increased access restrictions. This would, in effect, provide a refugium for wildlife, especially game animals. Deer and wild turkey, both heavily hunted onsite, would be afforded additional protection during hunting season because of restricted access during power plant construction and operation.

Listed Species

No federal- or state-listed plant species were found on the power plant site, nor are any known to occur based on records maintained by MNHP (administered by MDWFP). In addition, no federally listed wildlife species were found on the power plant site, nor are any known to occur there. One state-listed species of concern (the sharp-shinned hawk) was observed on the east side of the property in an area potentially needed for power plant development (primarily byproduct storage). This bird is listed because of rarity of the breeding population in the state. The field surveys failed to identify any nesting pairs of this bird on the site, and, due to its mobility and the abundance of suitable habitat in the area, no adverse impacts to this species would be expected.

Surface Lignite Mine

Vegetation

Site preparation and construction activities would result in vegetation removal from most of the mine facility construction areas. These areas include the access roads, water control structures, lignite transport roads, and mine support facilities, such as shop and warehouse building, offices, parking areas, fuel tank farm, vehicle wash area, and dragline erection site. Approximately 455 acres would be affected during the construction phase, and suitable habitat for wildlife in the immediate vicinity of the construction site would be impacted. Vegetative cover removed during site preparation and facility construction would generally not become reestablished in the mine area. Plant communities that would be affected include mainly pine/hardwood forest, planted pine, and pasture land. Most of these areas have been altered by past timber management or farming activities.

Wildlife

Terrestrial impacts would result in the migration of mobile species out of the construction area during the initial construction phase. Loss of habitat would continue for the life of the project within the footprint of building structure, access roads, parking lots, and other mining-related structures. Once the initial construction phase is completed, return of some mobile species within the construction area would be expected. The species likely to be displaced by facility construction include deer, turkey, rabbit, grey squirrel, other small mammals, several species of birds, and various reptiles and amphibians. Some wildlife species such as mice, rats, squirrels, and various birds would become reestablished in the vicinity of mine buildings and infrastructure where revegetation occurs. Landscaping and regrowth of native plant species would provide some habitat for wildlife species.

Listed Species

Mine facilities site preparation and construction would not be expected to have any impact on threatened or endangered plant or animal species. No species listed by USFWS as threatened or endangered were found in the mine study area, although Prince’s potato bean has been recorded in Kemper County. Soils suitable for this species do not occur in the mine study area, and it is unlikely that it would become established along mine roadways or woodland edges.

Two state-listed bird species were observed in the mine study area and could be affected by construction activities. The barred owl is classified as S-5 (secure) and the sharp-shinned hawk is S-1 (critically imperiled). The barred owl is a permanent resident of Kemper County and could be displaced by clearing of nest sites and forage areas. The sharp-shinned hawk is a nonbreeding, temporary resident and would be less likely to be adversely affected by construction. No other state-listed plant or animal species would be affected by mine construction.

Linear Facilities

The study corridors in which the final rights-of-way for the linear facilities are proposed to be constructed are 200 ft wide for new facilities and 75 ft wide (the existing rights-of-way) for transmission lines that would be upgraded. As discussed in Subsection 2.3.3, most or all of the width of the corridors would potentially be needed for construction where transmission lines and pipelines would be collocated. In other situations (natural gas pipeline and southern portion of CO_2 pipeline), the 200-ft width study corridors are wider than the linear projects' rights-of-way for construction and maintenance. In those cases, the additional space provides design engineers with flexibility in siting the final rights-of-way and facilities within the study corridor. This slight flexibility might provide opportunities to avoid significant natural resources that exist within the 200-ft-wide study corridor. Nonetheless, for purposes of assessing potential impacts, the complete 200-ft-wide corridor has been assumed to be impacted during construction. For the existing transmission line rights-of-way, the full 75-ft width was assumed to be impacted. These assumptions likely overestimate overall impacts by a wide margin. Future engineering efforts on the placement and design of the linear facilities would aim to minimize environmental impacts.

As noted in Subsection 3.8.4 (also see Subsection 2.2.3), information to fully characterize several linear facility corridors was incomplete or unavailable for this EIS. Approximately 13.5 miles of the reclaimed effluent pipeline corridor in the immediate vicinity of Meridian were not surveyed, nor has the approximately 9.5-mile stretch of existing electrical distribution line right-of-way along MS 493 from MS 16 to the site. And the estimated 9- to 10-mile-long TVA transmission line interconnection corridor between MS 16 and the mine site has not been demarcated. The approximately 32 to 33 miles of unsurveyed corridors represent less than 18 percent of the project's estimated 189 total miles of linear corridors.

Impacts due to construction of these 32 to 33 miles of the connected linear facilities would likely be similar to those described in the subsequent paragraphs given the similar physiographic locations and features of the unsurveyed corridors. Terrestrial ecological characteristics of the unsurveyed portions would also likely be similar to those of the surveyed areas. Furthermore, the distribution line upgrades would occur within an existing right-of-way. These upgrades would likely be constructed by EMEPA, which would follow its own procedures to minimize environmental impacts. Similarly, TVA would follow its environmental review procedures when selecting the route for their power transmission line connecting to the mine site.

Thus, while impacts could not be assessed within 18 percent of the project's linear facility corridors, DOE does not believe the missing and incomplete information is essential to its evaluation of overall project impacts.

Vegetation

The major primary impact from linear facility construction or upgrade would result from vegetation clearing; smaller, temporary impacts would be due to trenching for laying of pipelines. Table 4.2-25 lists the worst-case acreages of potential impacts associated with constructing linear facilities.

Pipelines—Dirt from the pipeline trenches would be side cast and used to refill the trenches after laying each pipeline. Only that vegetation lying within the actual construction width and interfering with actual trenching and laying of the pipe would be cleared. Various clearing methods would be employed and would depend on the size of woody vegetation, contour of the land, and ability of the ground to support clearing equipment. Cleared brush would be shredded and distributed on the cleared right-of-way to stabilize the soil surface. Again, the acreages shown in Table 4.2-25 are conservative upper limits that assume the entire width of the study corridors would be impacted. In the cases of the natural gas pipeline and the southern 40-mile stretch of the CO_2 pipeline corridor, only a 75-ft-wide construction right-of-way would be required. The final right-of-way and trench location would be selected based, in part, on minimizing environmental impacts.

Table 4.2-25. Potential Vegetation/Land Use Impacts Associated with Construction of Linear Facilities

Land Use	Total Impacted Acreage Within Linear Facilities Corridors	Impacted Acreage Along Natural Gas Pipeline*	Impacted Acreage Along CO_2 Pipeline Only*	Existing Transmission Lines To Be Reconductored†	Impacted Acreage Along New Transmission Lines*
Active construction†	17.31		6.27		11.04
Pastures, hay fields, deer plots‡	132.25	0.80	35.57	4.08	91.80
Existing gas pipeline corridors‡	7.64		5.50	0.58	1.55
Hardwood forest	319.90	15.48	2.50	3.82	298.10
Hardwood pine forest	313.15	3.45	178.70	3.61	127.39
Pine hardwood forest	486.84	20.65	148.36	3.54	314.29
Planted pine	787.82	86.27	219.08	2.60	479.87
Roads‡	76.49	5.98	25.04	8.16	37.31
Residential or commercial development‡	48.35		10.58	34.73	3.04
Shrubland	13.15		2.25	0.49	10.40
Existing transmission line corridors‡	382.21	0.70	163.64	182.06	35.81
Forested wetland (palustrine forested)	246.81	6.06	145.48	1.29	93.98
Herbaceous wetland (palustrine emergent)	99.89	0.23	45.65	30.49	23.52
Shrub wetland (scrub-shrub)	46.95	0.26	18.22	4.55	23.92
Ditches	3.94	0.05		1.62	2.26
Ponds	12.56		4.61	0.90	7.05
Natural drainages seasonal, intermittent, and perennial streams (riverine)	41.40	0.32	3.21	9.14	28.73
Totals	3,036.67	140.25	1,014.67	291.67	1,590.07

*Impact acreage calculations are based on complete clearing of the 200-ft-wide study corridors. Actual terrestrial ecology impacts will be calculated for necessary clearing of a 150-ft right-of-way for transmission line construction and 75-ft rights-of-way for the natural gas, reclaimed effluent, and CO_2 pipelines after final engineering design. Formerly forested areas would be maintained as shrub and/or herb communities; the only permanent impacts would be due to pad construction/pole placement for transmission line structures and any necessary access road construction. Trenching for pipeline placement would be a temporary impact, and revegetation would occur through seeding of native herbs or natural recruitment.

†For those portions of the transmission line to be reconductored, 75 ft would be cleared adjacent to the existing cleared and maintained transmission line.

‡Roads, pastures, existing corridors, etc., crossed by proposed new linear facilities are already cleared; no additional impact would occur.

Source: ECT, 2009.

Transmission Lines—All impacts associated with construction of the new transmission lines would be associated with clearing for construction activities required for pole placement and any necessary access roads. In certain areas, the distance between structures would vary, for example, to minimize impacts on wetlands or other significant ecological or cultural resources, provide proper clearance over roads or other existing obstructions, or reduce the height of structures where shorter structures would be required.

Construction phases would consist of right-of-way clearing, access road construction (where necessary), line construction, and right-of-way restoration (where necessary). Construction phases generally would be performed sequentially along the right-of-way such that activities in any one area would be short-termed. Where available, mainly in the case of existing transmission lines to be upgraded, existing roads would be used for access and construction activities to the greatest extent practicable. Improvements might be made to these roads depending on their existing conditions. However, where roads are not available for access, new access roads might be constructed. Structure pads for placement of new pole locations might also be constructed at structure locations perpendicular to existing or proposed road crossings.

In areas of the corridor where collocation opportunities occur with existing transmission lines or hunting roads, forested communities have already been impacted. Limited additional clearing of danger trees directly adjacent to the existing rights-of-way would be required, and these areas of the rights-of-way would subsequently be maintained in a low-growing, early successional state with vegetation not exceeding heights necessary to ensure safe and reliable operation. Adjoining tracts of woodlands would remain intact and provide habitat for forest species. In addition, adjacent communities should not be affected by structure pad and road construction since erosion control measures and proper culverting would be used wherever necessary. Clearing would be required for construction of the new transmission line structures, pads, and roads. The forested portions of the right-of-way would generally be cleared across the entire permanent right-of-way width. Upland areas that are not heavily vegetated (herb- and/or shrub-dominated areas) would be mowed or brush-hogged. Depending on the density of trees to be cut and the restrictions on clearing in wetlands and sensitive areas, the machinery required for clearing would include bulldozers, shearing machinery, and chain saws for hand removal of woody vegetation in sensitive areas such as wetlands.

Due to necessary maintenance practices in the right-of-way, a decrease in structural diversity would occur in formerly forested areas (i.e., permanent loss of a tree canopy layer). However, this would be offset by an increase in species diversity as additional shrubs and herbs colonize the right-of-way in response to increased sunlight and decreased competition for light due to canopy removal.

Access roads would be needed to provide efficient, safe, and cost-effective ingress and egress to the structures. Access roads would be used for initial construction, routine maintenance, and to repair any damage to the transmission facilities that might occur on rare occasions. Where available, existing access roads (i.e., hunting roads/trails, public roadways, or roads within existing transmission line corridors to be upgraded) would be used. In some cases, these existing access roads might need to be improved to accommodate the necessary construction and/or maintenance equipment.

Proper construction of the access roads and pads for the new transmission line structures would result in minimal impacts to terrestrial (upland and wetland) and water resources. Means to minimize impacts would include the use of turbidity screens and erosion control devices, where there is a potential for erosion, to minimize construction impacts to wetlands and water bodies. Wetlands could be avoided wherever practicable by routing necessary access roads around them; unavoidable wetland impacts could be minimized by constructing access roads as narrow as possible and using corduroy roads or geotextiles. Unavoidable stream crossing impacts could be minimized by restricting access road width to the minimum necessary and culvert placement to allow uninhibited flow and wildlife/fish/macroinvertebrate movement through the culverts. In summary, necessary wetland/waterway crossings could be constructed to allow continued functioning of wetland/riparian areas.

Finally, the installation of transmission line structure foundations would require structural fill. Other than any necessary access roads, structure placement would be the only permanent impact to terrestrial ecological resources. In upland areas, access would be at-grade earthen or gravel roads. As previously mentioned, structure placement could be manipulated to avoid or minimize the impacts to significant ecological resources.

Wildlife

The proposed transmission lines, reclaimed effluent pipeline, natural gas pipeline, and CO_2 pipeline would cross many potential wildlife habitats found throughout this part of Mississippi. Although these rights-of-way would be relatively narrow, they would be cleared of most forested and shrubby vegetation communities. The estimated acreage to be cleared would be approximately 1,700 acres. Subsection 3.8.4.1 describes these communities in more detail.

These habitats would be altered along the various rights-of-way by removal of trees and most shrubby vegetation. This would represent a permanent loss of some forested habitat and shrub community habitats within the right-of-way boundaries. Most wildlife encountered during field surveys would be mobile enough to relocate to offsite habitats during clearing and construction activities. Some individuals of less mobile species might be lost, however.

It is anticipated that, where possible, wetlands would be avoided or spanned by the new or upgraded transmission lines. Some wetland impacts would be unavoidable from the pipeline construction. Generally these impacts would consist of clearing and trenching/backfilling of wetland areas, as discussed previously. Some larger wetland areas could potentially be directionally drilled; in which case, the wetland itself might not be affected, but the adjacent vegetation on each side might be removed for the drilling setup and operation. In these areas, this type of construction would represent a temporary impact on wildlife that use wetland systems. Some minor degradation of water quality might occur because of construction in wetlands and thereby affect fish and aquatic/wetland-dependent wildlife, such as reptiles and amphibians. The use of BMPs, including silt screens, would minimize potential impacts to such wildlife species.

No threatened or endangered species' habitats would be affected along the proposed corridors. No parks, preserves, or wildlife refuges would be crossed by the linear facilities other than the proposed Vimville-Sweatt transmission line, which would cross the southern portion of the Bonita Lakes Park, owned by Meridian.

Listed Species

Construction of the linear facilities would not be expected to adversely affect any endangered or threatened plant and wildlife populations. Evidence of only one listed species was observed along the approximately 156 miles of new and existing linear facility corridors that were surveyed: one inactive burrow of a gopher tortoise. No other listed species were observed, although the potential exists for some to use portions of the proposed corridors, as described in Subsection 3.8.4.3.

The one inactive gopher tortoise burrow might be affected by construction, depending on final right-of-way location in that vicinity. If the burrow was deemed active at that time and could be affected by construction activities, Mississippi Power could relocate the tortoise to suitable adjacent habitat or capture and hold the animal until completing construction in that area and then release it back to the same area.

Price's potato bean is federally listed as threatened by USFWS and has been recorded in Kemper County. Where known, it is most often found in open woods and along woodland edges in limestone areas, typically where bluffs are adjacent to creek or river bottoms and on roadsides or transmission line rights-of-ways. Though Price's potato bean was not observed within the project area during the ecological field surveys, appropriate habitat is present. Some wooded habitat and bluffs that are adjacent to creeks or river bottoms could be impacted. Again, there is some flexibility due to the widths of the study corridor and the subsequent ability to avoid or minimize impacts to sensitive ecological features such as bluffs by avoidance through structure/trench placement and access road location flexibility. It is possible that construction of the linear facilities might produce habitats suitable for Price's potato bean's growth, since it is known to occur on roadsides and linear facilities rights-of-ways elsewhere in its range. DOE has initiated informal consultation with USFWS regarding potential effects to this species (see Appendix A).

4.2.6.2 Operation

Potential impacts to terrestrial ecological resources associated with the project operation could result from air emissions from the power plant (the stacks and cooling towers) and the noise levels originating from operation of the power plant site and surface mine (wildlife resources only). The audible noise associated with a transmission line is expected to be less than the ambient outdoor noise levels and would not result in any impact to wildlife. An evaluation of potential and expected impacts on vegetation and wildlife components resulting from air emissions is presented in the following paragraphs.

Power Plant

Since the IGCC facility would be a new stationary source, it requires additional impact analysis to evaluate the impacts of the proposed emissions on soils, vegetation, and wildlife, etc., via the PSD permitting process. Although state-of-the-art equipment and emissions controls would be employed, there is the potential for impacts to vegetation and wildlife resources of the project site resulting from the proposed plant operation. Emissions of air pollutants could have an impact on local flora and fauna; the secondary NAAQS are designed to protect public welfare, including protection against damage to animals, crops, and vegetation (see Table 3.3-2). Modeled impact levels for criteria pollutants are below these standards (refer to Subsection 4.2.1). The following discussion provides additional information regarding potential impacts to ecological resources.

Vegetation

Vegetation damage due to power plant emissions is principally foliar damage. Less apparent vegetation injury is described as a reduction in growth and/or productivity without visible damage, as well as changes in secondary metabolites such as tannins and phenolic compounds (Booker *et al.*, 1996). Vegetation damage most often results from acute exposure to pollution (i.e., relatively high doses over relatively short time periods). Injury is also associated with prolonged exposures of vegetation to relatively low doses of pollutants (chronic exposure). Acute damages, which have both functional and visible consequences, are usually manifested by internal physical damage to foliar tissues. Chronic injuries are typically more associated with changes in physiological processes.

The following discussion summarizes descriptions from the literature of the potential effects on vegetation in the project region that have been associated with the relevant pollutants. To evaluate the potential for impacts, levels known to cause damage to the most sensitive vegetation are discussed.

Nitrogen Oxides—During combustion, atmospheric and fuel-bound nitrogen are oxidized to nitrogen oxide (NO) and small amounts of NO_2 (Taylor *et al*., 1975). Impacts to vegetation from NO_2 result from high concentrations occurring during short time periods (Taylor and MacLean, 1970). Acute exposures of this sort will cause necrotic lesions in leaf tissue and excessive defoliation (MacLean *et al*., 1968). Short-term (acute) exposures to NO_2 of less than 1,880 $\mu g/m^3$ for 1 hour have caused no adverse effects to vascular plants (Taylor *et al*., 1975). Common sunflower exhibits an injury threshold of 375 $\mu g/m^3$ for chronic exposure. For perennial ryegrass, the injury threshold for chronic exposure is 125 $\mu g/m^3$. Nonvascular bryophytes are very sensitive to NO_x exhibiting reductions in nitrate reductase activity at concentrations of 65 $\mu g/m^3$ with exposure duration of 24 hours (WHO, 2000). The possibility of vegetation injury to vascular or nonvascular plants due to NO_x emissions from the power plant would be remote, since emissions from the plant are predicted to result in an average annual ambient concentration of only 1.43 $\mu g/m^3$; this level is below the level known to cause damage to the most sensitive plants, bryophytes and far below the chronic exposure thresholds know to cause injury to sunflower and ryegrass, which are common in the area.

Sulfur Dioxide—Natural (ambient) background concentrations of SO_2 range between 0.28 and 2.8 $\mu g/m^3$ on a mean annual basis (Prinz and Brandt, 1985). The most common source of atmospheric SO_2 is the combustion of fossil fuels (Mudd and Kozlowski, 1975). At low concentrations, SO_2 byproducts are effectively detoxified by the plant and can become a sulfur source to the plant, while elevated concentrations can be toxic (Zeiger, 2002). Adverse effects on plants from SO_2 are primarily due to impacts to photosynthetic processes. SO_2 can react with chlorophyll by bleaching or phaeophytinization. This latter process constitutes a photosynthetic deactivation of the chlorophyll molecule. Acute damage due to SO_2 appears as marginal or intercostal areas of dead tissue that at first cause leaves to appear water-soaked (Barett and Benedict, 1970). Chronic injuries are less apparent; the leaves remain turgid and continue to function at a reduced level. In more severe cases of chronic SO_2 exposure, there is some bleaching of the chlorophyll that appears as a mild chlorosis or yellowing of the leaf and/or a silvering or bronzing of the undersurface. Species that are categorized as sensitive to SO_2 emissions are those that show damage to at least 5 percent of the leaf area upon being exposed to 131 to 1,310 $\mu g/m^3$ SO_2 for a period of 8 hours (Jones *et al*., 1974).

Researchers have conducted numerous studies to determine the effects of SO_2 exposure to a wide variety of selected plant species. A review of the literature demonstrates that the most sensitive vascular plants (e.g., white ash, sumacs, tulip poplar, goldenrods, legumes, bracken fern, blackberry, black oak, and ragweeds) exhibit visible injury to short-term (3 hours) exposure to SO_2 concentrations ranging from 790 to 1,570 $\mu g/m^3$. All these plants are present on the plant site or vicinity.

Due to their rather diminutive and inconspicuous nature, lichens and bryophytes are often not considered as important biological components of the ecosystem. However, these nonvascular plants do play a valid role in the environment by functioning as habitat for invertebrates, containing blue-green bacteria that fix nitrogen, participating in mineral cycling, and providing a food source for various fauna, among others. These plants are especially important as bioindicators due to well-documented air pollution sensitivity. Because of relatively low chlorophyll content and the absence of the protective covering of a cuticle (common in the leaves of higher plants), nonvascular plants are more sensitive to SO_2 injury. Tolerant lichens can resist SO_2 concentrations in the range of 79 to 157 µg/m^3; higher concentrations are deleterious to most nonvascular flora (LeBlanc and Rao, 1975). A mean annual concentration of 30 µg/m^3 of SO_2 may injure sensitive individuals of some lichen species such as *Usnea*, *Lobaria*, *Ramalina*, and *Cladonia* (Treshow and Anderson, 1989). One lichen species, *Ramalina americana*, is known to be absent where SO_2 concentration mean annual values range from 13 to 26 µg/m^3 (LeBlanc, *et al*., 1972; Wetmore, 1983). The maximum predicted impact resulting from emissions of SO_2 from this project are 1.91 µg/m^3 annual average and 33.86 µg/m^3 for a 3-hour exposure period, below levels known to cause injury to vascular or nonvascular plants in the region.

Particulate Matter—In addition to gaseous emissions, small amounts of PM would be emitted from the power plant and mining facilities. Typically, the density of PM limits impacts such that only vegetation in proximity to the source may be affected. Because the power plant must operate within permit limits for PM, adverse impacts are not expected to occur from plant operations.

Included among the PM may be low concentrations of mercury, beryllium, arsenic, and lead, to the extent present at low levels in coal. The mercury may occur as both mercury vapors and particulates. The mechanism of mercury phytotoxicity is currently under investigation. Past investigations indicate that mercury vapors will cause chlorosis, abscission of older leaves, growth reduction, and poor development. Most investigations have been restricted to greenhouse crops where air quality monitoring was not conducted. One investigation indicates that vegetation exposed to 50 µg/m^3 mercury for 7 days experienced leaf abscission (Siegel *et al*., 1984). Plants found in the region showing injury at this concentration and period of exposure to mercury are willow and red maple.

No impacts to ecological resources are anticipated due to PM emissions since estimated impacts (21.4 µg/m^3 for 24-hour and 3.2 µg/m^3 annual average) are predicted to be less than those that could affect plants and animals in the project region.

Carbon Monoxide—CO is not considered harmful to plants and is not known to be effectively taken up by plants (Bennett and Hill, 1975). Microorganisms within the soil appear to be a major sink for CO. Therefore, no adverse impacts to plant and animal resources in the project area would be expected to occur due to CO emissions from the proposed generating plant.

Salt Drift—Based on the plan to use reclaimed effluent as the primary IGCC plant water source, deposition of salt from cooling tower drift would have little potential to harm terrestrial ecological resources (see also Appendix N and Subsection 4.4.1).

Wildlife

Operational impacts would consist of human presence, routine vehicular traffic, noise, vibrations, air pollutant emissions, and artificial lighting. These impacts might cause certain wildlife species to relocate farther from the power block area. However, most wildlife species would soon become acclimated to the presence of the power plant and would reestablish in suitable adjacent habitats.

Air emissions have the potential to impact wildlife due to direct uptake of pollutants through ingestion or via the skin and indirectly as a result of air pollution-induced changes to wildlife habitat and food source. Studies have shown direct air pollution-induced injury and death in wildlife as a result of fluoride, cadmium, SO_2, particulates, NO_x, arsenic, mercury, and oxidants like ozone (Newman 1980; Newman and Schreiber 1985). These impacts are mostly the result of extreme incidences due to acute toxicity. This acute toxicity occurs most severely in circumstances where air pollutants were likely elevated far above the NAAQS, or where significantly elevated concentrations of pollutants occurred on vegetation that was subsequently consumed.

Studies have shown damage to the tracheal epithelium of bird species at extreme concentrations of NO_x and SO_2 of 2,500 µg/m³ and 1,221 µg/m³, respectively (Llacuna *et al.*, 1993). These values are far elevated above concentrations that would be expected from IGCC facility emissions.

In summary, air pollutant concentrations in the project vicinity would be expected to remain below NAAQS and minimum injury threshold concentrations, below which no wildlife acute toxicity would be expected to occur. Most effects on wildlife are indirect, predominantly as a result of decreased habitat quality.

Listed Species

No listed plant species were observed on the project site, nor are any expected to inhabit the site. Furthermore, air pollutant concentrations are projected to be lower than those known to affect the most sensitive vegetation. For listed wildlife, other than the aforementioned sharp-shinned hawk, no other listed wildlife species are known to occur on the power plant site. Given the low air pollutant impacts predicted, the air emissions from operation of this facility should have no effect on this bird or any other listed species. As previously mentioned, DOE has initiated informal consultation with USFWS regarding potential project impacts on federally listed species.

Surface Lignite Mine

Vegetation

Operation of the mine would remove all vegetation on up to 11,816 acres proposed to be mined or disturbed during the 40-year operating period. Depending on vegetative cover type, tracts of land would be cleared and grubbed just prior to mining, except in the case of some commercial timberlands. The rate of clearing would range from 195 to 375 acres per year and would average 275 acres each year, in advance of lignite removal.

Table 4.2-26 provides the average of selected land covers/vegetative communities that would be affected by the surface lignite mine. As shown, the 31,260-acre mine study area contains 20,822 acres of the vegetative communities listed, of which 7,005 acres (or 34 percent) are prepared to be mined or disturbed. The remainder of the mine study area is comprised of bottomland forests (i.e., wetlands/floodplains) and land historically converted into other uses (e.g., roads).

The total maximum proposed mining disturbance is 12,272 acres within the 31,260-acre mine study area, or 39 percent (see Table 2.4-2). The total maximum proposed disturbance of 7,005 acres shown in Table 4.2-26 is 34 percent of the land covers listed. Hardwood pine forest communities and pastures/hayfields would be cleared at percentages above the sitewide average, whereas hardwood forest and scrubland communities, as well as pine plantations, would be cleared at percentages below the sitewide average.

In terms of timing of the proposed clearing on the native communities listed in Table 4.2-26, mine blocks C (2023 to 2032) and G (2043 to 2053) would represent 86 percent of the hardwood forests and 64 percent of the hardwood pine forests to be cleared; mine blocks A (2012 to 2018), B (2018 to 2022), and C (2023 to 2032) would represent 85 percent of the pine hardwood forests; and mine blocks A (2012 to 2018), D (2033 to 2037), and F (2040 to 2042) would represent 96 percent of the scrubland. Clearing of wetlands is addressed in Subsection 4.2.9, and clearing of floodplain is addressed in Subsection 4.2.8.

Table 4.2-26. Summary of Vegetative Cover Cleared in Advance of Mining

Cover Type	Current Acreage	Percent of Current Total	Acreage Cleared in Mine Blocks							Cleared Total	Percent of Total Disturbance	Percent of Current Total
			A	B	C	D	E	F	G			
Hardwood forest	2,176	10	3	12	227	26	34	4	240	546	8	25
Hardwood pine forest	3,689	18	115	116	442	300	34	0	561	1,568	22	43
Pasture/hayfields	5,909	28	487	57	667	503	86	100	331	2,231	32	38
Pine/hardwood forest	2,233	11	254	172	194	77	3	0	34	734	10	33
Planted pine	5,746	28	149	366	291	229	242	84	375	1,652	24	29
Scrubland	1,069	5	121	0	12	69	0	72	0	274	4	26
Total*	20,822	100	1,129	723	1,833	1,204	399	260	1,542	7,005	100	34
Total mine study area	31,260	—	—	—	—	—	—	—	—	12,272	—	39

*Excluding bottomland wetlands forests and converted uplands (e.g., residential).

Source: ECT, 2009.

Following lignite removal, the mine pit would be backfilled and regraded to approximate original contour. Once the final contour was achieved, revegetation activities would begin. Much of the original soil seed bank would be eliminated, and the revegetated community during the early years of reclamation would be largely determined by the replanting process. The plant species diversity of the reclaimed lands would initially be lower than premining conditions, and premining plant communities would be eliminated in the immediate disturbance area.

The type of plant cover restored during reclamation would be determined by NACC, the MDEQ SMCRA Regulations, and the discretion of the surface landowner. It is likely that most landowners would request pine plantations, which would be interspersed with fish and wildlife features and grasslands. Plant succession in areas reclaimed as pine plantations would likely follow trends in commercial pine plantations following clear cutting and site preparation. Grasses and forbs would be expected to dominate during the first 5 to 10 years until the pines become large enough to shade out the understory, which could cause plant species diversity to decrease.

Wildlife

Operation of the mine would impact wildlife populations. Existing wildlife habitats would be cleared by mining operations at an average rate of 275 acres per year. Local wildlife species using mature hardwood and hardwood-pine forests would likely be temporarily lost from the site.

Mobile species of wildlife, such as deer, would disperse ahead of mining activities into adjacent areas including the Okatibbee Lake WMA in northern Lauderdale County managed by USACE. This dispersal could cause an increase in the number of deer and other mobile species in these areas; however, these increases would be considered temporary because wildlife would return to reclaimed areas as the mining progressed; furthermore, the area from which such species would be displaced at any one time would be less than 1,897 acres. Experience at the Red Hills Mine indicates that return of various wildlife species including deer and turkey onto reclaimed land happens relatively quickly.

Wildlife populations in the pine plantations would likely reach their highest levels of diversity and abundance during the first decade after reclamation and would resemble populations currently found in commercial pine plantations located within the project boundary (Atkeson and Johnson, 1977; Dickson and Segelquist, 1979; Dickson et al., 1995). Current reclamation practices include development of wildlife areas within pine plantations to provide long-term habitat for returning wildlife.

Mining operations could benefit many wildlife species using early succession grassland and shrub habitats by providing increased acreages of these habitats on reclaimed land. Species that would benefit include eastern cottontail, several small mammals, northern harrier, American kestrel, northern bobwhite, eastern bluebird, eastern phoebe, and loggerhead shrike. Early successional grasslands would also provide over-wintering habitats for several species such as the savannah sparrow, LeConte’s sparrow, song sparrow, and yellow-rumped warbler.

Sedimentation ponds would provide additional wetland and open water habitats for mammals such as the muskrat and raccoon, wading birds, waterfowl, and several species of reptiles and amphibians. Impacts to some wildlife species could be mitigated through specific reclamation practices such as establishment of wildlife food plots and planting groves of mast- and fruit-bearing trees and shrubs. Hard-mast producing riparian corridors could be planted along reclaimed stream banks.

Listed Species

The lignite mining operation would not be expected to adversely affect any federally listed species. No threatened or endangered species were observed during surveys, nor will any designated critical habitat for any species be disturbed. Price’s potato bean was not observed within the project area during the ecological field surveys. However, this federally threatened species has been recorded in Kemper County. Where known, it is most often found in open woods and along woodland edges in limestone areas, typically where bluffs are adjacent to creek or river bottoms and on roadsides or transmission line rights-of-ways. Appropriate habitat for Price’s potato bean is present within the proposed mine blocks, and it is possible that some of that habitat would be affected by construction. DOE has initiated informal consultation with USFWS regarding potential effects to this species.

Natureserve (2008) indicates a previous element occurrence of gopher tortoise from Lauderdale County, Mississippi. The species is not included on USFWS’ list of protected species occurring in Lauderdale County, and the species is assumed to have been extirpated and is no longer occurring there. There are no element occurrences of gopher tortoise in Kemper County, and they are not expected to be found within the mine operation area.

Two state-listed avian species were observed within the mine area. One barred owl was observed dead on a road, and it should be noted that the species is a permanent resident in Kemper and Lauderdale Counties, Mississippi. The barred owl is listed as an S-5 (secure) species in the state of Mississippi. Habitat for this species may be adversely affected by mining operations. One sharp-shinned hawk was observed within the proposed mine blocks. The sharp-shinned hawk is listed as an S-1 (critically imperiled) species in Mississippi and is considered to be a nonbreeding resident. Habitat for this species may also be adversely affected by mining operations.

Linear Facilities

Vegetation

The only impact due to operations of the linear facilities would result from periodic maintenance of the rights-of-way. Safe and reliable operation of all linear facilities would be maintained through regular inspection of the pipelines, structures, conductors, insulators, access areas, and vegetation in the rights-of-way. To ensure safe and reliable linear facility operation, vegetation in the right-of-way would be managed by a variety of methods, including trimming, mowing, and the use of EPA-approved growth regulators and herbicides, targeting species that are incompatible with the safe access, operation, and maintenance of the linear facilities.

The exact manner in which maintenance would be performed would depend on the location, type of terrain, and surrounding environment. Vegetation removal would be minimized consistent with safe and reliable operation of the transmission and pipelines. For example, fast-growing vegetation species and other vegetation whose mature height could interfere with the safe operation of the linear facilities would normally be cut or removed. Other species would generally be allowed to remain, resulting in a shrubby and herbaceous cover within the right-of-way. This would encourage a broad diversity of vegetation growth to remain on the right-of-way, which would enhance wildlife use potential.

Growth regulators and herbicides would typically be selectively used for vegetation control. Due to the selective nature of vegetation cutting, the prescriptive use of growth regulators and herbicides, and the infrequent occurrence of maintenance activities, the potential effects on wildlife and water quality should be negligible.

Wildlife

As previously mentioned, construction of the linear facilities would result in clearing of most trees and shrubs. Taller growing plant species would not be allowed under the transmission lines or within a certain distance of the conductors. Also, plants (such as trees and shrubs) with extensive root systems would not be allowed within the right-of-way for the pipelines. This means that maintenance practices would be developed to preserve the rights-of-way as early successional habitats—herbaceous and small shrubby communities.

Perpetuation of these community types would not adversely affect regional wildlife populations. None of the communities crossed by the linear facilities are considered rare or unique.

These maintained rights-of-way would create a diverse habitat edge through forested communities. This edge would provide foraging habitat to certain forest species, but it would reduce the amount of forest habitat for forest-nesting/breeding species. In turn, the open herbaceous communities created would increase this habitat type for open land or grassland-nesting/breeding species. The rights-of-way might also open previously inaccessible areas to unauthorized four-wheel-drive vehicles and hunters. Mississippi Power could work with landowners to ensure access was limited to the landowner’s desires.

Operation of the linear facilities would not be expected to negatively affect wildlife. The pipelines would be buried, so they would not affect wildlife usage of the right-of-way. The overhead transmission lines could be located so as to not cross any major wetlands or water bodies, which are used by large flocks of waterfowl or water birds. Therefore, potential for bird collisions with the wires could be minimized. In situations where there were bird collisions or probable collisions, bird diversion devices on the conductors could be installed. Other than the occasional maintenance and patrols by utility personnel, human disturbances to wildlife would remain similar to current conditions.

Listed Species

O&M of the linear facilities would have no effect on listed species that may occur along the routes. The gopher tortoise, if present, might actually benefit from the low-growing herbaceous habitat that would be maintained on the right-of-way. DOE has initiated informal consultation with USFWS regarding potential effects to this species.

4.2.7 AQUATIC ECOLOGY

Potential impacts on aquatic systems and ecology associated with power plant, mine, and linear facilities construction activities and operations would relate directly to impacts on surface waters, as previously discussed in Subsection 4.2.4. Potential impacts would be controlled by the same means and methods described previously.

4.2.7.1 Construction

Power Plant

Construction activities would include clearing and grading, which would potentially increase runoff from the construction site during rain events. Construction of the power plant would have minimal likelihood to impact aquatic ecology. The power plant site is well drained by multiple drainageways containing small ephemeral and intermittent streams that drain to Chickasawhay Creek. Control of construction stormwater runoff and delivery to drainageways would minimize impacts of sedimentation in downstream receiving water bodies and would, therefore, minimize impacts on the aquatic systems.

Surface Lignite Mine

Construction activities associated with the proposed mine facilities would include clearing and grading for haul roads, shop/maintenance areas, etc. These activities would potentially increase runoff from the construction site during rain events. All surface water runoff from all construction projects would flow to stormwater sediment ponds where it would be retained to meet effluent standards. The construction of a sediment pond would be the first disturbance to a watershed area. During the construction of the sedimentation ponds, planned surface water runoff and sediment transport controls, provided for in the SWPPP, such as fabric filter fences, hay bale dikes, and use of BMPs, would be expected to reduce the impacts of construction of the ponds. Once the sedimentation ponds were constructed, construction-related runoff within that watershed would flow to the sediment pond.

Clearing of terrestrial vegetation in areas to be mined, construction of surface water control structures, and erection of administrative and service buildings would also occur as part of initial mine construction. Some of the roads would cross area streams, as would embankments constructed for diversion channels and sedimentation ponds. Each of these activities could adversely impact aquatic biota resulting from: (1) disruption of existing stream channels (e.g., stream realignment); (2) changes in nutrient and chemical inputs; (3) reduction in the shade and organic materials provided by riparian vegetation; and (4) alteration of existing flows.

The immediate increase in leaching of soil nutrients commonly associated with the clearing of vegetation could temporarily enrich streams in the project area. If this were accompanied by the clearance of riparian vegetation, etc., the increased nutrient and light levels could cause algal blooms in pool areas, when suspended solids concentrations are sufficiently low. Nutrient release rates from cleared areas would decrease following the initial pulse; therefore, nutrient enrichment of project streams is not anticipated to be a long-term effect.

Construction of sedimentation ponds SP-2 and SP-3 would remove less than 4,000 linear feet (lf) of intermittent tributary stream channels currently connected to Chickasawhay Creek. Construction of sedimentation pond SP-7 would remove approximately 3,000 lf of the Tompeat Creek channel. Upstream of the SP-7 dam, Tompeat Creek is classified intermittent. Construction of all three ponds would require authorization by USACE through issuance of a 404 Permit, including measures to minimize and mitigate these potential effects.

Construction of temporary diversion channel 1A would disconnect approximately 3.6 miles of Chickasawhay Creek channel, which is classified perennial. These losses of connected habitat would be offset, in part by aquatic habitat created in the diversion channels, as more fully discussed in Subsection 4.2.7.2. Construction of the diversion channel would require authorization by USACE through issuance of a 404 Permit, including measures to minimize and mitigate these potential effects.

Linear Facilities

Construction of the linear facilities would not be expected to have any permanent impacts on streams crossed. Activities would include soil disturbance (i.e. tracking, grading, and excavation), trenching, stockpiling of excavated soils during construction, clearing of vegetation, and installation of temporary crossings. These activities could deliver excess sediment to streams and increase turbidity during wet weather if adequate soil erosion and sedimentation control measures were not used. During construction of overhead transmission lines, installation of temporary crossings, removal of vegetation, and tracking could disturb soils within the stream corridors. Installation of the pipelines via trenching within streambeds would increase turbidity in the stream if construction was completed in the presence of flow. Likewise, trenching and excavation adjacent to the streams could deliver sediment to the stream during wet weather.

Excess sedimentation and turbidity caused by linear facility construction activities could directly impact habitat and organisms through smothering. Turbidity could damage fish gills. However, short-term increases in turbidity would not usually harm biological organisms, particularly when the turbidity was within the natural range for the crossed streams.

Sedimentation and turbidity could be effectively controlled by using applicable soil erosion and sedimentation control BMPs to minimize soil erosion and transport to the stream, as discussed previously. When trenching in streambeds with water flow, sediment traps could be used or flow could be dammed and pumped around the trenching site. When appropriate, on larger streams with perennial flow, other means such as jack-and-bore and directional drilling might be feasible for installation of the pipelines. These construction methods would reduce the impacts associated with open trenching in the presence of flow.

4.2.7.2 Operation

The power plant and linear facilities should have minimal impacts on streams and aquatic resources during operation. The surface lignite mine would have greater direct impacts on aquatic resources during operation due to mining of stream channels and associated diversion of flow. Other potential indirect impacts on aquatic systems associated with operation of the surface lignite mine would include sedimentation and downstream alteration of hydrology.

Power Plant

The power plant would be a zero-discharge operation with no cooling tower blowdown or other process discharges. The only discharge from the power plant site would be stormwater runoff. Permitting and technology-based NPDES controls for stormwater discharges are adequate to protect receiving waters. Operation of the power plant would have other potential impacts on aquatic resources. These would include indirect impacts caused by deposition of air pollutants to surface waters and impacts associated with the use of reclaimed effluent from the Meridian wastewater treatment system.

The power plant would make use of reclaimed effluent from two Meridian POTWs to satisfy cooling and other plant water needs, as discussed elsewhere. Use of POTW effluent would reduce flows in Sowashee Creek, a tributary of Okatibbee Creek with its confluence located downstream of Okatibbee Lake. Sowashee Creek is impaired due to pathogens and biological impairments. It is currently on the 303(d) list for not meeting the Aquatic Life Support designated use and is part of the fecal coliform TMDL for Okatibbee Creek. Due to wastewater discharges and urban runoff, the biological communities of Sowashee Creek have been degraded. There are special or unique aquatic animals or communities associated with Sowashee Creek downstream of the main Meridian POTW. Removing a source of pollutants and stressors by routing a portion of the Meridian effluent for use at the proposed power plant should have long-term benefits for the biological communities of Sowashee Creek downstream of Meridian. It would also benefit Okatibbee Creek downstream of the Sowashee Creek confluence.

Surface Lignite Mine

Disturbance of downstream aquatic habitats during mine operation could result from increased suspended solids loads entering the creeks; however, all of the runoff and other discharges along and within each mine block would be regulated by sedimentation ponds and diversions. Sedimentation ponds would provide detention of surface runoff from subbasins affected by the mining operation, as well as the detention of pit inflows from mine pit water control operations. Discharges from sedimentation ponds would be subject to the MDEQ SMCRA and CWA permits and effluent limitation requirements discussed in Subsection 4.2.4.2.

Potential constituents of runoff from roads and service areas could include oil and grease deposited during operation of vehicles. Runoff from service areas and road surfaces would be controlled by sedimentation ponds or other BMPs. An SPCC plan would be in place to address oil and grease spillage. Releases of this type would be subject to the permit and effluent limitation requirements discussed in Subsection 4.2.4.2.

Lignite extraction during the operation period would remove up to 31.9 miles of stream channel classified as perennial (NACC, 2009). In addition, lignite extraction would remove up to 24.26 miles of intermittent tributaries. Lignite extraction in aquatic habitat would require approval by USACE through issuance of a 404 permit, including measures to minimize and mitigate effects of aquatic resources.

Use of temporary stream diversions would result in the loss of habitats and the aquatic life in the existing stream channels. Although rapid colonization of the new channels would likely occur, the new channels would not likely initially provide the habitat diversity of the natural channels.

Extensive removal of riparian vegetation from the streams of the mine study area would result in the loss of stream ecosystems that are presently dominated by detrital food chains dependent on leaf litter fall from the surrounding woodlands. In situ production by algae and macrophytes is, at present, largely confined to areas that have been cleared, such as road crossings. While extensive alterations in the abundance and composition of the algal and macrophyte flora could be initially expected, the potential effects on other components of the aquatic community are less clear but are discussed further.

Zooplankton and littoral macroinvertebrate densities would probably rise due to increases in phytoplankton food availability and the additional cover provided by more extensive stands of aquatic vegetation. The factors affecting potential changes in the macroinvertebrate community are more complex. Although in situ production would, to a large degree, supplement terrestrial organic material at the base of the food chain, it must be pointed out that the largest proportion of aquatic macrophyte production also enters the food web as detrital material rather than being cropped when living. Detritus-feeding organisms (e.g., most oligochaetes) may be largely unaffected, as the source of organic material in the sediments appears to be unimportant relative to the amount available. Some changes might occur in the composition of the detritus-feeding fauna as the source of detritus changes from mainly terrestrial plant leaves to aquatic vegetation, but little is known about the dependence (or lack thereof) of these species upon specific detrital sources. Two groups of macroinvertebrates, the scrapers/algal grazers and filter feeders, could be expected to increase in abundance and diversity in response to these changes. Additionally, the increased habitat diversity provided by macrophyte stands could be expected to result in some increase in macroinvertebrate abundance and diversity. Fish species feeding on macroinvertebrates (e.g., sunfishes, catfish) would be affected by changes in invertebrate species composition and distribution only to the extent that the availability, or catchability, of prey items changed. For instance, the greater abundance and variety of invertebrates generally associated with aquatic vegetation could result in some increases in sunfish and top minnow populations. Other factors attendant to the change from woodland to open stream habitat that could affect the fish community would include increases in the ranges of variation in temperature and water level, and increased availability of cover in stands of vegetation.

Sedimentation ponds controlling runoff from disturbed areas would not be expected to concentrate a variety of discharge constituents such as metals for two reasons. Firstly, although these ponds are designed to treat mine discharge and other runoff by settling and would be able to retain the water and associated solids during a 10-year, 24-hour storm, MDEQ SMCRA Regulations require all captured runoff be routed through sedimentation ponds for removal of TSS. Secondly, the data obtained from the overburden cores suggest that concentrations of runoff materials such as arsenic, cadmium, chromium, copper, lead, nickel, manganese, selenium, and zinc from disturbed and undisturbed areas would be insignificant.

No attempt would be made to artificially restock stream sections because of their ephemeral or intermittent nature. Natural restocking of plankton and invertebrate species would occur, and fish would move principally from downstream areas to occupy the postreclamation habitat. Following completion of mining, stocking of individual landowner’s reclamation ponds and lakes could be employed to maintain or enhance their fishery value. Although fish stocking depends on landowner goals and management philosophy, the most commonly stocked fish in Mississippi farm ponds are channel catfish, largemouth bass, bluegill, and redear sunfish. Ponds and lakes stocked with these species, and properly managed, would provide a stable fishery resource.

A study of existing streams and diverted streams at NACC’s Red Hills Mine showed that habitat quality, water quality, and biological communities were similar in natural and diverted streams (Vittor, 2008). RBAs were performed at four sites: one upstream of the mine study area in the natural headwater stream (R1 Headwaters), one downstream of the mine study area in the natural stream (Little Bywy), and two within portions of the diverted stream (Diversion 1 and 2). Water quality met minimum state standards at all but the Diversion 1 site, where DO was measured at 2.75 mg/L. Habitat scores ranged from 98 at Diversion 2 to 128 at Little Bywy. The habitat score at Diversion 1 and R1 Headwaters were the same (113). The habitat scores for streams on the Kemper County mine study area ranged from 56 to 115. Bioassessment scores at Red Hills ranged from 13 to 25. R1 Headwaters and Diversion 1 scores were 13, while the Diversion 2 and Little Bywy scores were 25 and 23, respectively. Bioassesssment scores at the Kemper County mine study area ranged from 17 to 27. These study results suggest that stream diversions proposed for the Kemper County mine study area (Liberty Fuels Mine) could maintain biological conditions similar to existing conditions during mine operation if the diversions are constructed and maintained in a fashion similar to that of the Red Hills Mine.

Impacts to the aquatic ecosystem within the mine study area would be limited to those authorized by the USACE 404 Permit. Mitigation for the authorized impacts would be required to result in no net loss of stream functional values provided by the existing dendritic intermittent and perennial stream system, including accounting for temporal losses. The USACE Mobile District Compensatory Stream Mitigation Standard Operating Procedures and Guidelines (USACE, 2009) would determine the type and magnitude of mitigation required, including creation of intermittent and perennial stream channels.

Linear Facilities

Operation of the linear facilities would not result in any permanent impacts on aquatic ecology.

4.2.8 FLOODPLAINS

Floodplains mapped by FEMA are limited to Okatibbee Creek in Kemper County. In Lauderdale County, mapping includes Chickasawhay, Tompeat, and Bales Creek floodplains as well. The FEMA Lauderdale County maps of 100-year floodplains generally correspond with the areal extent of the bottomland forest type wetlands mapped and described in Chapter 3. Qualitatively, these comparisons indicate Penders and Chickasawhay Creek riparian wetlands provide sizeable flood storage capacities in unmapped Kemper County, whereas Tompeat Creek, Bales Creek, and the intermittent tributary streams do not. The discussion of floodplain impacts in this section, combined with the descriptions of the proposed action in Chapter 2, the affected environment in Chapter 3, and alternatives to the proposed action in Section 2.7, satisfies the requirements regarding preparation of a floodplain assessment (see Subsection 7.1.6).

4.2.8.1 Construction

Power Plant

The portion of the power plant site that would be used for permanent facilities is wholly located outside of floodplains. Construction of the power plant would have no direct or indirect impacts on floodplains.

Surface Lignite Mine

All permanent facilities associated with the mine would be constructed at locations with elevations above the 100-year flood level. Several of the water management structures, however, would be located within mapped and estimated floodplain areas. There would be no critical action in the critical action floodplain as defined in 10 CFR 1022.4.

Construction of diversion channels 1A and 1B would disconnect the existing floodplain of Chickasawhay Creek. To mine through Chickasawhay Creek, the creek would be relocated into a channel that bypasses the existing valley and floodplain. The diversion channel would be constructed to contain the 100-year flood flow. Therefore, the floodplain of the Chickasawhay Creek would be completely contained within the diversion channel banks once its construction is completed.

The principal hydrologic effect attributable to the construction of diversion channel 1A would be removal of an unestimated volume of flood storage capacity in the Chickasawhay Creek basin. Because the diversion channel would be sized to convey the 100-year flood flow within its banks, floodwaters historically stored in bottomland forested riparian wetlands along Chickasawhay Creek within the mine study area would be conveyed downstream by the diversion channel into Okatibbee Lake. As discussed in Section 3.10, no flood studies of Chickasawhay Creek have been conducted; therefore, the volume of flood storage capacity reduction cannot be quantified at this time. Once mining operations commence, the control of drainage in mine block A and the attenuation capacity of sedimentation pond SP-10 would partially offset the reduction by reducing flood flows.

Linear Facilities

Construction of the linear facilities would not have any permanent impacts on floodplains of streams crossed. Temporary impacts would be limited to short-term stockpiling of excavated soils during construction, clearing of vegetation, and temporary crossings. All disturbed portions of floodplains would be returned to preconstruction grades and revegetated to prevent permanent or long-term impacts to crossed floodplains.

4.2.8.2 Operation

Power Plant

The operation of the power plant would have no impact on floodplains.

Surface Lignite Mine

During active mining of mine block A, the Chickasawhay Creek floodplain would be removed over the length of mine block A. Up to 450 acres of floodplain would be removed. The volume of flood storage provided by the existing floodplain has not been quantified. The 100-year flood flow of Chickasawhay Creek would be completely contained within the 41-acre diversion channel along the west edge of mine block A.

To prevent floodwaters from entering active mine block E during mining and reclamation, NACC's current conceptual plans include construction of a levee within the Okatibbee Creek floodplain. Construction of a levee at this location would require approval by USACE in a CWA Section 404 permit and MDEQ in a mine operation permit. During permit application review, USCAE or MDEQ could require relocation or redesign to avoid or minimize impacts. In addition, NACC might at some future date revise, alter, or amend the location and design based on further engineering studies. The following assessment of effects is based on the initial location proposed by NACC.

Figure 4.2-4 illustrates the initial location proposed by NACC. At this location, the proposed levee would reduce the floodplain width from approximately 3,000 ft to approximately 200 ft. The estimated cross-sectional area within the floodplain would decrease from 21,000 to 2,700 ft^2. The areal extent of the floodplain would decrease from approximately 1,509 to 885 acres.

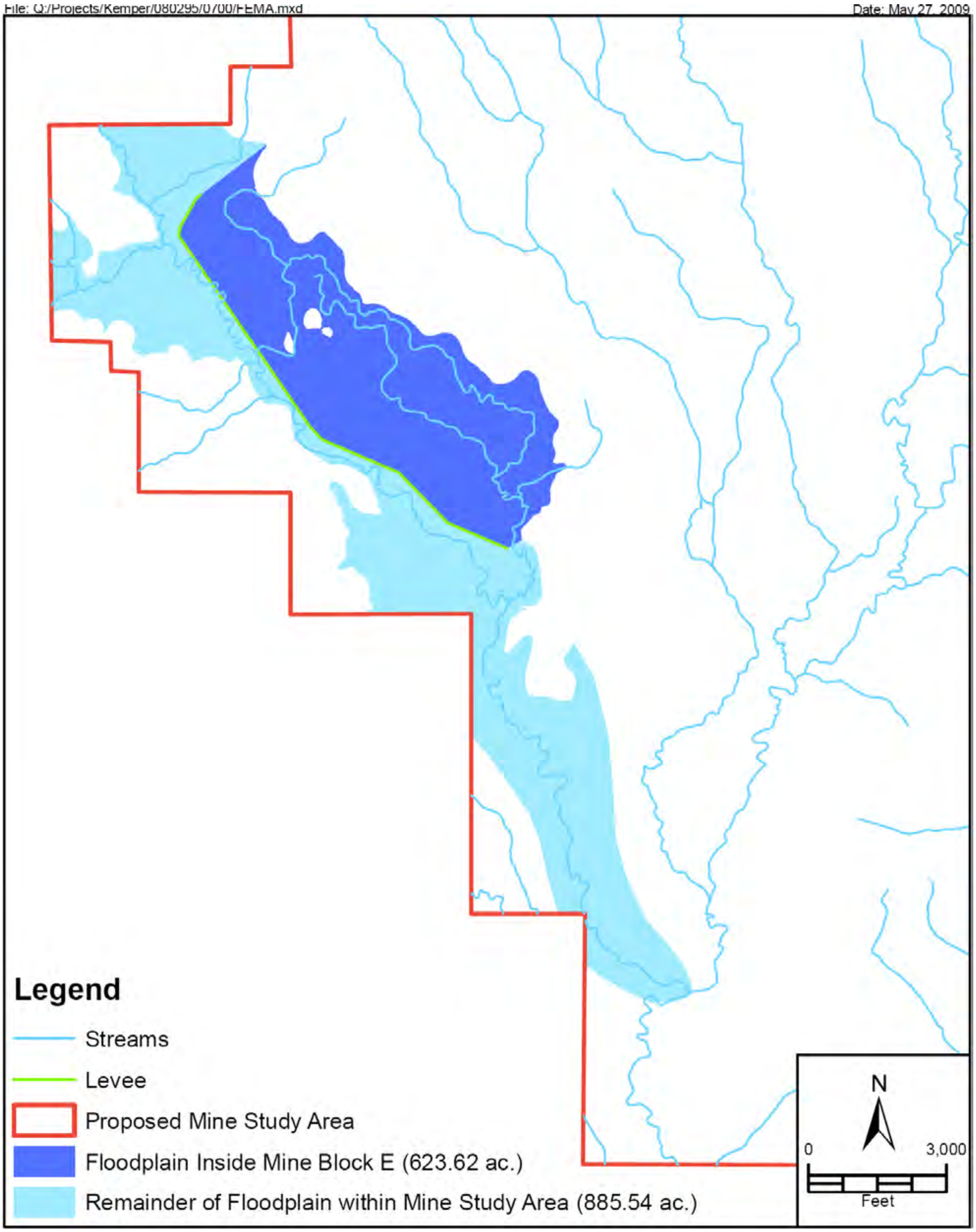


Figure 4.2-4. Impact of Mining Block E on Okatibbee Floodplain
Source: ECT, 2009.

Tetra Tech, a consultant to NACC, evaluated the effects of constructing a levee at this location using USACE's HEC RAS flood routing model. Tetra Tech reports flood elevations adjacent to and upstream of the proposed levee would rise approximately 1.5 ft in response to the 50-year or 100-year rain event. Flood flow velocities in Okatibbee Creek within the mine study area would increase by 0.5 ft per second.

Linear Facilities

Operations of transmission lines and pipelines would have no impacts on floodplains.

4.2.9 WETLANDS

This section addresses potential impacts to wetland resources located on the power plant site, surface lignite mine, and linear facilities (approximately 156 miles of surveyed corridors) associated with the project. Subsection 4.2.6.1 presented information on impacts to terrestrial ecology, including wetlands. The following focuses more specifically on wetland impacts. The discussion of wetlands impacts in this section, combined with the descriptions of the proposed action in Chapter 2, the affected environment in Chapter 3, and alternatives to the proposed action in Section 2.7, satisfies the requirements regarding preparation of a wetlands assessment (see Subsection 7.1.6).

4.2.9.1 Construction

Clearing of wetland vegetation and subsequent excavations associated with construction would expose soils to erosion by winds and stormwater. Increased stormwater runoff, erosion, and sedimentation into downstream wetlands and surface waters have the potential to accelerate eutrophication. Eutrophic waters exhibit an increase in turbidity, nutrient and bacterial levels, and oxygen demands, producing an environment that favors plant over animal life. Fugitive dust from clearing operations could affect wetland vegetation in the vicinity of the project site. Potential impacts resulting from fugitive dust and prevention techniques to control and limit potential erosion, sediment transport, and fugitive dust from the site are previously discussed in Subsection 4.2.6.1.

Power Plant

The power plant and associated onsite facilities' construction activities with the potential to impact wetlands include clearing and grading for the various power plant and mining facilities built on the plant site. The portion of the 1,646-acre site potentially impacted is shown in Figure 2.5-1. Construction activities associated with the power generating facilities as well as a portion of the lignite mine that would be located on the power plant site would impact approximately 133 acres of wetlands (30 percent of the total wetland acreage on the power plant site). Forested wetlands are second-growth wetlands, and all of the wetlands on the site have been impacted to varying degrees by historical uses of the property, primarily pine plantation and other agricultural activities. The remaining 312 acres (70 percent) of wetlands on the power plant site would not be impacted by construction. Table 4.2-27 lists specific wetland impacts.

Table 4.2-27. Specific Wetland Impacts—Power Plant Site

Wetland/Aquatic Resource Type	Total Wetland Acreage	Wetland Impact Acreage
Forested wetland (palustrine forested)	330.7	93.4
Herbaceous wetland (palustrine emergent)	35.5	11.8
Shrub wetland (scrub shrub)	76.1	27.6
Ditches	0.08	0.05
Ponds	2.1	0
Streams	0.28	0.03
Total	**444.7**	**132.9**

Source: ECT, 2009.

Construction of the project would avoid wetland impacts to the extent ble, and unavoidable impacts to wetlands would be minimized to the extent possible. Any unavoidable wetland impacts that could not be acceptably minimized would be mitigated per CWA Section 404 requirements. DOE may also consider additional mitigation as a condition of the record of decision (ROD). Details would be established as part of the Section 404 permitting process. Appendix P provides a preliminary wetland and stream mitigation plan that outlines possible mitigation concepts and options. Both DOE and USACE have conducted an initial review of this plan; however, neither agency has granted final approval, pending final review and response to comments.

Surface Lignite Mine

Assembly of the dragline and construction of the mine facilities would remove fewer than 25 acres of wetlands. Construction of sedimentation ponds SP-2, SP-3, SP-7, and SP-10 would impact up to 92 acres of wetlands.

Construction of the 1A diversion channel would indirectly impact up to 476 acres of wetlands through hydroperiod alteration. Removal of the Chickasawhay Creek inflow would eliminate periodic flooding and result in periodic dehydration.

As previously stated, wetlands would be avoided where practicable and mitigated where impacts are unavoidable. Only then would mitigation to offset impacts to wetlands be considered. During the application review process, USACE would review the proposed mine plan, as well as alternative mine plans, to ensure all appropriate and practicable steps have been taken to minimize potential adverse impacts on the aquatic ecosystem.

Once the minimization review is complete, the mitigation requirements would be established by USACE, both in terms of type and magnitude. If issued, the CWA 404 permit would require that all wetland functional losses, including temporal losses, be offset through the mitigation in accordance with USACE and EPA regulations. Mitigation type would be established by USACE, and magnitude would be established using the quantitative WRAP method (see Appendix P).

Linear Facilities

Construction practices in wetlands would retain the vegetative root mat in the rights-of-way in areas not filled for road or structure pad construction or pipeline trench excavation, thereby minimizing impacts to wetlands. Impacts to wetlands would vary depending on the wetland system through which the transmission line or the pipeline was routed. The shift in wetland composition would vary with the type of original overstory and soil alterations resulting from construction activities. Outside areas where filling might be necessary for roads or structure pads or laying of the pipeline, small freshwater marsh/wet prairie systems intersected by the transmission lines and pipelines could potentially be avoided as a matter of design choices. If so, clearing would be required in those areas, and proper culverting would maintain the existing hydroperiod. In forested wetland areas, restrictive clearing processes could be used. Restrictive clearing would require that all cutting be done by hand, usually with chain saws, or by low ground-pressure shearing machines to reduce disturbance to the ground cover. Table 4.2-28 lists worst-case potential wetland impacts and acreage associated with linear facilities. Wetlands are identified in Table 4.2-28 as forested wetland (palustrine forested), herbaceous wetland (palustrine emergent), and shrub wetland (scrub-shrub). Similar to the power plant site, wetlands intersected by the linear facility corridors have been impacted to varying degrees by past uses, primarily pine plantation. Jurisdictional *other waters* resources are identified as ditches, ponds, and natural drains: seasonal, intermittent, and perennial streams (riverine). As discussed previously in Subsection 4.2.6.1, the acreages of wetland impacts have been conservatively estimated to provide an upper bound. Actual impacts to wetlands would likely be less. Possible means to reduce impacts are discussed in the next subsections.

Table 4.2-28. Specific Wetland Impacts—Linear Facilities

Land Use	Total Impacted Acreage of All Linear Features	Impacted Acreage Along New Transmission Lines*	Impacted Acreage Along CO_2 Pipeline*	Impacted Acreage Along Natural Gas Pipeline Only*	Existing Transmission Lines to be Reconductored
Forested wetland (palustrine forested)	246.81	93.98	145.48	6.06	1.29
Herbaceous wetland (palustrine emergent)	99.89	23.52	45.65	0.23	30.49
Shrub wetland (scrub-shrub)	46.95	23.92	18.22	0.26	4.55
Ditches	3.94	2.26	0	0.05	1.62
Ponds	12.56	7.05	4.61	0	0.90
Natural drainages (riverine)-seasonal, intermittent, and perennial streams	41.40	28.73	3.21	0.32	9.14
Totals	**451.55**	**179.46**	**217.17**	**6.92**	**47.99**

*Maximum predicted impacts due to the necessity of clearing vegetation within a 100-ft-wide right-of-way for transmission lines and 50-ft rights-of-way for the natural gas and CO_2 pipelines. This would result in conversion of forested uplands and wetlands to shrub- or herb-dominated communities. The only permanent impact would be due to any structures or necessary access road construction through or in wetlands or over streams in the transmission line right-of-way.

Source: ECT, 2009.

Pipelines—In wetlands or sensitive areas within the right-of-way, the top soil would be stockpiled and replaced after the pipe is entrenched. Storing that side cast material for short periods would minimize impacts to the soils. BMPs would be employed during construction, including the use of hay bales and/or silt screens, to prevent or control and contain possible sedimentation and erosion. If necessary, clearing within wetlands and buffers could be accomplished using only chain saws or brush axes.

At the crossings of highways and major streams, pipe could be laid by bore and jack. The effluent from dewatering of jacking and receiving pits could be pumped to a dewatering basin or portable sediment tanks. At stream crossings and other flooded areas, two types of sandbag/stone flow diversions could be used to isolate the work areas from streams and wetland areas. Sediment-laden water could then be pumped from the construction site into a dewatering basin to allow for filtration before re-entering the waterway. The excavated material could then be stockpiled inside of the sandbag area. Silt fences could also be used as required to prevent any discharge of sediment into the stream or adjacent wetlands.

When construction activities would take place within a stream channel, such as culvert construction or replacement, a flow diversion pipe could be installed. The water within the sandbag/stone diversion area could be pumped instead of providing a diversion pipe. However, pumping would only be acceptable if the diversion was only in place for a single workday or the pump was supervised during off-work hours.

Some steams crossings would require the installation of an in-stream stone dike to be used as a sediment-filtering device for streams that generally carry wet weather flow. Alternatively, a temporary swale might be constructed to divert and filter runoff from disturbed areas.

The sandbag/stone diversions proposed to isolate work areas from streams could be used unless the site conditions require other measures, such as coffer dams, sheeting, or manufactured dams. No standard construction specifications exist for the referenced dams since these devices are extremely variable in design and could be specifically manufactured based on site-specific conditions. Straw bale dikes could be used along the edges of some wetland areas located close to construction areas to prevent erosion or sedimentation damage.

Transmission Lines—Impacts to wetlands could be minimized where the transmission line could be designed to span sensitive areas by locating structure pads outside of wetlands. Where wetlands cannot be avoided, the construction of the transmission lines could involve installation of culverts and placement of fill resulting in temporary increases in turbidity and silt deposition. Such impacts would be local. Appropriate control measures such as staked hay bales and silt curtains would minimize sedimentation. Construction of transmission lines and access roads (where necessary) in wetland areas would use methods such as proper culverting and erosion control as necessary to minimize any significant disruption to the aquatic ecosystem.

The proposed transmission line corridors cross the following streams: Wild Horse, Baker, Lost Horse, Ponta, Toomsuba, Blackwater, Rogers, Okatibbee, Nanabe, Hognose, Sawashee, Coats, and Graham Mill Creeks and White, McLeemore, and Curtis Branches. No transmission structures would likely be placed within these water bodies, because all are narrow enough to be spanned by the proposed transmission lines. New transmission lines would also cross some wetland areas. Some of these wetlands have been previously impacted by existing transmission lines, gas pipelines, and agriculture (particularly pine cultivation). Impacts to these wetlands could be minimized to the extent practicable by locating construction activities in areas of existing cleared right-of-way, using existing access roads where available, or by locating new right-of-way immediately adjacent to existing clearing so only supplemental clearing is needed. Where available, existing roads and access ways could be used to limit the need for construction of new roads. For example, some structure pads could potentially be located and constructed to allow access to the structure from an existing road, thus minimizing the need for new and additional roadway impacts.

Water quality along and adjacent to the construction site would be preserved by the implementation of BMPs to control the quantity and quality of runoff from the construction site. Prior to construction near or in wetlands/surface waters, silt fences and/or hay bales would be placed landward of the wetland or stream boundary. Hand removal of trees in wetlands or on stream banks would decrease the potential for erosion/siltation that could result from machinery. Where use of machinery is required, low ground pressure equipment could be employed. This would minimize substrate disturbance and reduce the potential for sedimentation/erosion into wetlands or streams.

To the extent possible, native wetland vegetation would be left in place to reduce erosion. However, some vegetation would be disturbed by the construction of the transmission lines. The impacts of land clearing could be reduced in forested wetlands by leaving the root mat of most trees in place. Upon completion of construction, disturbed areas of steep slopes would be seeded and mulched to control erosion. Native vegetation would gradually recolonize the disturbed areas.

The construction of the transmission lines would not require ground water withdrawal, dewatering, or relocation of any water bodies.

4.2.9.2 Operation

Impacts to wetland ecological resources associated with the project operation would result from potential air impacts on vegetation and wildlife and the noise levels originating from operation of the power plant site and surface mine. The audible noise associated with transmission lines would be expected to be less than the ambient outdoor noise levels. An evaluation of potential and expected impacts on wetland vegetation and wildlife components resulting from operation of the project is presented in the following paragraphs.

Power Plant

Operational impacts on wetland vegetation would be similar to those discussed in Subsection 4.2.6.2.

Surface Lignite Mine

A total of 5,994 acres of wetlands were identified within the 31,260-acre mine study area; of this total, approximately 2,374 acres are within the approximately 13,000-acre area proposed to be disturbed by mining and mining-related activities (including buffer zones around the immediate mining perimeter, ponds, and diversions) (Table 4.2-29).

Table 4.2-29. Proposed Wetlands Impacts—Surface Lignite Mine

Combined Category	Vegetation/Land Use Categories Included	Proposed Acreage Impacts	Percent of Existing
Forested wetlands	BF, H, HP, PH, PP	1,856	39
Shrub wetlands	S	181	62
Herbaceous wetlands	C, F, G, R, R/C	237	41
Total Wetlands		**2,374**	**41**

Source: NACC, 2009.

Impacts to wetlands due to mining would be limited to those authorized by the USACE 404 Permit. Avoidance, minimization, and mitigation requirements and procedures to be implemented by USACE during review of the CWA 404 permit application would be identical to those described in Subsection 4.2.9.1. See Appendix P, which provides a preliminary wetland and stream mitigation plan outlining possible mitigation concepts and options.

Linear Facilities

Wetland vegetation in the rights-of-way would be managed by a variety of methods, including trimming of all vegetation to the height that is compatible with the safe access, operation, and maintenance of the linear facilities. The exact manner in which maintenance would be performed would depend on the location, type of terrain, and surrounding environment. Wetland vegetation removal would be minimized consistent with safe and reliable operation of the transmission lines and pipelines. For example, fast-growing vegetation species and other vegetation whose mature height could interfere with the safe operation of the linear facilities would be cut or removed. Other species would generally be allowed to remain, resulting in shrub and herbaceous wetlands within the right-of-way. This would encourage a broad diversity of vegetation growth to remain on the right-of-way, which would enhance wildlife use potential.

Growth regulators and herbicides would be selectively used for vegetation control. Due to the selective nature of vegetation cutting, the prescriptive use of growth regulators and herbicides, and the infrequent occurrence of maintenance activities, the potential effects on wetlands should be reduced.

4.2.10 LAND USE

The current land uses of the power plant, surface lignite mine, linear facilities, and substations were described in Section 3.12. The majority of the properties are nonurban and forested. Existing development is limited to residences, churches, and commercial uses located on the proposed mine study area.

4.2.10.1 Construction

The proposed project would involve the construction and operation of an electrical generation facility, a surface lignite mine, transmission lines, pipelines, and three substations. Construction of the power plant would result in permanent land use change. Mining activities would result in both permanent and temporary land use changes based on the reclamation approved by the landowners and applicable regulatory agencies. The impacts from constructing new transmission lines and burying of the pipelines would be primarily temporary, although the conversion of permanent rights-of-way would be long-term. There would be permanent land use changes associated with development of the substations and access roads associated with the transmission lines.

Power Plant

Construction activities of the power plant would not displace any residences or businesses. The principal land use conversion would be from forests (approximately two-thirds of the site) to power plant and associated facilities. The impacted portions of the site would be converted to electrical power generating and related uses (including the mining-related facilities onsite), precluding other uses of the site for the life of the facilities, with the rest to remain in existing vegetation, providing screening and buffering. Even if all the upland forested portions of the power plant site were harvested and converted to power plant uses, the sale of the timber would have a negligible effect on the local timber supply and the timber market.

Surface Lignite Mine

All mining activities would be subject to reclamation. A landowner would have the option to sell or lease their property or opt not to be part of the mine. The landowner might or might not opt to rebuild after reclamation was complete. NACC, the landowner, and MDEQ and USACE regulations would determine the vegetative cover that would be present after mining and reclamation were complete.

Construction of mine support facilities (see Subsection 2.2.1 and Figure 2.1-5, for example), including a shop and warehouse building, an office and change house building, parking areas, bucket shed, fuel storage area, vehicle ready line, wash pad, and dragline erection site, would disturb approximately 320 acres. These facilities would be located on the 1,650-acre power plant site. Change to industrial land use for construction of these buildings and facilities could be long-term (i.e., in excess of 50 years), thereby precluding any use for other purposes.

The construction impacts of the mine are identified as the mine support facilities to be built on the power plant site and premining construction of various sedimentation ponds. The actual mining of the lignite is analyzed as an operational impact.

Linear Facilities

Clearing activities would be conducted during construction of the linear facilities. After construction, there would be no trees within the transmission corridors and within an approximately 50-ft-wide area over and adjacent to the buried pipelines. Except for any access roads beneath the transmission lines and at the pad locations, the linear facilities would be vegetated with naturally recruited ground cover and shrubs.

The three substation sites (or at least portions thereof) would be converted from the existing land uses. There might be some landscaping vegetation provided.

4.2.10.2 Operation

Power Plant

It is anticipated that the direct impacts related to construction would continue through the life of the power plant. The laydown area could continue to be used for overflow parking during planned outages. Some of the forested vegetation, including planted pines, would remain in place to maintain a screening and buffering function.

It is not anticipated that commercial or industrial development would occur in the project vicinity. Nearby development has not occurred in the vicinity of the RHPP or the TVA Kemper plant. Similarly, it is anticipated that any permanent relocations to the area would occur in established municipalities such as Meridian, Philadelphia, or DeKalb.

Surface Lignite Mine

Proposed mining activities would eventually affect land use on up to approximately 12,275 acres (Figure 2.2-3). This includes up to 11,250 acres that would be disturbed over a 40-year period by the excavation and removal of lignite.

Various water control structures (i.e., sedimentation ponds) would be constructed over the life of the proposed mine. As discussed in Chapter 2 (e.g., Subsection 2.4.2), some of these ponds would be constructed within the area to be mined prior to mining and would be removed with advancing mining and reclamation activities, while other ponds would be constructed outside the area to be mined. Although all ponds would be designed as *temporary* (i.e., to be removed as part of the reclamation process), some might be left in place, depending on the owner(s) of the surface rights.

At an approximate rate of 195 to 375 acres per year (see Table 2.4-2), the existing land would be converted to reclaimed land forms that would be revegetated and redeveloped in accordance with agreements with each landowner and MDEQ and USACE regulations and permits. Areas being mined would be precluded from any other land use from the initiation of land clearing activities until the reclamation activities were deemed complete and the land was released (typically 8 to 9 years). At that time, the individual properties could be returned to the control of the landowner.

The predominant land use within the area to be mined is forestry, with approximately 1,073 acres of recent clear-cuts. Actual operation of the mine would change current land uses within the up to 10,285 acres from which lignite would be removed. For each individual land tract, the postmining land use would be determined by the premining land use(s), surface owner wishes, and MDEQ and USACE regulations and permits. Based on a survey of landowners within the area proposed to be impacted by mining activities during the first 5 years of operation, most of the project area is anticipated to be reclaimed to forest, which in most cases corresponds to the premining use.

Linear Facilities

The transmission line corridors and at least a portion of the buried pipeline corridors would be maintained in low vegetation. The construction and operation of the linear facilities (156 miles) would result in the permanent loss of approximately 1,900 acres of upland forests, of which 790 acres are planted pine. The loss of the planted pine acreage is only approximately 0.2 percent of the total acreage of commercial forest acreage in Kemper County. There would be a permanent loss of vegetation beneath the access roads associated with the transmission corridors and the pads for the poles.

The construction impacts from development of the substations would continue through the operational life of the substations. It is anticipated that the substation sites would be mostly impervious.

4.2.11 SOCIAL AND ECONOMIC RESOURCES

4.2.11.1 Construction

Construction impacts to social and economic resources are discussed for the power plant and for the surface lignite mine. Employment for the construction of the transmission corridors/lines, pipelines, and substations would be minor in comparison.

Power Plant Employment

Employment during construction of the generation facility is estimated to average 500 workers, with an estimated peak of 1,150 workers. The peak employment would be expected to be maintained for 3 months of the approximately 42-month construction schedule (see Figure 2.3-1). Mississippi Power project managers would expect that approximately 15 percent of the workers would commute from their current residences in the local area. Except for certain specialized needs, all of the construction workers could be recruited from the east Mississippi/west Alabama area within an approximate 65-mile radius of Meridian.

As of 2006, 2,308 employees of Kemper County’s entire employed labor force worked outside Kemper County, and these employees had an average commute time of 31.1 minutes (MDA, 2008). The corresponding numbers in Lauderdale County are 2,583 employees of the entire employed labor force of 31,670, with an average commute time of 17.9 minutes, and in Neshoba County are 2,901 (2000 count), with an average commute time of 20 minutes. The combined unemployment in 2006 of Kemper, Neshoba, and Lauderdale Counties was 3,364. According to a labor availability report prepared by the Pathfinders (January 2008), there are 12,700 unemployed persons actively seeking work within a 65-mile radius of Meridian. Given a 42-month construction period with varying numbers and types of workers required, it is reasonable to assume that potential workers would increase and, in fewer cases decrease, commute times to maintain their existing housing. A housing profile conducted by Alpha Resources (December 17, 2007) reviewed housing opportunities in the east-central Mississippi area and concluded that a large percentage of the estimated number of average workers could be accommodated in the area, particularly in Philadelphia and Meridian. The housing profile identified rental units, recreational vehicle (RV) parks, and hotel rooms in the area. The housing profile noted that workers do not generally gravitate to a residence camp environment.

The supposition that commute times to maintain existing housing or to seek housing in nearby metropolitan areas is borne out by the experience during construction of the RHPP. As with the proposed project and construction projects in general, workers with expenses such as temporary housing would be allowed a per diem. Per diem is a primary tool used to attract and maintain workers. Per diem is an allowance provided to craft workers from outside the local area and can be used to offset travel and living expenses. The per diem amount for each project is based on market conditions at the time of the project. On past projects located in rural areas of the southeast where per diem has been used, workers have been successful in locating temporary housing, and local people have also been successful in meeting temporary housing needs to earn extra money. On some projects, added incentives such as completion incentives or safety incentives might be offered to maintain craft workers at the project. The need for these added incentives are evaluated on a project-by-project basis.

Surface Lignite Mine Employment

During mine construction and development, average monthly employment is estimated to be 88 workers over an approximate 31-month period. Peak employment is estimated to be 155 workers for approximately 5 months. The impacts of these workers would depend on the timing of peak employment relative to the peak employment of the generation facility construction. The following subsection addresses the combined impacts of construction of the power plant and the mine development.

Combined Impacts of Power Plant and Lignite Mine

Employment and Employment-Related Economic Impacts

The greatest potential for impacts would be the result of the peak employment for the construction of the generation facility overlapping with that of development of the mine for a total construction work force of 1,305 for 3 months. For comparison purposes, the estimated peak employment at the Red Hills power plant and mine was estimated to be 1,700 workers for a 3-month period. Because of the temporary nature of construction employment, the normal commuting range for construction workers is often considerably larger than that for permanent positions. As previously noted, an area with a radius of 65 miles centered around Meridian has 12,700 unemployed persons actively seeking work. As happened at the Red Hills project, up to one-half of the workers could move within commuting range of the project to available temporary housing opportunities. The other workers would already be located in the local area encompassing all of the adjacent counties. In the specific instance, that would be expected to occur in the area to the west (Philadelphia area) and to the south (Meridian area).

Total payroll during construction would be expected to be $130 million for the generation facility and $15 million for development of the mine. Total construction expenditures for the generation plant are estimated to be $1.6 billion with $225 million to be spent in the local area. The corresponding amounts for the mine are total estimated construction expenditures of $54 million with most of the monies to be spent in the local area.

The U.S. Bureau of Economic Analysis developed the Regional Industrial Multiplier System (RIMS) for estimating regional input-output multipliers. RIMS II is the most recent model used to estimate the regional impacts on the initial changes in output, earnings, or employment associated with a specific project for any industry or group of industries. To incorporate the Red Hills project, a region encompassing Choctaw, Winston, Kemper, Lauderdale, Clarke, and Jasper Counties was created to determine the specific multipliers for the utilities and mining industries. The utilities industry includes power generation and mining excludes oil and gas extraction. Table 4.2-30 provides the direct-effect multipliers for the power plant construction and development of the surface lignite mine.

Table 4.2-30. Direct-Effect Multipliers—Construction

Construction Employment	Average	Direct-Effect Multiplier	Total Employment	Earnings (Payroll, $ Millions)	Direct-Effect Multiplier	Total Earnings ($ Millions)
Power plant	500	1.3191	659	$130	1.5503	$201.54
Surface lignite mine	88	1.3	114	$26.25	1.3961	$36.65

Source: U.S. Bureau of Economic Analysis, RIMS II Multiplier, 2006.

The construction employment and direct-effect multipliers would temporarily increase local government revenues through sales tax proceeds associated with worker spending, sales tax proceeds associated with equipment and materials procurement locally, and ad valorem taxes for workers purchasing residential property. RIMS II estimated that the impact to the region from construction of the power plant would be an additional $71.54 million and 159 jobs. The corresponding numbers for the development of the surface lignite mine would be an additional $10.4 million and 26 jobs.

Population and Housing

The previous section provided estimates of the number of workers for construction of the generation facility and development of the mine. It is estimated that up to 10 percent of the average construction employment could be supervisors and managers. Most of these employees would likely be relocations to the area. In addition, up to 50 of the mine construction workers would remain during the operational phase of the mine. Again, based on the experience of similar projects, the majority of the remaining employees would commute up to 1 hour from the project site and would use existing temporary housing opportunities. Based on both the availability of unemployed and underemployed workers in the surrounding area and accommodations in the area, a significant influx of new residents would not be expected. For purposes of impact assessment, it is estimated that 85 percent of the average combined work force would move to the area. Supervisors and managers and approximately 50 of the mine workers would bring families. Given these assumptions and the average of the Kemper, Lauderdale, and Neshoba Counties' persons-per-household count of 2.54, Kemper County and the adjacent counties would experience a relocated population increase of 1,310 at peak employment, or approximately 1.1 percent of the combined 2006 population of Kemper, Lauderdale, and Neshoba Counties. Table 4.2-31 summarizes the estimate of population increase. All of the children have been assumed to be of school age.

Table 4.2-31. Construction Worker Population Increase

Construction Area	Average Construction Employment	Average From Outside Area	Peak Construction Employment	Peak From Outside Area	Percent Supervisors or Managers	Additional Household Population	Total Relocated Population Average Construction Employment	Total Relocated Population Peak Construction Employment
Power plant	500	425	1,150	978	10*	77	502	1,055
Surface lignite mine	88	75	155	132	10*	90†	165	255
Total	588	500	1,305	1,110		167	667	1,310

*Percent of average number of employment.
†Includes supervisors, managers, and 50 employees transitioning to operational phase.

Source: ECT, 2009.

The largest increase would be expected in Lauderdale County (Meridian area), with the next largest increase expected in Neshoba County (Philadelphia area). According to the 2000 U.S. Census, there were 3,428 vacant housing units; 228 seasonal, recreational, or occasional use units; and a rental vacancy rate of 10.2 percent in Lauderdale County. The corresponding numbers for Neshoba County are 1,286 vacant housing units; 198 seasonal, recreational, or occasional use units; and a rental vacancy rate of 9.1 percent. In addition, the housing profile study conducted by Alpha Resources identified more than 1,700 hotel rooms in a 40-mile radius of DeKalb and more than 176 RV spaces in six RV parks in DeKalb or Philadelphia. Given the availability of vacant housing units, units available for occasional use, rental housing availability, hotel rooms, and RV parks, any shortfall in housing availability should be minor and can be mitigated through a proactive and aggressive housing identification program.

Schools

The estimated increase in the number of school-aged children during the 42-month construction/development schedule is 167. The majority of the increase in school-age population would be expected to occur in Lauderdale County, where there are nine schools, with the next largest increase to occur in Neshoba County, with six schools. Comparison of this estimated increase with the available capacity in the surrounding area indicates that the existing schools would have the capacity to absorb the projected increases.

Health Facilities

Between the four hospitals identified in Subsection 3.13.5.5, there are 697 licensed beds and four emergency treatment centers. Three of the hospitals with a total of 615 licensed beds are located in Meridian, and the fourth nearby hospital is located in Philadelphia (82 licensed beds). Expected population-based impacts on medical facilities and services from construction/development activities would be minimal since the estimated increase in population would only be 1.1 percent of the existing population. Both the mine and power plant would place priority on worker safety and training programs. It is anticipated that the four nearby emergency room-equipped hospitals would be capable of meeting the emergency medical service needs that might arise during construction/development. In the event of a catastrophic event, communication between emergency service personnel and first responders would direct patients to available treatment facilities, where, if necessary, additional beds, gurneys, and/or staff could be added.

Law Enforcement

The estimated increase in population from construction of the power plant and development of the mine would likely increase the demand for law enforcement. It is expected that the increased demand would be greatest in Meridian/Lauderdale County and Philadelphia/Neshoba County. Since the estimated population increase would represent only 1.1 percent of the existing population, there would be no *boomtown* impact where the increase in population overwhelmed the existing population. It is not expected that there would be any measurable change in the incidence of crime.

Linear Facilities

As previously mentioned, construction of the pipelines and transmission lines would not be expected to result in an increase in employment. These activities are generally conducted by subcontractors already working in the general area. These employees would not be expected to relocate to the project area.

4.2.11.2 Operation

Operation impacts to social and economic resources are discussed for the power plant and for the surface lignite mine.

Power Plant and Surface Lignite Mine Employment

Employment during operation of the power plant would be 105 fulltime employees during commissioning and demonstration (initial 6 years) and approximately 90 employees through the remaining life of the plant. It is anticipated that most of the employees would be hired from the local area (i.e., a 65-mile radius of Meridian). It is also anticipated that relocations would occur within or near the existing municipalities in Lauderdale, Neshoba, and Kemper Counties.

Employment during operation of the mine would total an estimated 189 to 213 employees, some of whom might be part-time. This employment level would continue throughout the life of the mine. As with the power plant, the employees would be hired from a 65-mile radius area around Meridian, and the permanent relocations would likely be in or around the existing municipalities.

Combined Impacts of Power Plant and Surface Lignite Mine

Employment and Employment-Related Economic Impacts

The combined employment of the power plant and surface lignite mine would be 318 (using the upper estimate for mine employment) for the first 6 years and 303 thereafter. The operational employees would likely be hired from or would relocate to municipalities located in Kemper, Lauderdale, and Neshoba Counties. Total operational payroll for the power plant would be an estimated $10 million per year for the first 6 years, decreasing to approximately $7.75 million (2009 dollars) per year for the remainder of the plant life. The operational payroll for the surface lignite mine would be an estimated $15 million per year.

Using the RIMS II input-output multipliers as described in Subsection 4.2.11.1, Table 4.2-32 provides the direct-effect multipliers for the operation of the power plant broken down into the commissioning and demonstration stage and thereafter and for the surface lignite mine.

Table 4.2-32. Direct-Effect Multipliers—Operation

Operation Area	Operational Employment	Direct-Effect Multiplier	Total Employment	Earnings (Payroll, $ Millions)	Direct-Effect Multiplier	Total Earnings ($ Millions)
Power plant first 6 years	105	1.3191	139	$10	1.5503	$15.5
Power plant after first 6 years	90	1.3191	119	$7.75	1.5503	$12.01
Surface lignite mine	213	1.3	276	$15	1.3961	$20.94

Source: U.S. Bureau of Economic Analysis, RIMS II Multiplier, 2006.

The employment and payroll direct-effect multipliers would increase local government revenues through property taxes for the improvements and increased value of the power plant and surface lignite mine properties, sales tax proceeds associated with plant and mine purchases of equipment and materials locally, and sales tax proceeds associated with worker spending. RIMS II estimates that the impact to the region from operation of the power plant for the first 6 years would be an additional $5.5 million and 34 jobs and for the remainder of the life of the power plant to be an additional $4.26 million and 29 jobs. The corresponding numbers for operation of the surface lignite mine would be an additional $5.94 million and 63 jobs.

Population and Housing

It is anticipated that the majority of the workforce would be provided from the local labor pool encompassing east-central Mississippi. The maximum operational employment of 318 workers would represent only 0.3 percent of the combined 2006 populations of Kemper, Lauderdale, and Neshoba Counties. Even if 50 percent of the operational employment, which is much higher than would be expected, relocated to the project area and established households, the increase in population, using 2.54 persons per household (average of the three counties), would result in a population increase of 404 persons, or only 0.4 percent of the combined populations. The 159 new households could be more than accommodated by the 6,305 (year 2000) vacant homes in the three-county area and/or available rental housing.

Schools

Using the relocation scenario of 50 percent of the highest operational employment (159 employees) and the averaged person-per-household multiplier and assuming that all children are of school age, there would be 245 additional students. The anticipated distribution would be 171 students in Lauderdale County, 61 students in Neshoba County, and 13 students in Kemper County. The increase in the number of students would represent an increase in school population of 2.6, 1.5, and 0.9 percent for Lauderdale, Neshoba, and Kemper Counties, respectively. These small potential increases in school population should be easily accommodated through the existing school facilities within each of the three counties.

Health Facilities

The maximum population increase through relocations to the project area would represent an increase of only 0.4 percent to the existing population of Lauderdale, Neshoba, and Kemper Counties. As during construction, both the power plant and mine would place priority on worker safety and training programs. The four area hospitals with 697 licensed beds and four emergency treatment centers would be more than adequate to meet the medical and health-related needs of the operational workforce and new residents.

Law Enforcement

The operational employment (within the first 6 years) with permanent relocations and the establishment of up to 162 new households would be far less of an impact to law enforcement personnel than impacts associated with construction. It is not expected that operation of the power plant and mine would require an increase in law enforcement positions. This expectation is further strengthened by the anticipation that the vast majority of relocations would be to the established municipalities as opposed to the rural areas.

Water Supplies

The discussion in Subsection 3.13.5.2 indicated that the city of Meridian has excess water treatment capacity of approximately 7 MGD. The certified utility providing service to the power plant site and mine study area has excess capacity of more than 4 MGD. The city of Philadelphia has excess capacity of approximately 1.8 MGD. Table 4.2-33 provides an estimate of the potable water needs from the area utilities.

There would be sufficient water treatment capacity to provide potable water to the power plant site and mine study area, if needed, and to the maximum projected population increase in the area.

Table 4.2-33. Potable Water Demand

Area Utilities	Employees/ Population	Per Capita Demand (gpd)	Potable Water Demand (gpd)	Excess Capacity (MGD)
Power plant and mine	323/411	100	32,300/41,100	4
Meridian	226/288	200	45,200/57,600	7
Northwest Kemper	16/20	200	3,200/4,000	4
Philadelphia	81/103	200	16,200/20,600	1.8

Source: ECT, 2009.

Wastewater Treatment

The information presented in Subsection 3.13.5.2 indicates there are no municipal wastewater treatment plants in Kemper County. It is anticipated that septic tank systems would be used to dispose and treat wastewater generated by the power plant. The mine operation would employ a package waste treatment plant. The total domestic wastewater generation, based on a per capita rate of 15 gpd, would be 4,770 gpd during the first 6 years, decreasing to approximately 4,545 gpd for the remainder of the life of the power plant and mine.

The city of Meridian has an estimated wastewater treatment excess capacity of 3.8 MGD (on average) at its wastewater treatment plant. The WWTP operated by the city of Philadelphia has an estimated

Table 4.2-34. Wastewater Generation

Area Utilities	Employees/ Population	Per Capita Generation (gpd)	Wastewater Generation (gpd)	Excess Capacity (MGD)
Power plant and mine	323/411	15	4,845/6,165	*
Meridian	226/288	250	56,500/72,000	3.8
Northwest Kemper	16/20	250	4,000/5,000	*
Philadelphia	81/103	250	20,250/25,750	0.85

*No municipal wastewater treatment facilities.

Source: ECT, 2009.

excess capacity of 0.85 MGD. Table 4.2-34 provides an estimate of wastewater generation. There would be cient capacity in the cities of Meridian and Philadelphia to accommodate the maximum projected population increase in these cities.

Linear Facilities

There would be only a minor increase in employment, if any, for maintenance of the transmission lines, pipelines, and substations.

4.2.11.3 Forestry Resources

The economic impact of the project on forestry resources was determined by assigning a value of $1,800 per acre for southern pine and $1,900 per acre for hardwoods.

Construction

Construction impacts with regard to forestry resources means the permanent loss of these resources. The land clearing for the power plant and its associated facilities on the power plant site, construction of the transmission lines and pipelines, and development of the substations would result in the permanent conversion of any marketable timber. The only construction impacts attributable to the mine are the mining facilities to be built on the power plant site. All other mining activities are intended to be temporary and would be reclaimed.

Power Plant

The estimated maximum value of the loss of timber on the power plant site is $121,295. This value is derived from the loss of all of the upland forest. The actual construction is intended to leave a perimeter buffer of trees.

Linear Facilities

As previously noted, approximately 1,900 acres of upland forests would be removed to develop the linear corridors. The estimated current value of the timber is $3,539,315.

Operation

Operational impacts to forestry resources would occur only as a result of mining and mining activities. To determine the economic impact of mining operations on forestry resources, the net present value of timber resources in the area to be impacted by mining activities was determined over the next 40 years on both with and without mine bases. The 40-year life-of-mine time frame forest economic models were based on a 25-year harvest rotation for southern pine and 40-year rotation for marketable hardwood species. Simulated forest growth and harvest economics associated with mining activities over a 40-year planning horizon employed the following assumptions/criteria:

- The study area would coincide with the 31,000-acre project area; timberlands outside the study area were assumed to be unaffected by the mine.
- Only those areas currently in timber, including cut-over land, would be reclaimed to forest after mining. Areas not in timber were assumed to be reclaimed to other (nonforestry) uses.

- In analyses both with and without the mine, timber stands were harvested as mature stands on an annual basis.
- All land reclaimed to forest would be planted with southern pine or marketable hardwood species.
- In accordance with mine reclamation timetables, annual tree planting activities would lag 3 years following mining operations.
- Postmining soil productivity (i.e., forestry site index) would be the same as the premining (original) productivity.
- Timber prices based on the current (2008) market were applied to the analysis. Timber prices and inflation were assumed to remain stable.

Using these assumptions, a simulation was performed to determine the economic effect of the mine operation with respect to onsite timber resources. The model accounted for annual timber harvests according to the mine plan. Growth on reclaimed land was simulated for 25-year rotations for southern pine and 40 years for marketable hardwood stands to calculate net present value. All income from timber sales was expressed in 2008 dollars.

Timber currently on the proposed pond sites is estimated to be worth approximately $1,100,000 (based on 243 acres at $1,800 per acre for southern pine, and 365 acres at $1,900 per acre for hardwoods). Assuming ponds would be reclaimed, timber value within the former pond sites would appreciate slightly to approximately $1,300,000 (based on 243 acres at $2,100 per acre for southern pine and 365 acres at $2,100 per acre for hardwoods) upon reaching maturity.

Based on the forestry growth and harvest simulation, the current value of timber in the study area is estimated to be $1,800 per acre for southern pine, and $1,900 per acre for hardwoods. Without the mine (that is, if the mine were not in place), the net value of timber would be $7,100,000 for southern pine and $11,300,000 for marketable hardwoods.

With the mine, the simulation predicted that the net present value of timber for southern pine would be approximately $1,800 per acre for timber stands not planted or managed as a result of mine reclamation. Following mining, timber would be intensively managed to maximize profit margins, with a predicted timber value of $2,100 per acre for mine-managed southern pine stands. These increases are due primarily to the maximization of resources associated with reclamation, i.e., establishment and intensive management of loblolly pine to produce high-quality wood products. Due to a 3-year lag in reclamation following mining operations, intensively managed timber would not reach maturity (25 years) until year 29 of the mining operation. Therefore, increased revenue would only be realized during years 29 through 40 of the mining operation. Furthermore, clearing for mining would continue to necessitate approximately 100 acres per year of timber harvest in front of the mining operations. With the mine, the net value of timber would be $9,600,000 for southern pine resulting from both the harvest of mine-managed timber and timber harvested in front of mining. Thus, implementation of the project would result in an increase ($2,500,000) in the net present value of southern pine resources during the 40-year life-of-mine. In addition, increased southern pine values would be realized for 15 years postmining, as many of the stands intensively managed under the mine scenario would not reach maturity until after the 40-year project term.

With the mine, the simulation predicted that the net present value of timber for marketable hardwoods would be approximately $1,900 per acre. Due to the 40-year rotation of marketable hardwoods, no change to net present value of timber resources would be realized during the 40-year life-of-mine. At maturity, postmining net present value of marketable hardwoods would be approximately $2,100 per acre. As a result of maturation periods related to the 40-year life-of-mine, increased timber value for marketable hardwoods would be realized for 40 or more years following the completion of the mine operation.

4.2.12 ENVIRONMENTAL JUSTICE

Specific populations identified under Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (Volume 59, Issue 7629, FR), were investigated in Subsection 3.13.6. Kemper County has a higher percentage of minorities and a higher percentage population below the poverty level than in the United States and in Mississippi. In this section, the potential effects of the power plant and the surface lignite mine on these populations are investigated for construction and operation. Environmental justice specifically refers to the potential disproportionately high and adverse human health or environmental effects on minority and low-income populations.

DOE defines environmental justice as “[t]he fair treatment and meaningful involvement of all people—regardless of race, ethnicity, and income or education level—in environmental decision-making. Environmental justice programs promote the protection of human health and the environment, empowerment via public participation, and the dissemination of relevant information to inform and educate affected communities. DOE environmental justice programs are designed to build and sustain community capacity for meaningful participation for all stakeholders in DOE host communities” (DOE, 2006).

Mississippi Power has met monthly with local leaders, including the Kemper County Economic Development Board and the Kemper County Board of Supervisors, beginning in 2007 to continually brief local leadership on the project, including environmental, social, economic development, and governmental issues. In 2009, Mississippi Power completed and adopted the Kemper County Community Plan (Mississippi Power, 2009), which addresses education, leadership development, communications, and other community impact issues. This plan was developed with input from the minority community leadership, local elected officials, and the Kemper Economic Development Board. The plan continues the ongoing community interface with Kemper County citizens and leaders addressing Kemper County IGCC project impacts to local citizens, including environmental justice, employment, supplier diversity, and many other social issues of importance to the local community.

Since 2007, Mississippi Power, in cooperation with its project partners, has involved citizens and provided Kemper County IGCC Project orientations including bus tours of the NACC operations at Red Hills Mine in Choctaw County, Mississippi, and the Southern Company Power Systems Development Facility’s coal gasification research facility in Wilsonville, Alabama. These project orientations included presentations and onsite tours of similar lignite mining facilities and a pilot-scale gasification facility. Citizens and local leaders from Kemper and adjacent counties have been invited to participate. These orientation tours will continue as part of the plan. Mississippi Power will also continue to participate in local community activities, including the Boys and Girls Club, Relay for Life, Kemper senior citizens center, community events, and related Chamber of Commerce activities (Mississippi Power, 2009).

In addition to the baseline data presented in Subsection 3.13.6, the following information is presented to provide background as to the existing health of the residents of Kemper County and to the existing risk of exposure to pollutants.

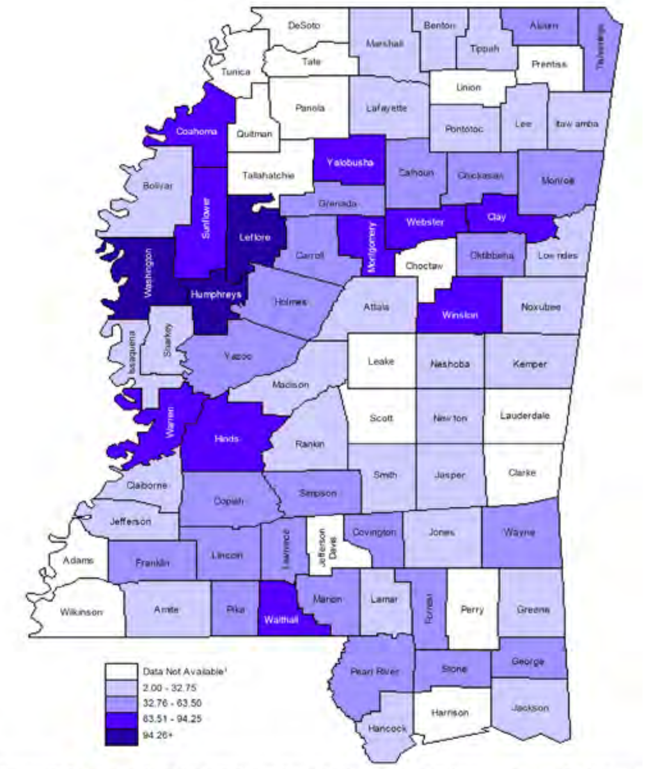
Figure 4.2-5 depicts the estimated number of emergency department visits per county for asthma as the initial diagnosis. Kemper and Neshoba Counties are depicted with the lowest rates of visits per 10,000 population. No data are available for Lauderdale County.

Table 4.2-35 provides data for cancer rates per 100,000 population for 2003 through 2006. Kemper County ranked 44th (out of 82 counties) for incidences of invasive cancer, 47th for all cancer, and 76th for cancer mortality. The National Cancer Institute state cancer profile identified Kemper County as having a death rate trend for lung and bronchus cancers through 2005 as stable and similar to the overall national rate. Lauderdale County has a rising trend above the national rate, Mississippi has a stable trend above the national rate, and Neshoba County has a trend and national rate the same as Kemper County (NCI, 2009).

Table 4.2-35. Regional Cancer Rates for 2003 through 2006

Location	Invasive Cancer Incidences	All Cancer Incidences	Cancer Mortality
State	461.65	486.32	209.02
Kemper	464.36	476.51	167.75
Lauderdale	492.22	513.03	246.76
Neshoba	410.05	428.65	174.17

Source: www.cancer-rates.info/ms, 2009.



¹Data not available due to non-reporting hospitals located within the county. Rates may be underestimated in counties bordering non-reporting counties due to travel across county lines for emergency asthma care.

*Rates are age-adjusted to the US 2000 standard population

Figure 4.2-5. Estimated Number of Emergency Department Visits with Asthma as First Diagnosis per 10,000 Population—Mississippi 2003 to 2005

Source: Mississippi State Department of Health, http://www.msdh.state.ms.us/msdhsite/_static/resources/2922.pdf, 2009.

Table 4.2-36 lists mortality rates for 2007. The mortality rate in Kemper County in 2007 did not significantly vary from that of the state as a whole. Table 4.2-37 provides information for the rate of heart disease per 100,000. The Web site did not indicate which year the data represented. Table 4.2-38 provides the same information for chronic lung disease. Kemper County ranged 65th (out of 82 counties) for incidences of heart disease and 75th for chronic lung disease.

Table 4.2-36. Regional Mortality Rates for 2007*

Location	Total	White	African-American
State	9.6	10.6	8.1
Kemper	9.6	11.3	8.6
Lauderdale	11.6	13.7	8.8
Neshoba	10.2	10.6	9.6

*Rates per 100,000 population.

Source: www.msdh.state.ms.us/msdhsite/_static/resources/3010.pdf, 2009.

Table 4.2-37. Regional Heart Disease Rates*

Location	Total
State	293.25
Kemper	277.0
Lauderdale	289.4
Neshoba	328.2

*Rates per 100,000 population.

Source: www.worldlife expectancy.com, 2009.

Table 4.2-38. Regional Chronic Lung Disease Rates*

Location	Total
State	50.76
Kemper	30.3
Lauderdale	60.6
Neshoba	31.9

*Rates per 100,000 population.

Source: www.worldlife expectancy.com, 2009.

The Web site www.scorecard.org provides an environmental justice analysis of Kemper County based on health risks, exposures, and emissions. Based on information provided at this Web site, Kemper County ranks as follows:

- Does not rank among the top 25 counties in Mississippi for VOC emissions.
- Does not rank among the top 18 counties with the worst air quality indices.
- Does not rank among the top 6 counties with the highest number of person-days in exceedance of NAAQS.
- Is in the 20th to 30th percentile of CO emissions.
- Is in the 20th to 30th percentile of NO_x emissions.
- Is in the 10th to 20th percentile of $PM_{2.5}$ emissions.
- Is in the 10th to 20th percentile of PM_{10} emissions.
- Is in the 0 to 10th percentile of SO_2 emissions.
- Is in the 10th to 20th percentile of VOC emissions.

The environmental justice analysis indicates that there are no National Priority List facilities in the county and only one facility releasing toxic release inventory chemicals to land. The release is identified as 44 lb of polycyclic aromatic compounds.

The existing health data indicates that residents of Kemper County have average to better than average health when compared to the state as a whole. The environmental justice analysis provided by www.scorecard.org indicates that Kemper County is well below the national average for air pollutant emissions and has almost no record of environmental degradation from industry.

As noted in Subsection 3.3.2, all areas of Mississippi are designated as better than national standards for unclassifiable/attainment for NAAQS. In addition, the AQI for Lauderdale County is characterized as good to moderate. The AQI for Kemper County would be expected to be lower (better air quality) than that for Lauderdale County due to fewer emission sources (see Subsection 3.3.3). Approximately 84 percent of the total emissions of six criteria pollutants in Kemper and Lauderdale Counties are attributable to sources in Lauderdale County because of the greater population, resulting in more vehicle-miles traveled (VMT). Although manufacturing provides approximately 23.5 percent of the employment in Kemper County, there are not a substantial number of employers with only five companies providing approximately one-third of the total manufacturing employment. Manufacturing in Kemper County is not identified as a major point-source for pollutant emissions.

The EPA document, Ensuring Risk Reduction in Communities with Multiple Stressors: Environmental Justice and Cumulative Risks/Impacts (EPA, 2004d), discusses multiple stressors, which include physical, chemical, biological, or other entity that can cause an adverse response in a human. The effects of these or other stressors are compounded by the vulnerability of the affected population. The document describes the following aspects of vulnerability:

- <u>Susceptibility/Sensitivity</u>—A subpopulation may be susceptible or sensitive to a stressor if it faces an increased likelihood of sustaining an adverse effect due to a life state (young, old), impaired immune system, or preexisting condition such as asthma.
- <u>Differential Exposure</u>—A subpopulation can be more vulnerable because it is living or working near a source of pollution and is, therefore, exposed to a higher level of the pollutant than the general population.
- <u>Differential Preparedness</u>—Refers to subpopulations that are less able to withstand an environmental impact, such as those with poor access to preventative health care.
- <u>Differential Ability to Recover</u>—Some subpopulations are more able to recover from an impact or stressor because they have more information about environmental risks, health, and disease.

As to susceptibility/sensitivity, medical information described previously indicated that the existing health characteristics of the residents of Kemper County are generally better than those of the state as a whole.

Table 4.2-39 provides the age distribution of Kemper, Lauderdale, and Neshoba Counties and the state of Mississippi. The median age of Kemper County in 2006 was 35.1; Lauderdale County was 36.1 in 2006; Neshoba County was 34.6 in 2006; and the state as a whole was 35.4 in 2008. The age distribution of Kemper County indicates a slightly lower percentage of children and a slightly higher older population. The 7.29 percent of the population older than74 years was a total of 744 individuals in 2006.

Table 4.2-39. Regional Age Distribution

	Age (Percent)				
Location	<17	18 to 34	35 to 54	55 to 74	> 74
Kemper (2006)	23	26.92	25.52	17.27	7.29
Lauderdale (2006)	25.6	22.94	27.11	17.23	7.12
Neshoba (2006)	27.19	23.36	25.99	16.75	
Mississippi (2008)	25.74	23.69	26.94	17.68	5.95

Source: Mississippi Development Authority, 2009.

The previous discussion of emission sources and pollutant sources existing in Kemper County indicated that there are no significant environmental stressors at present. The AQI is good to moderate, and air pollutants meet all NAAQS.

Residents of Kemper County currently have access to the following health care agencies/facilities located within the county:

- Women, Infants, and Children (WIC) Program (Board of Health).
- Kemper County Health Department.
- Scooba Medical Clinic.
- Kemper Family Medical Clinic.
- Mississippi Care Center of DeKalb.
- Weems Community Health Care Center.

The nearest hospitals are located in Philadelphia and Meridian, as noted in Subsection 3.13.5.5. The residents of Kemper County have access to medical treatment and are likely to experience only a slight diminution of preparedness because of the distance of the nearest hospitals providing more advanced care. The same statement applies to the differential ability to recover.

The referenced EPA document discusses disadvantaged, underserved, and environmentally burdened communities. The information provided in this section and Subsection 3.13.6 clearly demonstrates a disproportionate population of minorities and low-income persons in Kemper County. However, the information demonstrates that these populations are not currently subject to disproportionately high and adverse impacts, and have access to adequate health care. The impacts of the project, when combined with other past, present, or reasonably foreseeable actions and impacts, are not expected to result in cumulative impacts.

4.2.12.1 Construction

Construction impacts with regard to environmental justice are discussed for the power plant and the surface lignite mine. Impacts associated with the linear facilities and the substations would be substantially less in comparison.

The impacts associated with construction would primarily be deforestation and clearing activities, fugitive dust, and traffic. As has been noted in the sections relating to socioeconomics, transportation, and air quality, the overall loss of vegetation and timber forest would be minimal compared to the county as a whole. The vast majority of the vegetation and forests to be cleared will be reclaimed postmining. The only permanent loss of forestry resources would be on the power plant site.

The transportation impact analysis has indicated that only roadway segments near the power plant entrance would experience heavy traffic. Local populations would be most affected, and the potential for a disproportionate impact to minority and low-income populations would be the same as for the local population, as a whole. Mitigation measures such as shuttles and park-and-ride facilities could mitigate this localized impact.

Fugitive dust would be a consequence of the major earthmoving activities to be undertaken during construction of the power plant and the mine facilities. Local populations would be most affected, but impacts are not expected to be disproportionately high and adverse. Mitigation measures would employ BMPs, including silt fences/hay bales and frequent watering of exposed areas.

Surface water flows would be altered during the construction and operation stages of the mining activities. Individual streams would have reduced flow and/or would be temporarily removed for recovery of the lignite. The downstream impact to the Okatibbee WMA would result in a different pattern of flow volumes with a reduction in peak flows. There will be an increase in TDS concentrations. In the case of Sowashee Creek, the diminution of stream flows would remove a source of pollutants. Impacted streams would be restored during the reclamation process. It is not anticipated that impacts to surface water quantity and quality would result in high and adverse impacts to the existing recreational opportunities.

The development of the surface lignite mine would displace willing landowners, i.e., landowners that successfully concluded negotiations with the mine owner for use of their land. The procurement of land to be mined would not be subject to eminent domain. To secure land for coal extraction, the mining company must approach the landowner and successfully negotiate for use of the land. The mining company might purchase the land, in which case any existing improvements such as houses, barns, fences, etc., would not be replaced after reclamation. Alternatively, the land might be leased, or lands might be swapped. If leased, the mining company would pay for all surface improvements and would disclose the length of the lease and the plan for reclamation. The landowner would have the option of rebuilding any or all of the former improvements. Landowners would be compensated for accepting temporary housing or other housing until reclamation and rebuilding activities are complete. These displaced homeowners could compete for available housing, apartments, and other rental opportunities in the area.

Landowners/residents whose property lies within the mine study area who choose not to allow their property to be mined would be affected to a greater extent than surrounding landowners by:

- Roadway congestion on local roads.
- Fugitive dust.
- Noise.
- Dewatering activities.
- Visual impacts.

Subsections 3.13.3 and 4.2.11.2 indicated that there would be sufficient housing opportunities to accommodate construction and operational employees. There would be sufficient vacant housing and rental opportunities to accommodate landowners willing to be compensated for temporary displacement. Traffic impacts and fugitive dust have been addressed previously. Noise impacts would be localized and limited in duration to the period of time required for mining and reclamation activities in any given area (i.e., mine block).

Dewatering effects during mining could disrupt private well use in the local area due to diminution of supply. There would be alternative potable well sources made available to affected landowners by the mine owner. The deforestation activities would result in change in the appearance of the mine study area. Given that reclamation would likely include replanting of pines and hardwoods and the current periodic clear-cutting activities associated with the silvicultural activities in the area, these land use changes would not be unusual. The increased health and safety risks during construction would be primarily traffic-related.

4.2.12.2 Operation

Operational impacts with regard to environmental justice are discussed for the power plant and the surface lignite mine. Impacts associated with the linear facilities and the substations would be insignificant in comparison.

The impacts associated with operation would primarily be ongoing deforestation and clearing activities for the mine and fugitive dust, traffic, and air quality impacts for the power plant. The discussion for construction impacts and for potential mitigation measures applies to the operational impacts with the clarification that the traffic would be reduced and that clearing for the power plant site would have been completed during construction.

Potential air quality impacts were described in detail in Subsection 4.2.1. Conservatively high estimates of increases in total air quality concentrations from project operations were predicted to range from as low as 2 percent of an individual NAAQS to up to 12 percent. Long-term air quality in the vicinity of the project site would remain within the limits set to safeguard public health and welfare. Therefore, minority and low-income populations would not bear a disproportionate share of high and adverse environmental impacts from the proposed project.

Many of the construction impacts attributable to the mine would be present during the operation of the mine (i.e., deforestation, surface and dewatering impacts, noise, and increased health and safety risks). The completion of the power plant construction would permanently change the views in that area. The taller structures and transmission lines would be visible in the proximate area and to the traveling public. There would be increased lighting associated with both the power plant and surface lignite mine. Impacts resulting from ongoing operations (e.gl, visual, noise, and lighting effects) on low-income and minority populations in the area near the power plant and the mine would not exceed those on the general population.

The construction and operation of the power plant and the surface lignite mine would create a substantial number of new jobs. The following is a discussion of the hiring practices of Mississippi Power and NACC.

Table 4.2-40 provides demographic information for Mississippi Power ongoing operations employment. Mississippi Power will continue to hire qualified women and minorities by:

- Building a job bank pre- and postconstruction for consideration of contractors and Mississippi Power and contractors (preconstruction) and Mississippi Power (postconstruction).
- Holding job fairs for minorities in the area.
- Meeting its equal opportunity employer regulatory requirements through an affirmative action plan.
- Providing vocational technology scholarships.
- Donating to area higher education schools and universities.
- Establishing training programs.
- Participating in military transition programs, local job fairs, posting available positions on university Web sites, etc.

Table 4.2-40. Mississippi Power Demographics

	March 2009	Mississippi Power 2008	Mississippi Power 2007	Mississippi Power 2006	Mississippi Power 2005	Mississippi Power 2004
Mississippi Power Demographics—2004 to 2009						
Total company staffing	1,304	1,308	1,288	1,262	1,242	1,255
Women	369 (28%)	368 (28%)	355 (28%)	336 (27%)	322 (26%)	324 (26%)
Minorities	224 (17%)	229 (18%)	228 (18%)	218 (17%)	196 (16%)	193 (15%)
Mississippi Power Generation Demographics—2004 to 2009						
Total company staffing	451	456	451	452	447	445
Women	65 (14%)	65 (14%)	60 (13%)	60 (13%)	59 (13%)	53 (12%)
Minorities	85 (19%)	85 (19%)	85 (19%)	83 (18%)	75 (17%)	75 (17%)

	Number Hired in Temporary Program	Number Hired Fulltime
Total company staffing	19	15
Women	7 (37%)	5 (33%)
Minorities	4 (21%)	2 (13%)

Source: Mississippi Power, 2009.

Mississippi Power is committed to affirmative action hiring practices, supplier diversity, and economic development by building and attracting businesses to the community.

NACC is an Equal Opportunity Employer adhering to U.S. Equal Employment Opportunity Commission (EEOC) requirements by:

- Recruiting, training, and promoting persons without regard to race, religion, color, sex, age, national origin, status as a disabled veteran or Vietnam-era veteran, or disability except where a disability is a bona fide occupational disqualification.
- Basing decisions on employment so as to further the principle of equal opportunity.
- Ensuring promotion decisions are in accordance with equal employment opportunity by imposing only valid requirements for promotional opportunities.
- Ensuring that all other personnel actions, such as compensation, benefits, transfers, layoffs, return from layoff, company-sponsored training, education, tuition assistance, and social and recreational programs will be administered without regard to race, religion, color, sex, age, national origin, status as a disabled veteran or Vietnam-era veteran, or disability except where a disability is a bona fide occupational disqualification.
- Protecting all employees and applicants for employment from coercion, intimidation, interference, or discrimination for filing or assisting in an equal opportunity complaint.

As of December 31, 2008, the Red Hills Mine employed 176 employees. Of these 176 employees, 15 (8.5 percent) were women and 28 (16 percent) were minorities. NACC attempts to hire new employees locally by first placing job advertisements in local newspapers. If no qualified candidates are found in the local area, the company begins extending the search area (NACC, 2009).

Given the current levels of employment of minorities by both Mississippi Power and NACC, the commitment of both firms to equal opportunity employment and processes in place to foster such hirings, it is anticipated that minorities would be well represented in the construction and operation workforces. In addition, the construction and operation of the power plant and the development and operation of the mine would likely have indirect impacts to minority hiring through vendor and subcontractor selection. Where the additional employment would reduce unemployment, increase gainful employment (part-time to full-time, underemployed to fully employed), and/or reduce commute times, the quality of life of employees and employees’ families would improve.

4.2.13 TRANSPORTATION INFRASTRUCTURE

The construction and operation of the power plant and surface lignite mine have the potential to impact rail, airports, and highways. Any impact to rail would primarily occur during construction activities and then only on existing rail lines and rail yards as there is no planned construction of a rail spur to the project area. Air travel would be only minimally impacted since permanent relocations to the area are expected to be limited and due to the presence of several airports in the area. An impact of short duration to area roadways would be heavy-haul highway/roadway trips to move heavy equipment to the project area. Turbines, generators, building materials, and the dragline would be brought to the project site over highways such as I-20, I-59, and U.S. 45 before finalizing the trips over local roads. Heavy-haul trips would be limited in number and temporary in nature. Another short-term impact would be initial lignite deliveries from the Red Hills Mine to the project site. It is anticipated that the route (described in Subsection 2.4.1) would be used for approximately 6 months during the startup and initial operations of the power plant.

The primary impact of the project would be construction commuters. The roadway segments presented previously in Table 3.14-1 provide the anticipated routes from the surrounding municipalities anticipated to house workers to the power plant and the mine. Commuter trips have been assigned to the roadway network based on the availability of housing and related amenities; the existing distribution of population in the nearby municipalities and Neshoba, Lauderdale, and Kemper Counties; and roadway characteristics (speed limits, number of lanes, estimated travel times, etc.). Even though a significant percentage of the employees would come from the east-central Mississippi area, almost all of the construction and operation traffic would be new trips to the project area, as there are no employment generators in the area currently.

Active mining might result in the temporary relocation of portions of MS 495 and MS 493, as well as local roads internal to the mine study area. Maintenance of traffic would be required for both local trips and for through traffic along the north-south MS 495 and MS 493 routes. Trips generated by construction and operation employees assigned to these two north-south routes would use either the existing roadways or those sections of these roadways provided to maintain traffic.

4.2.13.1 Construction

As noted in Subsection 4.2.11.1, the peak construction employment would be an estimated 1,305 employees for a period of 3 months. Because it is anticipated that workers would be successful in saving per diem allowances, 1.5 passengers per vehicle have been assigned for each of the two daily trips (to and from the project site). The following capacity analysis has been based on LOS D vehicles per hour. The most recent annual average daily traffic (AADT) count (2007) was converted to vehicles per hour using a K factor (the proportion of AADT occurring in the analysis period) in rural areas of 0.1 and suburban/urban areas of 0.09. The LOS D AADT was derived from a default value for either a rural highway or a suburban arterial, as appropriate, from the Highway Capacity Manual (Transportation Research Board, 2000). The 2007 background traffic plus the one-way commuter traffic are considered to provide an estimate of the traffic on the roadways as a result of construction of the power plant and development of the mine.

In addition to the capacity analysis, the existing LOS was determined for the roadway segments that comprise the available routes to and from the power plant site. LOS A describes the highest quality of traffic service, when motorists are able to travel at their desired speed. LOS B characterizes further increases in flow with speeds of 50 mph or slightly higher on level terrain highways. LOS C describes further increases in flow resulting in noticeable platoon formation, platoon size, and passing impediments. The average speed exceeds 45 mph on level terrain highways. Unstable traffic flow describes LOS D. On two-laned roads, passing demand is high, but passing capacity is near zero. LOS E defines the capacity of the highway. Operating conditions at capacity are unstable.

It can be expected that there would be significant peak-hour traffic at the start and end of the construction day, with minimal construction activities occurring at night. It is likely that the peak hours of construction traffic would occur before and after the peak-hour traffic of other commuters because of the length of the workday.

Traffic generated by construction of the transmission lines and pipelines would be insignificant compared to that generated from the construction of the power plant and the mine. In addition, these construction activities would occur away from the municipalities and the main driving routes.

In addition to the commuter traffic, there would be truck deliveries. An estimated 50 one-way truck deliveries and a total of 100 daily truck trips would be added to the roadway. Ninety percent of the trucks would be expected to arrive and depart the project site from the south by the MS 39-Blackwater Road-MS 493 route. The remaining 10 percent would leave and depart from the west by the MS 16-MS 495 or MS 16-MS 493 routes. Trucks used for heavy hauls and heavier or wider loads will enter the project site from the north. Most of these trips will originate at Scooba or Columbus along U.S. 45. This truck traffic will proceed south to MS 16, then south on MS 493 to the project entrance. Because these trips will be relatively few in number, infrequent, and can be scheduled for nonpeak-hour deliveries, they have not been added into the daily trip capacity analysis.

Combined Impacts of Power Plant and Surface Lignite Mine

Figure 4.2-6 depicts the distribution of traffic on the main roads from the south, west, and east to the power plant site and mine study area. Workers would be anticipated to locate within the nearby city (incorporated) boundaries or within the nearby, adjoining suburbs. The majority of the traffic of workers located to the south would be likely to travel to and from the project area by MS 39 to Blackwater Road to MS 493. The primary reason for this is that MS 39 is four-laned from downtown Meridian to and from John C. Stennis Drive, allowing for higher driving speeds. Blackwater Road is paved and allows for the shortest travel time to and from MS 493 and the power plant entrance. For workers living in the northern suburbs of Meridian, MS 493 would provide a more direct route to and from the power plant. The development of the mine and the first 6 years of mining would occur in the vicinity of MS 493. As a worst-case scenario, all construction traffic to the power plant and the mine facilities during construction originating from the northern suburbs of Meridian have been assigned to MS 493.

For workers located to the west, MS 16 would be the commuter route to and from either MS 495 or MS 493. There would likely be a split in the use of these two roadways as workers would seek less congested and quicker routes to the employee parking areas for the power plant and the mine. Only 5 percent of the construction workforce has been assigned, for evaluation purposes, to the area surrounding DeKalb. Commutes from this area to the project site would be split between Old Jackson Road to and from MS 493 and MS 16 to and from MS 493, with the majority using Old Jackson Road since it would be closer to the power plant entrance.

Table 4.2-41 identifies the significant roadway segments with directional information indicative of the morning commute. The information depicted on Figure 4.2-6 (project traffic) has been added to the 2007 AADT volume (derived from MDOT) multiplied by a K factor (peak hour) of 0.1 (this may overestimate the background traffic in suburban/urban areas but is a conservative figure). Table 4.2-41 presents the existing LOS and the LOS with project traffic. A review of the table indicates that the traffic generated by the project would degrade the LOS D at the following roadway segments:

- MS 493 from Bailey-Topton/Dogwood Lake Road/Briarwood School Road Northeast to Center Hill Road.
- MS 493 from Blackwater Road to project entrance.
- MS 493 from MS 16 to Old Jackson Road.
- MS 493 from Old Jackson Road to the project entrance.

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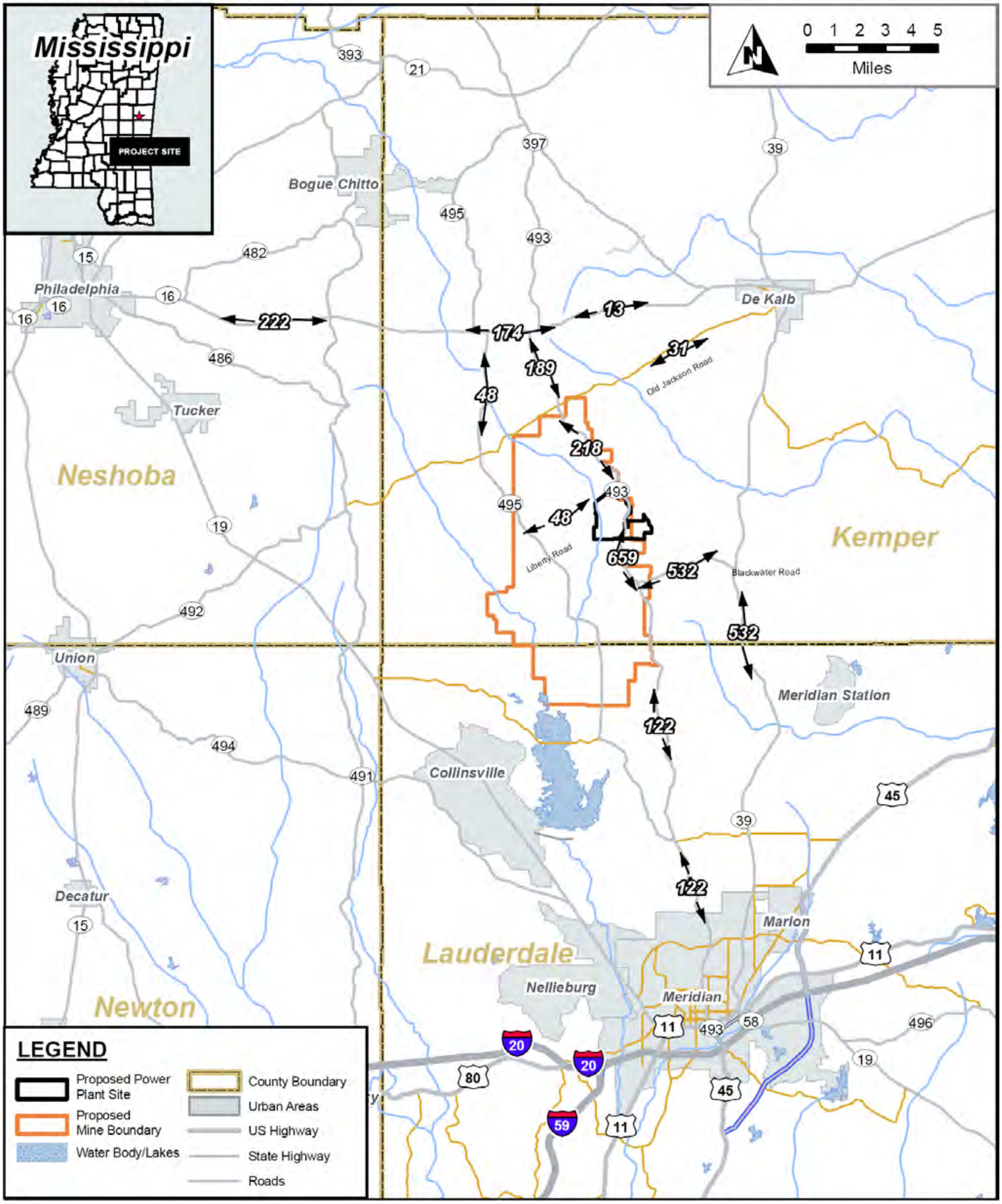

Figure 4.2-6. Distribution of Traffic—Construction (a.m. Shift)

Sources: U.S. Census, 2000. MARIS, 2008. ECT, 2009.

Table 4.2-41. Capacity Analysis—Construction

Segments	Description	Number of Lanes	2007 AADT	LOS D AADT	LOS D Vehicles per Hour	LOS D Vehicles per Hour with Project	LOS Existing	LOS with Project Traffic*
Lauderdale County								
MS 39	From U.S. 45 north of 52nd Street	4	5,900	34,000	3,060	1,122	A	B
MS 39	From 52nd Street north to Bailey-Topton/ Dogwood Lake Road/Briarwood School Road Northeast	4	9,400	34,000	3,060	1,472	A	C
MS 39	From Bailey-Topton/Dogwood Lake Road/Briarwood School Road Northeast north to John C. Stennis Drive	4	4,500	34,000	3,400	482	A	B
MS 39	From John C. Stennis Drive north to county line	2	2,500	7,900	790	782	D	E
MS 493	From North Hills Street north to Windsor Road	2	4,100	7,900	790	532	D	D
MS 493	From Windsor Road north to Bailey-Topton/Dogwood Lake Road/Briarwood School Road Northeast	2	3,100	7,900	790	432	D	D
MS 493	From Bailey-Topton/Dogwood Lake Road/Briarwood School Road Northeast north to Center Hill Road	2	2,400	1,700	170	362	D	E
MS 493	From Center Hill Road north to county line	2	470	1,700	170	169	C	D
Kemper County								
MS 39	From county line north to Blackwater Road	2	1,900	7,900	790	722	D	D
MS 493	From county line north to Blackwater Road	2	460	1,700	170	168	C	D
MS 493	From Blackwater Road north to project entrance	2	350	1,700	170	689	C	E
MS 493	From MS 16 south to Old Jackson Road	2	420	1,700	170	229	C	E
MS 493	From Old Jackson Road south to project entrance	2	350	1,700	170	253	C	E
MS 495	From MS 16 south to Old Jackson Road	2	550	1,700	170	103	C	C
MS 495	From Old Jackson Road south to county line	2	520	1,700	170	100	C	C
MS 16	From Neshoba County line east to MS 495	2	2,400	13,900	1,390	462		C
MS 16	From MS 495 east to MS 493	2	2,300	13,900	1,390	404	B	C
MS 16	From MS 493 east to MS 397	2	2,700	13,900	1,390	283	B	B
MS 16	From MS 397 east to DeKalb	2	3,100	13,900	1,390	323	B	B
Old Jackson Road	From DeKalb west to MS 493	2	690	1,700	170	100	C	C
Neshoba County								
MS 16	From west of MS 19 west to MS 486	4	17,000	34,000	3,400	1,922	C	C
MS 16	From MS 486 to MS 482	2	6,700	13,900	1,390	892	C	D
MS 16	From MS 482 east to MS 491	2	3,300	13,900	1,390	552	C	C
MS 16	From MS 491 east to county line	2	2,700	13,900	1,390	492	B	C

Note: LOS D capacity derived from Highway Capacity Manual.
2007 AADT information from MDOT.

Source: ECT, 2009.

In all of these listed instances, the resulting LOS would not fall below the LOS E roadway capacity. Most of the LOS impacts would occur in the vicinity of the project area. This is not unanticipated as the roadways in this area are two-laned rural facilities with limited peak-hour capacity.

The LOS impacts noted could be mitigated by establishing a shuttle service from convenient park-and-ride locations within or near the city limits of Meridian and Philadelphia. Another mitigation factor could involve restricting truck deliveries to nonpeak-hour times. It is noted that during the nonpeak construction months, only three roadway segments would experience an LOS degradation. One segment, MS 493 from Bailey-Topton/Dogwood Lake Road/Briarwood School Road Northeast to and from Center Hill Road, is already above the LOS D peak-hour volume without project traffic. The second and third segments, MS 493 from Blackwater Road and MS 493 to the project site entrance, would experience heavy project traffic during the entire construction schedule. Since the intersection of MS 493 and Blackwater Road actually occurs within the project boundary, a large parking area could be developed with shuttle buses distributing workers to the mine and power plant construction areas.

Linear Facilities

Construction of the linear facilities would not be expected to have a significant impact on the area roadways since the crews would be using different roadways throughout the construction schedule, and far fewer trips would be involved in the construction of these facilities. In addition, construction activities at any one location would be of shorter duration.

4.2.13.2 Operation

The initial power plant employment would be 105 for the first 6 years, decreasing to 90 for the remainder of the plant life. The mine operational employment would be a maximum 213 employees. Both the power plant and surface lignite mine would work in two shifts.

The start and end of the two shifts would likely be either 6 a.m. to 6 p.m. or 7 a.m. to 7 p.m. After the first 6 months or so of power plant operation, the expected number of visitor and delivery trips would be 45 per day, to occur primarily during the day shift. Ninety percent of the deliveries would be expected to leave from the south, with the remaining 10 percent to transit from the west. Although up to 100 trucks per day would be expected to deliver coal from the mine to the power plant, these trips would be internal to the project site. During the initial 6 months of power plant operation, up to 80 truck trips per day would deliver lignite from the Red Hills Mine by the route described in Subsection 2.4.1 and characterized in Section 3.14.

Combined Impacts of Power Plant and Surface Lignite Mine

Given the employment numbers, Figure 4.2-7 depicts the estimated trips during either the a.m. or p.m. peak hour for first 6 years of operation. Given the hours of the shifts, either the a.m. or the p.m. peak-hour traffic currently on the area roadways would not be significantly impacted by the project. Trip generation would be an estimated two per employee, and the vehicle occupancy ratio assumed to be one. After the first 6 years of operation, the impacts would be reduced.

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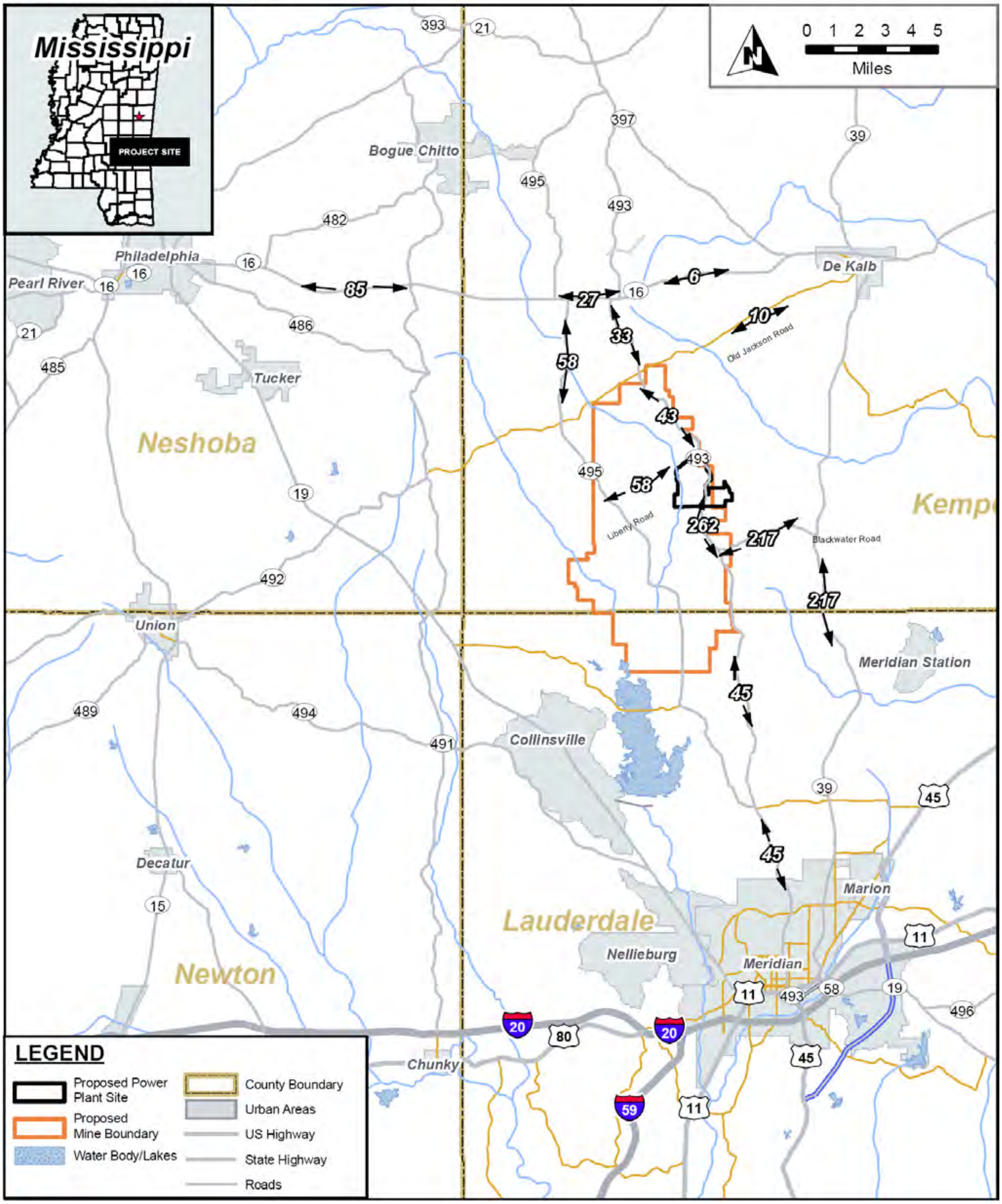

Figure 4.2-7. Distribution of Traffic—Operation (a.m. or p.m. Peak Hour)

Sources: U.S. Census, 2000. MARIS, 2008. ECT, 2008.

Table 4.2-42 presents only those roadway segments that would be impacted by the much greater trip generation expected during the peak of construction. As with the construction traffic impacts, the resulting LOS would not fall below the LOS E roadway capacity. The capacity analysis indicates that only two segments would experience a degradation in the LOS. The two segments are two of the same as would be impacted by the average number of expected construction workers:

- MS 493 from Bailey-Topton/Dogwood Lake Road/Briarwood School Road Northeast to Center Hill Road.
- MS 493 from Blackwater Road to the project entrance.

Table 4.2-42. Capacity Analysis—Operation

Segments	Description	Number of Lanes	2007 AADT	LOS D AADT	LOS D Vehicles per Hour	LOS D Vehicles per Hour with Project (a.m. Shift)
Lauderdale County						
MS 39	From John C. Stennis Drive north to county line	2	2,500	7,900	790	467
MS 493	From Bailey-Topton/Dogwood Lake Road/Briarwood School Road Northeast north to Center Hill Road	2	2,400	1,700	170	285
MS 493	From Center Hill Road north to county line	2	470	1,700	170	92
Kemper County						
MS 39	From county line north to Blackwater Road	2	1,900	7,900	790	407
MS 493	From county line north to Blackwater Road	2	460	1,700	170	91
MS 493	From Blackwater Road to project entrance	2	350	1,700	170	297
MS 493	From MS 16 south to Old Jackson Road	2	400	1,700	170	73
MS 493	From Old Jackson Road south to project entrance	2	350	1,700	170	78

Note: LOS D capacity derived from Highway Capacity Manual.
2007 AADT information from MDOT.

Source: ECT, 2009.

As noted previously, the first segment is already operating above the LOS D capacity, and the second segment would experience heavy traffic throughout operation of the plant and the mine. Similar mitigation methods as described in Subsection 4.2.13.1 could be employed during operation of the plant and mine such as park-and-ride lots with shuttles.

Initial Lignite Coal Delivery Route

Figure 4.2-8 depicts the initial delivery route of coal from the Red Hills Mine to the power plant entrance of MS 493. It is anticipated that up to 80 truckloads per day would be delivered over a 16-hour period for a period of approximately 6 months. Table 4.2-43 provides a capacity analysis of the roadway segments that comprise the route from the Red Hills Mine to MS 16. For a worst-case scenario, all 80 truckloads are analyzed as arriving during the a.m. peak hour. In actuality, the truckloads and truck trips would be evenly spaced over the 16-hour delivery schedule resulting in only five peak-hour trips on the delivery route. Only the LOS of two roadway segments (MS 397 from MS 490 to the Winston/Kemper County line and MS 397 from MS 21 to MS 493) would be

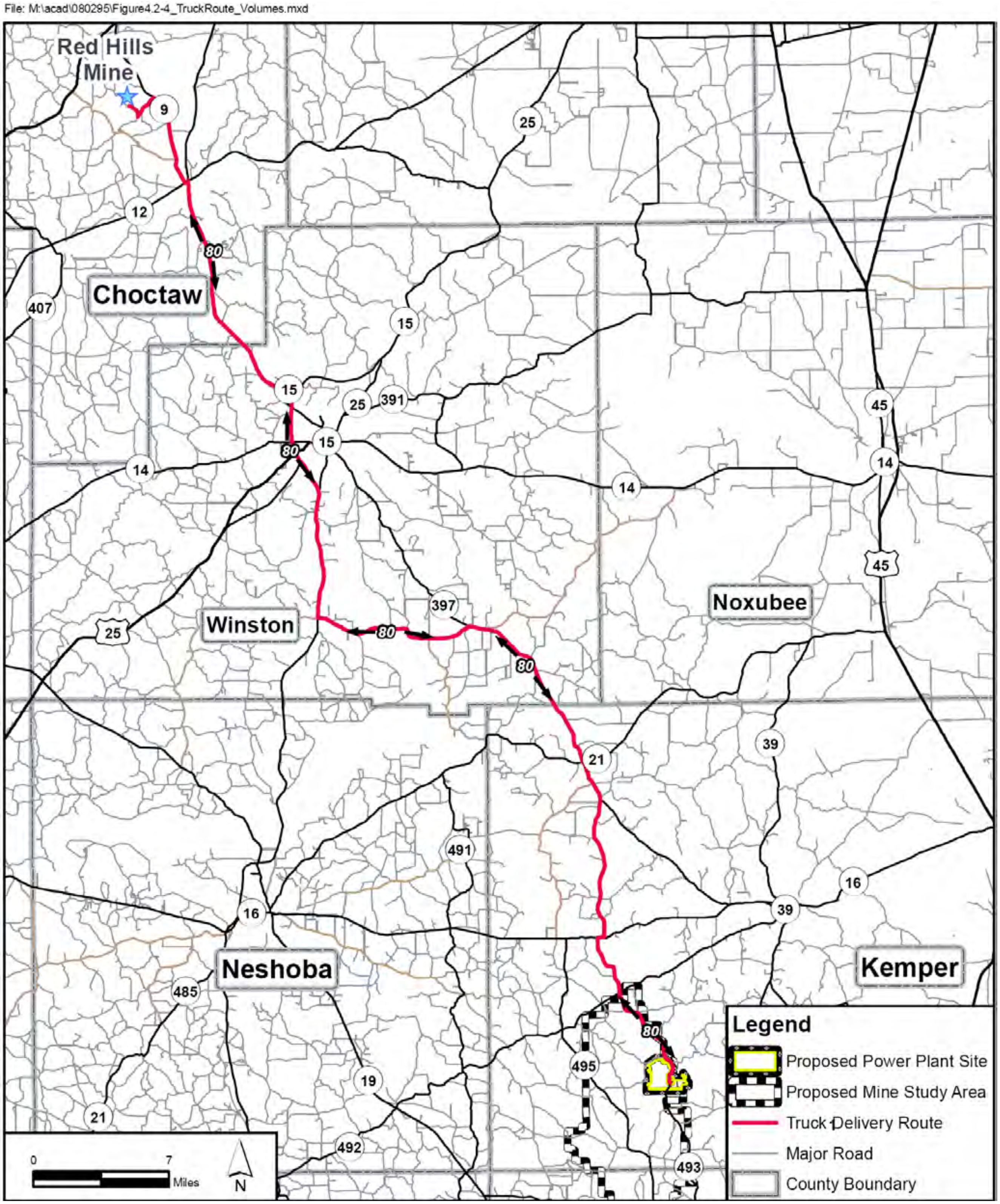

Figure 4.2-8. Initial Lignite Coal Delivery Route Distribution of Traffic
Sources: MARIS, 2008. ECT, 2009.

impacted, and then only if at least 70 trucks traveled the peak hour through the first segment and at least 30 trucks were delivering during the peak hour through the second segment.

Table 4.2-43. Capacity Analysis—Initial Lignite Coal Deliveries

Segments	Description	Number of Lanes	2007 AADT	LOS D AADT	LOS D Vehicles per Hour	LOS D Vehicles per Hour with Project
Choctaw County						
Pensacola Road	From Red Hills Mine northeast to MS 9	2	260	1,700	170	106
MS 9	From Pensacola Road south to MS 415	2	1,900	7,900	790	270
MS 9	From MS 415 south to MS 12	2	3,300	7,900	790	410
MS 12	From MS 9 northeast to MS 15	2	4,100	7,900	790	490
MS 15	From MS 12 south to county line	2	2,600	7,900	790	340
Winston County						
MS 15	From county line south to McMillan	2	3,300	7,900	790	410
MS 15	From McMillan south to South Ackerman Road	2 to 4	2,600	7,900	790	340
MS 15	From South Ackerman Road south to MS 14	4	7,300	34,000	3,400	810
MS 15	From MS 14 south to Old Robinson Road	4	4,800	34,000	3,400	560
MS 15	From Old Robinson Road south to South Church Avenue	2 to 4	4,400	7,900	790	520
MS 15	From South Church Avenue south to MS 490	2	4,500	7,900	790	530
MS 490	From MS 15 east to Union Ridge Road	2	1,900	7,900	790	270
MS 490	From Union Ridge Road east to Enon Road	2	870	7,900	790	167
MS 490	From Enon Road east to MS 397	2	77	7,900	790	157
MS 397	From MS 490 south to county line	2	1,000	1,700	170	180
Kemper County						
MS 397	From county line south to MS 21	2	750	1,700	170	155
MS 397	From MS 21 south to MS 16	2	1,400	1,700	170	220
MS 493	From MS 16 south to the plant site	2	200	1,700	170	100

Note: LOS D capacity derived from Highway Capacity Manual.
2007 AADT information from MDOT.

Source: ECT, 2009.

The addition of five trucks along the following project vicinity roadway segments would not degrade the LOS D roadway capacity:

	Existing Traffic* Peak Hour	Existing Traffic with Project (a.m. Shift)	Existing Traffic with Project and Initial Route Deliveries (a.m. Shift)	LOS D Vehicles per Hour Capacity
MS 16 from MS 493 to MS 493	270	276	281	1,390
MS 493 from MS 16 to Old Jackson Road	42	76	81	170
MS 493 from Old Jackson Road to project entrance	35	79	84	170

*Based on MDOT 2007 AADT.

Linear Facilities

There would be no permanent employment associated with the linear facilities and, therefore, no trips to assign to the road network. Maintenance activities would be sporadic and of short duration.

4.2.14 WASTE MANAGEMENT FACILITIES

There is one permitted landfill in Kemper County as described in Section 3.15. The landfill is undergoing an expansion from 8.17 to 22.37 acres within the total property area of 102 acres. (This expansion is unrelated to the proposed IGCC project.)

4.2.14.1 Construction

Power Plant

It is anticipated that any economically valuable timber would be harvested prior to the start of construction. Unusable wood and other vegetation remaining after clearing and grubbing would be burned onsite in accordance with applicable regulations. Any concrete or other nonburnable debris found during clearing activities could be accepted at the Kemper County Solid Waste Landfill. During actual construction activities, solid waste would consist of scrap lumber, scrap metal, and packing materials. Materials that cannot be recycled could be disposed locally in the county landfill. The current expansion is intended to meet the county’s needs at current landfilling rates for the foreseeable future (Kemper County Solid Waste Landfill, LLC, 2008).

The largest quantities of hazardous wastes generated during construction of the power plant would be associated with maintenance of the equipment. Waste oil, spent solvents, and other used oils and coolants would be drummed and periodically removed and disposed at regulated facilities such as the Chemical Waste Management, Inc., facility located in Emelle, Alabama.

Surface Lignite Mine

As with the power plant site, all economically valuable timber would likely be harvested prior to development of the mine. Vegetative waste would be burned onsite. The disposition of homes and other structures would be arranged with each landowner and would be disposed of properly. Wastes capable of being disposed in mined-out pits include demolition debris such as wood, metal, sheetrock, wiring, farm building, sheds, scrap piles of wood, glass, appliances, furniture, brick, concrete, stone, asphalt, fences, power poles, pipes, cables, and similar material. Asbestos-containing building materials, refrigerants, air conditioners, empty or full containers, or any hazardous materials would be disposed offsite in approved, licensed locations. As with the power plant, hazardous wastes generated during development of the mine would most likely be associated with spent equipment fluids.

Linear Facilities

To the extent practicable, economically valuable timber within the linear facilities corridors would be harvested. Other vegetative waste would be burned in accordance with applicable regulations. It is anticipated that excess materials such as wood, metal, and cable would be amassed onsite or offsite at contractor’s facilities before being disposed appropriately at area landfills. The amount of debris associated with development of the linear facilities would be insignificant compared to construction of the power plant and development of the mine. It is not anticipated that any hazardous waste would be generated onsite within the linear facility corridors.

4.2.14.2 Operation

Solid and hazardous wastes would be generated by the power plant and surface lignite mine during operation. Ongoing development of the mine, expected to comprise approximately 275 acres per year, would be considered an operation-related impact relative to solid waste generation. The maintenance facilities, offices, warehouses, and other buildings serving the mine would be located close to the power plant facilities. There would not likely be any significant amount of solid waste or hazardous waste generation associated with the linear facilities.

Combined Impacts of Power Plant and Surface Lignite Mine

The solid waste generation per employee per year, based on a generation rate of 0.8 tpy, would be an estimated 274.4 tpy for the initial 6 years and 238.4 tpy through the life of the plant and the mine. This generation rate could easily be accommodated at the existing landfill or at appropriately licensed disposal facilities.

Based on an 85-percent capacity factor, approximately 560,000 tons of ash would be produced annually. Both gasifier and filter ash would be transported by truck to the ash management unit located in the northern portion of the plant site along Liberty Road (see Figure 2.1-5). Although likely exempt from regulation under RCRA as a Bevill amendment material, the ash would be classified as industrial/special waste in the state of Mississippi, and the ash management unit would be subject to the permit requirements and regulations of MDEQ. To reduce long-term ash storage needs, Mississippi Power would try to market ash for beneficial use in industrial processes such as building roads, soil amendment, or for other uses as approved by MDEQ. Limited quantities of hazardous wastes would be generated primarily from maintenance activities. Management of hazardous wastes would begin by limiting the amount of hazardous materials used and through reuse and recycling to reduce the generation of waste. Wherever possible, nonhazardous materials would be used instead of hazardous chemicals. Hazardous material use and hazardous waste generation programs would be supported by appropriate and adequate training. Hazardous wastes would be managed in accordance with applicable federal regulations.

Spent equipment fluids such as waste oil, waste coolant, and used hydraulic oil would be properly managed onsite prior to removal offsite to a recycler for processing. Spent batteries would also be temporarily stored onsite before being removed offsite for disposal at a properly licensed facility. Periodic outages would result in the temporary accumulation of a larger amount of wastes. Arrangements would be made with outside contractors to dispose of spent materials in an appropriate manner.

Linear Facilities

The only solid waste generated as a result of the presence of the linear facilities would be during sporadic maintenance activities. Waste disposal would be the responsibility of the maintenance crews and would be at the nearest landfill. There would be no continuous source of solid waste generation associated with operation of the linear facilities.

4.2.15 RECREATION RESOURCES

No public recreation resources exist or are proposed on the power plant site or mine study area. Hunting activities associated with leases could continue outside of actively mined areas. The closest publicly available recreational facilities, described in Section 3.16, are Okatibbee Lake and WMA located approximately 4.7 miles to the south and Kemper County Lake located approximately 6.5 miles to the north. Limited impacts associated with the construction or operation of the linear facilities would be anticipated as discussed in the following.

4.2.15.1 Construction

Increased use of public recreational use facilities could be anticipated during construction of the power plant and development of the mine study area.

Combined Impacts of Power Plant and Surface Lignite Mine

Even at the peak construction employment resulting in the relocation of 1,330 people to the three-county area, the increase would be only 1.1 percent of the area's population in 2006. The nearby recreational facilities would be able to accommodate the increased utilization potential from this small increase in population. It is likely that some hunting club leases might be terminated as a result of the project. Deer and turkey hunting are popular activities in Kemper County and the surrounding area. The displaced hunters should be easily accommodated through other hunt clubs or leases.

Construction of the proposed power plant and surface lignite mine would not cause measurable adverse effects on Okatibbee Lake and the associated recreation resources. Subsection 4.2.4.1 documents that changes in water flows into the lake and water quality in the lake would be *de minimis*. Based on that analysis, no decrease in recreation values would occur during the time of construction.

Linear Facilities

There would not likely be any impact to recreational resources associated with the construction of the linear facilities and the substations, with the exception of traversing Lake Bonita Park. This park is owned by the city of Meridian, is 3,300 acres in size, and includes Long Creek Reservoir, Lakeview Golf Course, and primitive park features, including nature trails, jogging and walking track, horseback riding, picnic facilities, paddle boats, boat ramps, and fishing. The transmission line does not intersect any improvements other than trails. The siting of the transmission line through the park will remove a swath of uninterrupted forest that will have to be maintained as lower level vegetation.

4.2.15.2 Operation

For the first 6 years of operation, the plant and mine employment would be an expected 323 employees, with approximately 411 people relocating to the area.

Combined Impacts of Power Plant and Surface Lignite Mine

The expected population increase due to employment and relocations to the area would be only 0.4 percent of the 2006 combined population of Lauderdale, Kemper, and Neshoba Counties. The impact to the surrounding recreational facilities, such as Okatibbee Lake and WMA and Kemper County Lake, would be easily accommodated by the existing amenities/facilities. There would likely be a permanent loss of some hunting lands at the power plant site. Reclamation activities could, over time, replace forested areas and restore land that could be leased for hunting within the mine study area. An opportunity would exist to enhance fishing and wildlife activities if sedimentation ponds constructed during mining activities were left as permanent impoundments and made available for public use. Public recreation opportunities would be dependent upon postmining ownership of the ponds, accessibility of the ponds to the public, access to public roads, and the size and quality of the ponds.

Subsection 4.2.4.2 documents water quality changes that would occur in Okatibbee Lake due to operation of the proposed surface mine. During mining and following reclamation, surface water inflows would increase in response to rainfall events. TDS levels would increase; however, the changes would not be noticeable to humans, induce changes in fish species present in the lake, or exceed MDEQ water quality standards. Turbidity and suspended solids levels would not change measurably. Thus, the recreation values of the lake would not diminish.

Linear Facilities

There would be no permanent employment associated with the linear facilities or the substations and, therefore, no potential impacts to recreational facilities.

4.2.16 AESTHETIC AND VISUAL RESOURCES

There are no unique landforms or visual or scenic features associated with the power plant site, mine study area, or linear facilities. A majority of Kemper County is forested, which restricts long-range views at ground and road levels.

4.2.16.1 Construction

Power Plant

Construction activities would involve substantial clearing of trees and a permanent conversion of land use from primarily forested land to an industrial use. Except at roadway entrances from MS 493, linear facility crossings of the property boundaries, and the interconnection of the power plant with the mining facilities and activities, it is anticipated that a perimeter of trees would be retained to provide screening and buffering. The traveling public along MS 493 and local drivers in the project area would have views of the clearing, grading, berming, earthmoving, and structural building activities. In the initial stages of construction, the vegetative clearing, berming, and earthmoving activities would predominate. Exhaust and dust would likely be associated with heavy machinery and equipment use. As the permanent structures commence construction, more of the surrounding area would be affected by changing views. Taller structures/equipment would include cranes, the stack, cooling towers, and transmission towers. As the taller structures reached completion toward the end of the 42-month construction schedule, they would be seen from greater distances along MS 495 and possibly MS 39. It is not anticipated that there would be views of the construction activities from Okatibbee Lake and WMA or from Kemper County Lake.

Surface Lignite Mine

The initial development of the mine would involve tree harvesting, vegetative clearing, burning, and earthmoving activities. Water control structures and the excavation and preparation of sedimentation ponds would occur early in the development of the mine. Stream and road relocations, overburden stockpiles, dragline construction, and construction of the buildings would also be occurring. Mine development would be the most extensive impact since more area of the entire mine study area would be involved. These activities would be visible to the traveling public from MS 495 and MS 493 and from many of the local roads. The widespread activities would be temporary as the mine infrastructure is completed during the approximately 30-month construction period. Views should be limited to the traveling public and nearby surface landowners. Existing roadside vegetation would screen some views.

Linear Facilities

The construction activities would involve removing the forested vegetation within the transmission line corridors, vegetation in the areas of any access roads, and vegetation in the pipeline corridors. It is anticipated that most of the vegetative debris would be burned. Completion of the pads, erection of the poles, and construction of any access roads would occur in the transmission corridors. The amount of time spent in any one place within either the transmission or pipeline corridors would be limited. The views of the construction activities would also be limited as the surrounding vegetation is primarily forested. Where there are openings in the tree cover and at road crossings, the construction activities would be visible. Construction of the substations would result in removal of the existing vegetation. Construction of the substations would have a limited visual impact restricted to the traveling public in the area and a few local residents.

4.2.16.2 Operation

Power Plant

At completion of power plant construction, the land use would be converted from primarily forested land in silvicultural use to an electrical power generation facility, the second one in Kemper County. The proposed power plant would be the only built environment of its kind in the surrounding area. The other power plant located in the county is located approximately 14.5 miles northeast of the proposed site. Taller structures would include the stacks, baghouses, cooling towers, and onsite transmission towers. Despite the incongruous appearance of the proposed plant, existing forested vegetation would screen all but the tallest structures from the few nearby residences and from the traveling public along MS 493. The taller structures would be visible to the traveling public along MS 493, from local roads, and possibly at limited intervals along MS 495 and MS 39. Views of the majority of the site and facilities would be obscured by perimeter vegetation. Landowners in the area would have views of the taller structures. It is possible that the tallest structures could be seen from Okatibbee Lake and WMA and Kemper County Lake. The lighting required at night would be visible for many miles where views are unobstructed by foreground vegetation. Mitigative measures to be used would be shielded fixtures and a dual lighting system in accordance with FAA Circular AC 70/7460_15 (January 1, 1996). The dual lighting system uses medium-intensity strobes during the day and steady red lights at night. The flame produced by the occasional operation of the derrick flares to combust syngas during IGCC plant upsets would also be visible. However, it is not expected that such events would be frequent. These events would also likely have short durations.

Surface Lignite Mine

Once development of the mine is complete, operation of the mine would be expected to proceed at approximately 275 acres per year. As active mining progressed, reclamation activities would follow to reestablish landforms and vegetation. The mining activities would be visible along MS 495 and MS 493 and the local roads in the project area at times. Surface landowners in the area would be visually impacted by the active mining operations. The traveling public might be able to see the top of the dragline and might occasionally see the piles of overburden. The coal handling equipment would be collocated with the power plant. Only a limited area of the overall mine would be actively excavated and reclaimed each year.

Long-term visual impacts attributable to the mine study area would likely be few. Depending upon landowner preferences, the current number of residences in the mine study area could remain approximately the same or decrease. Similarly, the types of vegetation after mining could vary from current conditions, although the amount of forested land postreclamation would be expected to be similar for both economic and recreational considerations. There would likely be more ponds in the postmining landscape. The visual impact of the reclaimed mine study area might be minimal, depending on landowner preferences. Given the intervening vegetation that would not be disturbed, active mining activities would not be visible from Okatibbee Lake and WMA or Kemper County Lake.

Linear Facilities

Only the electrical transmission line corridors would have tall structures. The majority of the corridors traverse forested lands. The transmission towers would be visible throughout the postconstruction landscape where views were available. It can be anticipated that views would be limited to road crossings and a few residences. In general, the views would be limited (e.g., to the tops of structures) except at road crossings because of the presence of intervening trees and vegetation. The transmission lines would be visible where silvicultural activities result in clear-cutting. The pipelines would be buried, and the only indications of their presence would be signage and maintained, lower vegetation above and adjacent to the pipelines. The operational substations would only be visible to the traveling public in the immediate vicinity and to local landowners.

4.2.17 CULTURAL AND HISTORIC RESOURCES

Cultural and historic resources that might be affected by construction or operation of the various components of the project were described in Section 3.18. Of primary concern would be impacts to resources that have been determined to, or could potentially, be eligible for listing on the NRHP.

4.2.17.1 Construction

Power Plant

The approved cultural resources study of the plant site yielded no sites potentially eligible for listing other than one architectural resource, the Goldman House. In correspondence with Mississippi Power and NACC, MDAH determined that this house was potentially eligible for listing on the NRHP and that its demolition would be an adverse effect. MDAH stated that mitigation in the form of Historic American Building Survey (HABS)-quality documentation (drawings and photographs) would be required if the house were to be demolished. The current site arrangement might allow for the house to remain in place and undisturbed. If the house cannot be avoided, however, Mississippi Power and NACC would then not disturb this house prior to completion of the required HABS documentation. After completing the documentation process, the house could be relocated or demolished.

It is unlikely but conceivable that, during construction of the power plant, additional archaeological resources might be encountered. In such situations, adverse impacts to such resources would be avoided, minimized, or mitigated pursuant to an approved emergency discovery plan.

As was shown in Figure 3.18-1, there are no NRHP-listed sites near the power plant site. The two closest listed sites are the Perkins House and the Oliver House, both approximately 5 miles northwest of the power plant site.

Surface Lignite Mine

All potential cultural resources sites would be identified prior to any mine or mine-related activity disturbance. Cultural resources include archaeological sites, standing structures, cultural landscapes, and traditional cultural properties. Once sites were identified and determined to be significant, and, based on the proposed mine plan and associated facility disturbance, it would be necessary to identify which archaeological sites, cultural landscapes, and structures would be impacted and mitigated. Potentially eligible NRHP sites that could be adversely impacted would require Phase II work to determine eligibility.

Prior to any vegetation clearing, the qualifying archaeological site would be completely mitigated, and all documentation of the site would be approved by affected parties as identified in a programmatic agreement to be developed specifically for this project. Once approved, the construction activity would commence. The only difference between the impacts of mine construction and mine operation on archaeological sites would be the time at which impacts occurred.

Linear Facilities

A number of cultural resources deemed eligible and potentially eligible for listing on the NRHP were discovered during the extensive field surveys of the proposed linear facility corridors (156 miles surveyed). Impacts to those resources would depend on whether: (a) the potentially eligible resources were determined to be, based on Phase II evaluation, eligible for listing; and/or (b) avoidance would be possible through transmission line structure location or pipeline trench alignment. Given that detailed engineering of the transmission lines and pipelines would not occur for some time, definitive assessments of potential impacts are not possible at present. Construction activities and facility designs could be carried out to avoid the resources. However, some sites were determined in the field to cover most or all of the 200-ft width of the study corridor. Transmission line construction could potentially avoid impacts by spanning particular sites. Pipeline construction, however, would not, in these few instances, be able to avoid some sites without rerouting. In these cases, Phase III data recovery would be the likely recourse. Tribal representatives have expressed their particular interest in any sites that might be investigated and artifacts that might be recovered, to the extent those sites/artifacts would relate to historical Native American habitation or presence.

Figure 3.18-1 illustrated a number of previously listed places in proximity to planned linear facility study corridors. Numerous places are shown in Meridian near one of the transmission line segments that would be upgraded. However, as this line and right-of-way already exist, it can be concluded that no significant new impacts would result from the line upgrade. Two listed places are near the proposed CO_2 pipeline corridor in the vicinity of its crossing of the Lauderdale-Clarke County line. Stuckey’s Bridge over the Chunky River is located more than 1 mile west of the corridor, while the Ward House in northern Clarke County is somewhat closer but separated from the corridor by I-59. Construction of the pipeline would impact neither of these places, given the separation of each from the corridor.

4.2.17.2 Operation

Power Plant

Once constructed, the operations of the IGCC power plant and related onsite facilities would have no potential to affect cultural or historical resources beyond those impacts that would occur during construction.

Surface Lignite Mine

All potential cultural resources sites would be identified prior to any mine or mine-related activity disturbance. Cultural resources include archaeological sites, standing structures, cultural landscapes, and traditional cultural properties. Once sites were identified and determined to be significant, based on the proposed mine plan and associated facility disturbance, it would be necessary to identify which archaeological sites, cultural landscapes, and structures would be impacted and mitigated. Potential NRHP sites that could be adversely impacted would require Phase II work to determine eligibility.

Impacts to archaeological sites come primarily from the removal of the overburden soil in order to access the lignite coal. Impacts to standing structures additionally might include viewshed alterations and activities that affect the integrity of the structure's setting.

The survey conducted for the EIS represents part of a Phase I effort. A 100-percent survey will be completed prior to application for the Mississippi Surface Mining and Reclamation Permit with the MDEQ. Once the 100-percent Phase I survey is complete, significance of the sites will be determined. Significance would be linked to NRHP eligibility statements, as required under Section 106 of the National Historic Preservation Act (NHPA).

Prior to any vegetation clearing for mining, the qualifying archaeological site would be completely mitigated, and all documentation of the site would be approved by affected parties as identified in a project-specific programmatic agreement. Once approved, the mining activity would commence. The only difference between the impacts of mine construction and mine operation on archaeological sites would be the time at which impacts occurred.

It is important to note that construction and mine disturbances associated with a surface mine do not all occur at the initiation of the project. The disturbances would be over time as the mining advances from one block to the next, as described in Chapter 2. All of these disturbance activities associated with the construction or the mining at the surface mine project area would be preceded by a complete survey and sign-off of the site by appropriate state and federal authorities in accordance with Section 106 of the NHPA.

Linear Facilities

The operations of the linear facilities would have essentially no potential to impact cultural or historical resources beyond those impacts that would occur during construction.

4.2.18 NOISE

Noise would result from both the construction and operation of the proposed facilities. A contractor to ECT (Tech Environmental) conducted a noise study (2009) that evaluated the potential impacts of power plant and lignite mine construction and operation. Their full report is included in Appendix Q. Impacts associated with the linear facilities would be minor and are discussed briefly.

4.2.18.1 Construction

Power Plant and Surface Lignite Mine

The construction of the Kemper County IGCC Project power plant and connected lignite mine would require the use of equipment that might be audible from offsite locations. Facility construction would consist of site clearance, excavation, foundation work, steel erection and installation of facility equipment, and finishing work. Some of these activities would overlap. During construction of the proposed facilities, noise would be generated by construction equipment including bulldozers, trucks, backhoes, graders, scrapers, compactors, cranes, pile drivers, pumps, pneumatic tools, air compressors, and front-end loaders. Noise levels during construction on the site would be typical of any major industrial plant construction. Noise from construction-related truck traffic passing residences on MS 493 and other local roads would constitute another form of noise impact.

The noise levels resulting from construction activities would vary greatly depending on factors such as the type of equipment, the specific equipment model, the operations being performed, and the overall condition of the equipment. Variations in the energy expended by the equipment and changes in construction phases and equipment mix make the prediction of potential noise impacts even more challenging.

EPA (1971) published data on the average sound levels for typical construction phases of industrial facilities. These average levels were projected from the edge of the power plant footprint to the closest residential receiver, located at a distance of approximately 900 ft. This calculation conservatively assumed all equipment operating concurrently onsite for the specified construction phase. The results of these calculations are presented in Table 4.2-44, which shows that estimated construction sound levels at the nearest residence would be between 53 and 64 dBA for all activities except pile driving, which, if necessary, would produce a sound level of approximately 68 dBA at the nearest residence. If pile driving were required for the project's foundations, that activity would most likely be limited to daytime hours. The construction sound at more distant locations would be less since sound level decreases with distance from the sound source. Construction noise impacts would be temporary, and the highest levels experienced by residents would be no louder than maximum levels from passing vehicular traffic on MS 493.

Table 4.2-44. Estimated Sound Levels at the Closest Residential Receptor by Construction Phase

Construction Phase	50 ft from Source (L_{eq})	At Closest Residential Receptor (L_{eq})
Site clearance	90	64
Excavation	89	63
Pile driving	95	68
Foundations	78	53
Erection	85	60
Finishing	89	63

Source: Tech Environmental, 2009.

The estimated noise levels conservatively (i.e., as an upper bound) do not account for any additional sound attenuation that might result from structures or vegetation. The predicted noise levels apply to receptors outdoors; persons indoors would experience a reduced level of noise.

Reasonable effort would be made to minimize the impact of noise resulting from construction activities. The mitigation measures outlined herein would be incorporated into the construction management guidelines:

- Construction activities that produce significant noise would generally be limited to daytime hours.
- Properly designed engine enclosures and intake silencers would be required.

- Regular equipment maintenance and lubrication would be required.
- All exhaust systems would be in good working order.

One other construction activity that would occur toward the latter part of power plant construction is steam blowdown. Steam blowdown is a procedure using pressurized steam to clear specific equipment of debris. For the HRSGs and steam turbine, the activity would consist of five blows over a period of 6 days lasting approximately 18 to 24 hours each. For the gasifier steam lines, four additional blows of approximately 18 to 24 hours each over a 5-day period would be required. For all of these steam blows, the peak sound pressure level at a distance of 50 ft from the source would be approximately 102 dBA. The noise would attenuate to a level of approximately 77 dBA at the nearest residence (outdoors). Relative to the human response to typical sounds levels presented in Table 3.19-2, the noise produced during the temporary steam blows would approach the level of annoyance. Persons indoors would experience a reduced level of noise.

Linear Facilities

The construction of the new and upgraded transmission lines and substations and reclaimed effluent, natural gas, and CO_2 pipelines would require the use of equipment that might temporarily be audible from locations outside the facility corridors. Project linear facilities construction would consist of site clearing, excavation, foundation work, trenching, pipe laying, structure erection and installation, transmission wire installation, and finishing work. Work on some of these phases would overlap. Excavations for transmission structure foundations would be relatively modest in size to meet the design requirements. Excavations for pipeline trenches would run the length of each corridor but would otherwise be modest in width and depth. Rock blasting would likely not be required to construct the project facilities and structures. At this time, pile driving is also not anticipated to be required.

The sound levels resulting from linear facility construction activities would vary greatly depending on such factors as the operations being performed and the type of equipment being employed. Most of the time, noise generated by these construction activities would be screened by trees and vegetation and/or masked by noise from other manmade activities. At locations more distant from the construction activities, the noticeable sound would be less since sound levels decrease with distance from the source. At any given location, linear facilities construction activities (other than at the electrical substations) would occur during only a brief time (days or several weeks, at most).

4.2.18.2 Operation

Power Plant

Maximum sound levels at nearby sensitive receivers (residences and Liberty Church) were calculated using the Cadna-A acoustic model assuming simultaneous operation of all IGCC plant equipment at maximum operating conditions. Appendix Q contains all Cadna-A model outputs. Figure 4.2-9 shows the location of noise-sensitive receivers in relation to the project site and its property boundaries. Cadna-A is a sophisticated three-dimensional model for sound propagation and attenuation based on International Standards Organization (ISO) 9613-2. Atmospheric absorption is the process by which sound energy is absorbed by the air and was calculated using American National Standards Institute (ANSI) S.1.26-1995 (ANSI, 1995). Air absorption of sound assumed standard day conditions and is significant at large distances and high frequencies. ISO 9613-2 was used to calculate propagation and attenuation of sound energy by hemispherical divergence with distance, surface and building reflection, and shielding effects by barriers, buildings, and ground topography. The predicted maximum sound levels are conservative because: (1) the acoustic model assumes a ground-based temperature inversion, such as may occur on a calm, clear night when sound propagation is most favorable; (2) the model was instructed to ignore foliage sound absorption; and (3) no ground absorption (i.e., 100-percent sound wave reflection) was assumed for the plant equipment area.

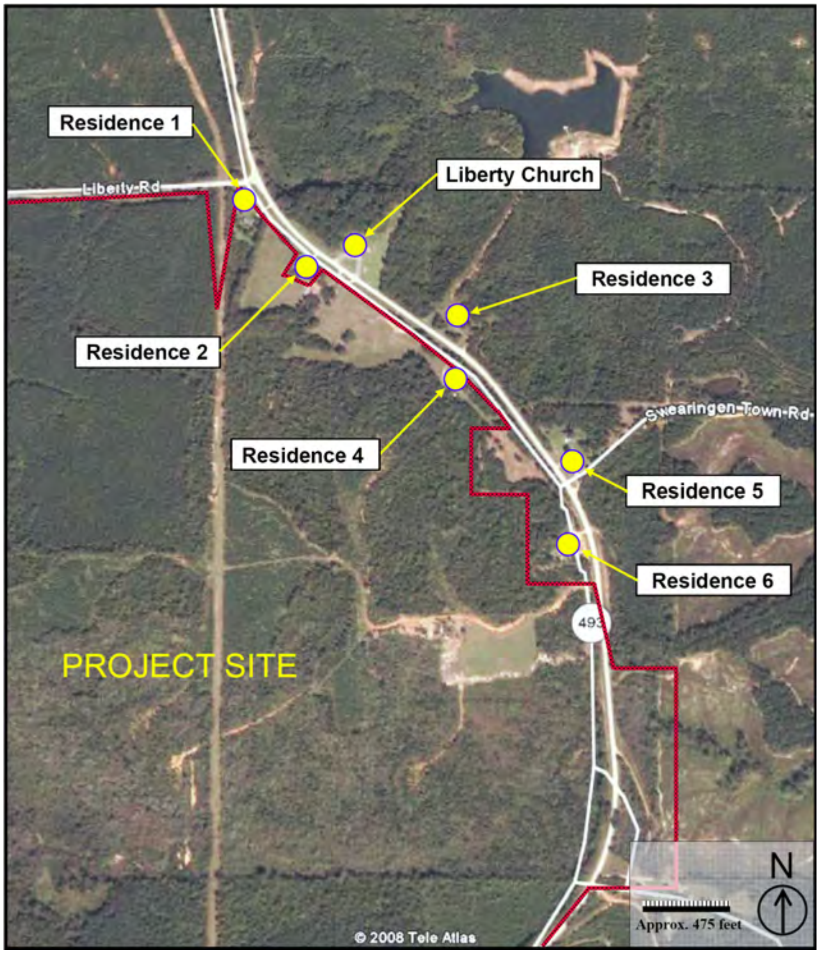

Figure 4.2-9. Sensitive Receiver Locations near Kemper County IGCC Plant

Source: Tech Environmental, 2009.

The potential future sources of sound at the site would be the coal gasification process equipment, including process air compressors (PAC) and PAC intercoolers, CTs and generators, a steam turbine and generator, CT air inlets, HRSGs, HRSG exhaust stacks, cooling towers, transformers, and auxiliary equipment. The modeling effort assumed standard silencers on the HRSG air inlet and exhaust and standard acoustical enclosures for the CTs and steam turbine. Modeling also assumed noise mitigation from barrier walls around the PAC and PAC intercoolers on the north, east, and south sides. These sound sources would have the highest sound power at the facility, and some form of sound reduction would be necessary to limit offsite noise impacts. Barrier walls were assumed, but other forms of mitigation could be implemented during detailed design to achieve similar results.

Table 4.2-45. Maximum Sound Levels from the Kemper County IGCC Plant (dBA)

Receiver Location	L_{eq}	L_{dn}
Residence 1	46.2	52.6
Residence 2	47.4	53.8
Liberty Church	43.4	49.8
Residence 3	44.7	51.1
Residence 4	47.9	54.3
Residence 5	45.6	52.0
Residence 6	50.9	57.3

Source: Tech Environmental, 2009.

Table 4.2-45 summarizes predicted L_{eq} at the sensitive receiver locations . These are maximum sound levels that assume all facility equipment would be in operation, and atmospheric conditions produce minimum sound attenuation. Predicted maximum facility sound levels are 43 to 51 dBA at the nearest receivers. Figure 4.2-10 presents a color contour plot of the facility sound levels and predicted levels at the sensitive receivers.

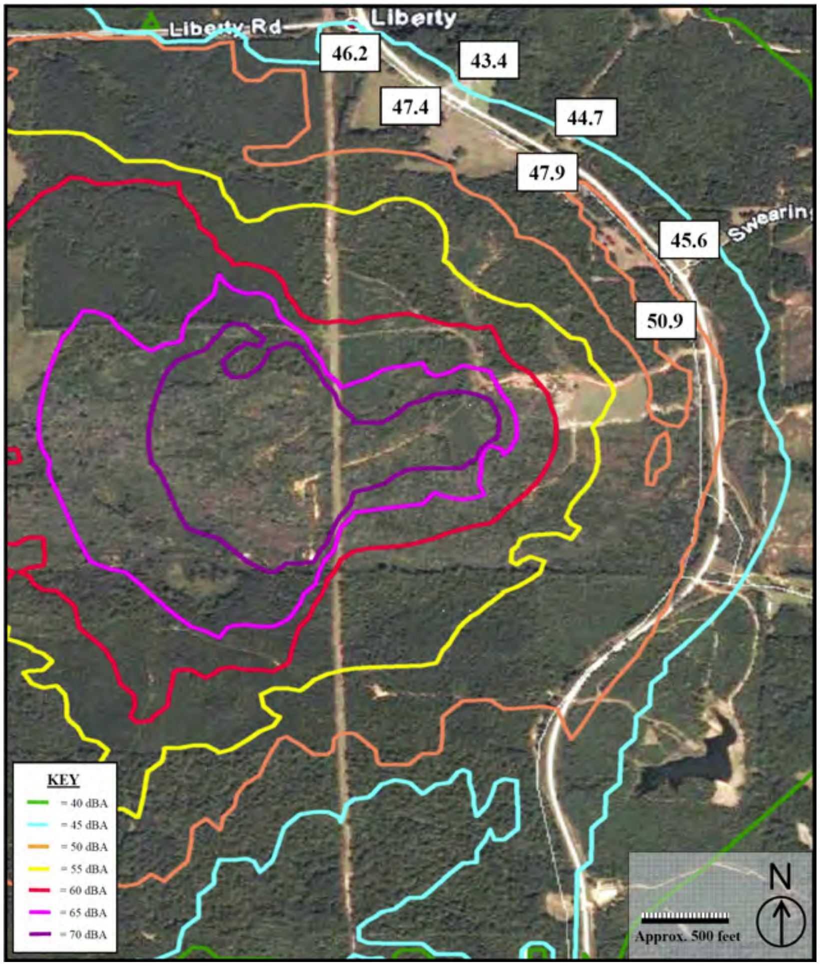

Figure 4.2-10. Maximum Sound Levels (dBA) at the Kemper County IGCC Plant (L_{eq})

Source: Tech Environmental, 2009.

Table 4.2-40 also provides the L_{dn} computed for noise from the IGCC power plant. Whereas the facility would operate 24 hours per day, the L_{dn} level is equal to the predicted L_{eq} level plus 6.4 dBA. These results show that the L_{dn} operational sound levels at Liberty Church and at all but one of the nearest residences would comply with the EPA residential noise guideline of 55 dBA L_{dn}. The predicted level at Residence 6 would be slightly above the EPA guideline but below the HUD residential guideline of 65 dBA L_{dn}.

It is expected that the sound from the IGCC power plant would be more audible at night when there would be less roadway traffic or human activity. Much of the time, depending upon weather conditions, actual sound levels would be less than predicted here, because this analysis does not include additional attenuation from wind gradients and atmospheric turbulence, effects that, at times, can reduce sound levels 10 to 20 dBA.

Combined Power Plant and Surface Lignite Mine Impacts

This subsection presents the potential sound impacts from lignite coal mining operations and the potential sound impact of coal mining and the power plant operations occurring simultaneously. Both operations would normally occur 24 hours per day and 7 days per week. The mining operation would consist of three major activities: removal of overburden, surface mining of coal, and reclamation of the open pit.

Surface mining would first consist of removing the overburden and then the exposed lignite seam with excavating equipment. This sequence would be repeated for each seam to be mined. The removal of the overburden for the first 5- to 20-ft depths would be conducted using a hydraulic-powered shovel to excavate the overburden and load into large dump trucks, which would then remove the overburden from the area. At depths below 20 ft, the electric-powered dragline would be used to remove overburden material. The dragline would operate from a bench within the pit mine. Once the overburden is removed from the pit, surface mining operations would occur.

Equipment used during surface mining activities would consist of electric-powered dragline, cable tractor, loaders, large dump trucks, dozers, graders, and backhoes. Surface mining would commence in the northeast corner of the life-of-mine area closest to the IGCC power plant. Each mining pit would be approximately 150 ft wide and 7,000 ft long and would be constructed from north to south, with mining operations occurring from east to west or west to east within each pit.

As required by federal and state surface mining regulations, reclamation of mined areas would occur concurrently with other mining operations. Following removal of the final coal seam from a mine pit, the pit would be backfilled with the overburden material from the adjacent active mine pit. The same equipment used to remove the overburden would be used during reclamation activities. If necessary, top soil would be salvaged, and large dozers would be used to spread the final cover. The final cover would be mulched, seeded, and planted to reduce runoff and dust impacts.

NACC provided a list of equipment anticipated to be in operation during coal mining. Noise emissions from mining operations were based on sound level measurements taken by NACC of some of the louder pieces of equipment and from Federal Highway Administration (FHWA) documentation (U.S. Department of Transportation [DOT], 2006). Table 4.2-46 presents the equipment and sound power levels used to represent surface coal-mining operations. Usage factors were applied to the sound power levels for each piece of equipment. A usage factor is the percentage of time during a 1-hour period that the equipment is actually being used at its maximum power and not shut down or idling. For example, during mining operations, the dragline would have a high usage factor of 90 percent, whereas a large dozer would have usage factor of 40 percent (DOT, 2006).

Table 4.2-46. Coal-Mining Equipment Sound Power Levels

Equipment	Sound Power Level (L_w) (dBA)
P&H 757 dragline*	119
Cable tractor	113
Cat 966 front-end loader	108
Cat 345 backhoe	108
Cat 365 backhoe	108
Cat 789C end dump truck*	112
Cat 785C end dump truck	111
Cat 844 wheel dozer	110
Cat 994F wheel loader	112
Cat D11R track dozer	109
Cat D10R track dozer	110
Cat D10R D.L. dozer	116
Cat D6LGP/D8LPG track dozer	110
Cat 24H* and 16 H graders	115
Cat D400 dump truck	110
O&K hydraulic shovel	116
O&K RH120C backhoe	108
Cat 436 backhoe/loader	114
Cat 825C compactor	109
Cat water truck	107

*NACC provided sound data for these pieces of equipment.

Sources: NACC, 2008; Tech Environmental, 2009.

The Cadna-A model was used to model the surface mining operations. The overburden removal phase would generate the highest sound levels during mining operations because much of the equipment would be working at the shallowest depth of the mining activities compared to those inside the pit, which would provide shielding for the dragline and other mining equipment. These highest sound levels were used to assess potential noise impacts at the seven noise-sensitive receivers. Sound modeling was conducted for two worst-case scenarios: (1) mining operations at its closest point to the noise-sensitive receivers, and (2) mining and IGCC power plant operating simultaneously. Because the coal mining operation would be approximately 2 miles away from the nearest noise-sensitive receivers impacted by the IGCC power plant, the sound level contribution from mining operations would not add to the plant's impacts at those same receivers. The cumulative modeling results showed that the IGCC power plant and mine operating simultaneously would not generate sound levels higher than those presented in Table 4.2-45 for IGCC power plant operating by itself. Figure 4.2-11 shows the maximum sound level contours for coal mining and IGCC power plant operating simultaneously. Appendix Q presents other graphical presentations of results as well as the Cadna-A model outputs.

The magnitude and areal extent of noise impacts beyond each subsequent active mining area would not likely vary to any significant degree. However, the noise generated by mining activities would shift with shifts in mine block locations, and new areas would be impacted. Mining of portions of blocks B1, C, E, and F would likely result in some temporary noise impacts within the northern areas of the WMA (see Figure 2.2-3).

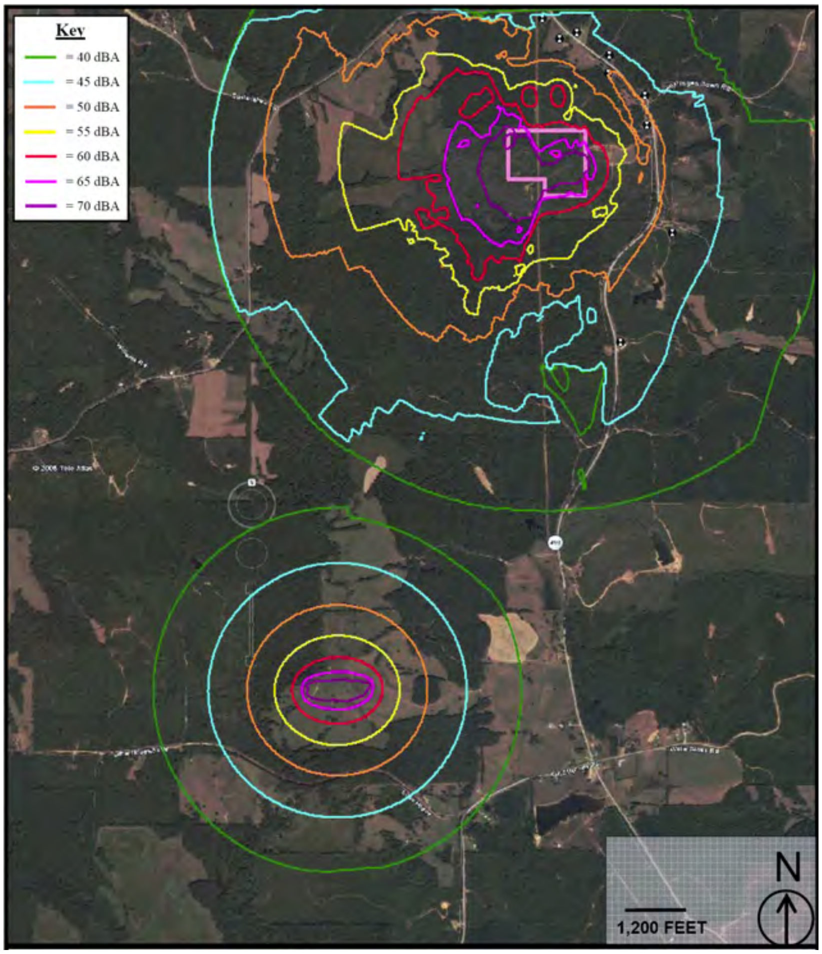

Figure 4.2-11. Maximum Sound Levels from Surface Mining Operations and IGCC Power Plant Noise (dBA)

Source: Tech Environmental, 2009.

Linear Facilities

Both the natural gas pipeline and CO_2 pipeline would be underground. Normal operation of these facilities would produce no noise.

Turning to electrical transmission line operation, the *corona effect* could produce some limited audible noise and radio interference. The audible noise associated with a transmission line is generated by either corona from the conductors or from gap-type discharges. Corona is a phenomenon that occurs when there is an irregularity on the surface of the conductor, such as buildup from fog, water droplets, significant PM, etc. Corona activity at the surface of the conductors produces a low-level audible noise that is a slight humming sound. Under wet conditions, higher noise levels are experienced than would occur under dry conditions. However, the background noise from various sources (inclement weather, traffic, etc.) has the effect of masking transmission line noise. For a small portion of time, when the conductors are wet from rainfall or heavy fog, the transmission line noise would increase.

For the new and reconductored transmission lines, maximum audible noise levels at the edges of the rights-of-way should be less than levels that might potentially result in any interference of activity, including at the nearest residential areas.

Corona, which can occur on high-voltage transmission lines, produces electromagnetic noise. When this noise is sufficiently strong, it can cause interference with radio and television signals. Since corona is enhanced by water droplets or water vapor, the magnitude of this noise is greater during wet or rainy periods than during dry or fair weather periods. The amplitude-modulated (AM) broadcast radio band and two television bands (very high frequency [VHF] and ultra high frequency [UHF] bands) are susceptible to this potential interference. No interference is typically expected for frequency-modulated (FM) radio, cable or satellite television systems, cellular telephones, home cordless telephones, or wireless networking. In general, the electromagnetic noise levels from a transmission line decrease with increasing distance from the right-of-way and with increasing noise frequency. Thus, interference effects are greatest immediately adjacent to the right-of-way and at the lower broadcast frequencies for radio and television.

Actual radio and television interference from transmission line corona would depend on numerous factors, including the weather, terrain, broadcast signal strength, and frequency. In general, corona effects from transmission lines at 230-kV or lower are not a significant issue. Due to the normal 230-kV operating voltages and the mostly rural, isolated locations of the proposed rights-of-way, the overall impacts to radio or television would likely be minimal, with the main potential for impact being the lower frequency AM radio band.

4.2.19 HUMAN HEALTH AND SAFETY

Both construction and operation of the Kemper County IGCC Project facilities would potentially impact human health and safety. Local community residents as well as project workers and employees could be impacted. Potential impacts due to releases of toxic or hazardous materials, whether due to accidents or intentional acts of terrorism, are described in this section.

4.2.19.1 Construction

Construction of all of the project facilities and components would involve the operation of heavy equipment and other job site hazards. U.S. Department of Labor Bureau of Labor Statistics (BLS) data for the United States construction industry were extracted from the BLS Web site (U.S. Department of Labor, 2009). Data were obtained on incidence rates of: (a) nonfatal occupational injuries and illnesses, and (b) fatal occupational injuries. The incidence of nonfatal injuries and illnesses averaged 230.5 per 10,000 full-time workers over the 5-year period from 2003 through 2007. The data show that injuries occur at a higher rate in the construction industry than in all United States industries on average (although the trend over the 5 years of data for construction was distinctly downward). The number of fatal injuries in the United States' construction industry during the same 5-year period averaged 1,246 per year. By comparison, there were 5,657 total fatalities in United States' industry in 2007. As reported elsewhere by BLS (Department of Labor, 1999) for the period 1995 through 1999, the construction industry had an average fatality rate of 14.3 per 100,000 full-time workers.

As discussed in Section 2.3, an average of approximately 500 construction workers would be onsite during the estimated 3.5-year construction period. Assuming an added 50 workers associated with mine construction over the same period and applying the industry incidence rates, an average of approximately 13 injuries per year might be anticipated. No fatalities would be expected in a given year (applying the incidence rate yields less than 0.1).

The proposed power plant and some of the mine facilities would be subject to several OSHA standards during construction (e.g., OSHA General Industry Standards [29 CFR 1910] and the OSHA Construction Industry Standards [29 CFR 1926]). A majority of the mine facilities would be solely subject to MSHA standards (30 CFR) during construction. During construction, risks would be minimized by the proposed facilities' adherence to procedures and policies required by OSHA and/or MSHA. These standards establish practices, chemical and physical exposure limits, and equipment specifications to preserve employee health and safety. Construction permits and safety inspections would be employed to minimize the frequency of accidents and further ensure worker safety. Construction equipment would be required to meet all applicable safety design and inspection requirements, and personal protective equipment would be used when needed to meet regulatory and consensus standards.

Subsection 4.2.13, previously, discussed potential impacts on transportation infrastructure. As presented therein, construction traffic would impact local highways and roads. The increases in traffic would have the potential to increase local area traffic-related accidents, injuries, and deaths.

During the construction phase, workers and suppliers would arrive and leave the site by cars and trucks. DOT has developed statistics for fatalities based on 1 million VMT. For 2008, the fatality rate was 1.37 per 100 million VMT (National Highway Traffic Safety Administration [NHTSA], 2009). Assuming an average of 629 workers per month over a 42-month construction period and 50 truck deliveries per day and that each worker and trucker would make two trips per day (one arriving, one leaving) over 6 days a week provides a conservative upper-bound estimate of roadway accidents. It was further assumed that all workers would individually make daily vehicle trips of 25 miles per day on roadways, even though it is likely that some construction workers would reside closer to the project area and that many workers would carpool often with other workers. If each trip is assumed to be 25 miles in length, then, collectively, over the 42-month period, the total number of miles driven by all workers would be approximately 42,206,250 miles. Based on a fatal accident rate of 1.37 fatalities per 100 million VMT (*ibid*.), 1 fatality might be predicted due to the construction of the project (the application of the fatal accident rate yields approximately 0.6).

4.2.19.2 Operation

Power Plant

General Considerations of Operation, Including Traffic

As discussed under construction, BLS statistics were obtained for incidences of worker injuries and fatalities under the category "electrical power generation." The incidence of nonfatal injuries and illnesses averaged 83.4 per 10,000 full-time workers over the 5-year period from 2003 through 2007. The data show that injuries occur at a lower rate in the power generation industry than in all United States' industries on average. The number of fatal injuries in the United States' power generation industry during the same 5-year period averaged 13 per year. As reported by BLS (Department of Labor, 1999) for the period 1995 through 1999, transportation and public utilities had an average fatality rate of 12.7 per 100,000 full-time workers. Closer examination of the underlying data show that most of these deaths were in the transportation sector (e.g., trucking), not in the utility sector.

As presented in Section 2.4, a maximum of approximately 105 employees would staff the IGCC power plant. Applying the industry incidence rates, an average of approximately one injury per year might be anticipated. No fatalities would be expected.

During operations, an upper limit on traffic fatalities could be estimated by assuming that approximately 318 maximum employees would be employed by the power plant and the mine, and an estimated 45 deliveries would occur daily. Assuming every employee traveled an average of 50 miles per day (25 miles both to and from work), this would collectively total approximately 37,686,250 miles traveled over the first 5 years of operation and 301,500,000 miles traveled over a 40-year period of operations. Based on a fatal accident rate of

1.37 fatalities per 100 million VMT (NHTSA, 2009), these estimates of travel would suggest potentially one fatal accident during the first 5-year period (calculation yields 0.52), and approximately four (calculation yields 4.1) fatalities could occur during the 40-year life of the power plant and the mine.

During operation of the proposed facilities, as with their construction, risks would be minimized by the proposed facilities' adherence to procedures and policies required by OSHA. These standards establish practices, chemical and physical exposure limits, and equipment specifications to preserve employee health and safety.

The proposed facilities would also likely develop supplemental detailed procedures for inclusion in their Occupational Safety and Health Program to assure compliance with OSHA and EPA regulations and serve as a guide for providing a safe and healthy environment for employees, contractors, visitors, and the community. These procedures would include job procedures describing proper and safe manners of working within the facilities (e.g., handling and storage of ammonia would comply with 29 CFR 1910.111), appropriate personal protective equipment (complying with 29 CFR 1910.132), and appropriate hearing conservation protection devices. The manual would be used as a reference and training source and would include accident reporting and investigation procedures, emergency response procedures, toxic gas rescue-plan procedures, hazard communication program provisions, material safety data sheet accessibility, medical program requirements, and initial and refresher training requirements. In addition, supplemental provisions would be added to the proposed facilities' emergency action, risk management, and process safety management plans.

HAPs Impact Analyses

HAPs would be emitted from the IGCC facility, most notably from the CT/HRSGs, auxiliary boiler, AGR process, and flares. The facility would not be a major source of HAPs (i.e., it would have total emissions that are less than 25 tpy of total HAPs and less than 10 tpy of any single HAP). The total HAP emissions from the power plant would be a maximum of 18.5 tpy of total HAPs.

An analysis of the potential effects of HAP emissions from the proposed IGCC facility CT/HRSG stacks was performed for the 50- and 67-percent CO_2 capture cases (AECOM, 2009a and e). These analyses are included in separate reports in Appendix R. The following discussions present the worst case of the two analyses. The HAPs were ranked in terms of potential impacts on health by comparing the maximum emissions of individual HAPs to their associated toxicological values for cancer risk and chronic exposure. The results indicated that arsenic and cadmium emissions would contribute to nearly 75 percent of the inhalation cancer risk and nearly 50 percent of the chronic noncancer inhalation risk. Since the combined impacts from these two substances were shown to be well below the levels of concern (i.e., more than two orders of magnitude below the reference air concentration and less than 20 percent of the one-in-a-million cancer risk target), it was concluded that all of the HAPs in combination would not pose an unacceptable health risk. Mercury is not classified as a carcinogen, and although mercury was not expected to contribute much to the chronic inhalation noncancer health risk, mercury was also evaluated because of the general concern over this substance. Mercury is an environmentally persistent bioaccumulative toxic element. In particular, the deposition of air mercury emissions onto watersheds can lead to increased human health risks from ingestion of fish with elevated mercury levels.

Only syngas firing was considered in the analysis, since that fuel would be the source of the HAPs resulting in the highest risks (i.e., arsenic and cadmium), as well as the primary source of the mercury emissions. Also, emissions were based on the CTs operating continuously at peak power. The modeling methodology was consistent with that of the Class II PSD analysis. However, only the meteorological data based on the surface characteristics of the National Weather Service site at the Meridian Airport were used, since they were found to result in the highest modeled concentrations. Although the risk analyses contained in Appendix R were limited to the three substances mentioned previously (arsenic, cadmium, and mercury), the evaluation for this discussion was expanded to include estimates of concentrations and risks for the complete list of HAPs emitted from the CT/HRSGs while firing syngas.

Cancer and Noncancer Risks—Cancer risk was determined by multiplying the modeled concentrations by the chemical specific unit risk estimate (URE) developed by EPA. The URE has units that are the inverse of concentration, such that the chronic predicted concentration multiplied by the URE produces the probability that a person breathing the pollutant at that concentration for a lifetime will have of developing cancer. A one-in-a-million risk is generally considered to be an acceptable level.

Noncancer risk was assessed by comparing the chronic predicted concentration to an inhalation reference concentration (RfC). The RfC is an estimate of a continuous inhalation exposure of a chemical to the human population, including sensitive subpopulations, that is likely to be without risk of deleterious noncancer effects during a lifetime. The RfCs are generally higher for shorter averaging times. If the hazard quotient, defined as the predicted concentration divided by the RfC, is below 1, then the noncancer risk is considered to be acceptable.

The chronic cancer and noncancer risks were assessed in two ways. First, the maximum risk was based on the maximum impact from the IGCC plant predicted to occur anywhere. Second, the average risks for the project were estimated. The latter were developed by averaging the predicted impacts for a model receptor grid of 1,000-meter spacing covering the entire county. In addition, the average predicted concentrations were added to chemical-specific values predicted for the project in the 1999 National Air Toxics Assessment (EPA, 2008). The results for the IGCC plant maximum impacts and Kemper County-wide average impacts are shown in Tables 4.2-47 and 4.2-48.

The maximum risks estimated from the Kemper County IGCC Project are shown in Table 4.2-47. As can be seen, the hazard quotients were predicted to be much less than 1, and the total individual cancer risk were estimated to be well below the target value of one in a million (i.e., less than 1.0E-06).

The average project chronic cancer risk estimates were driven by the background estimates from the NATA study. Although the total cancer risk was greater than one in a million (i.e., 4.1E-06), the project's contribution to the total would be less than 1 percent of the total (see Table 4.2-48). The risk is attributed to the high background estimates for acetaldehyde and benzene, which accounts for approximately 88 percent of the total estimated cancer risk.

Also in Table 4.2-48, the average project chronic hazard quotient was greater than the target level of 1 (i,e,. 1.3). Again, the Kemper County IGCC Project would contribute an insignificant amount (i.e., 0.05 percent) to the noncancer risk estimate. The high-risk estimate was primarily due to a high background level of acrolein and, to a lesser extent, by the estimated background levels of acetaldehyde and formaldehyde. Acrolein background accounts for more than 90 percent of the risk, and the background concentration of the three substances together account for 99.8 percent of the estimated risk.

Acute inhalation risk was also assessed for these HAPs. The acute dose response values are levels below which no adverse health effects should result for exposure times up to 1 hour. As shown in Table 4.2-49, the maximum predicted concentrations were found to be well below the acute dose response values.

Table 4.2-47. Maximum Chronic Inhalation Risk Estimates from Kemper County IGCC Project

HAP	Maximum Short-Term Emissions (lb/hr)	Maximum Chronic Impact (µg/m^3)	Cancer Unit Risk Estimate (µg/m^3)$^{-1}$	Maximum Cancer Risk	Reference Air Concentration (µg/m^3)	Chronic Hazard Quotient
VOCs						
Acetaldehyde	1.79E-02	8.7E-05	2.2E-06	1.9E-10	9	9.7E-06
Acrolein	1.58E-03	7.7E-06	NA		0.02	3.8E-04
Benzene	1.91E-02	9.3E-05	7.8E-06	7.2E-10	30	3.1E-06
Ethylbenzene	6.43E-03	3.1E-05	NA		1000	3.1E-08
Formaldehyde	8.61E-02	4.2E-04	5.5E-09	2.3E-12	9.8	4.3E-05
Toluene	1.92E-02	9.3E-05	NA		5,000	1.9E-08
Xylene	1.83E-02	8.9E-05	NA		100	8.9E-07
POM*						
PAH†	1.33E-04	6.5E-07	1.1E-03	7.1E-10	200	3.2E-09
2-Mythlnapthalene	1.14E-03	5.5E-06	NA		NA	
Acenapthylene	8.25E-05	4.0E-07	NA		NA	
Benzo(a) anthracene	7.30E-06	3.5E-08	1.1E-04	3.9E-12	NA	
Benzo(e)pyrene	1.75E-05	8.5E-08	NA		NA	
Benzo(g,h,i)perylene	3.02E-05	1.5E-07	NA		NA	
Napthalene	1.45E-03	7.0E-06	3.4E-05	2.4E-10	3	2.3E-06
Metals						
Antimony	1.24E-02	6.0E-05	NA		NA	
Arsenic	9.52E-03	4.6E-05	4.3E-03	2.0E-07	0.03	1.5E-03
Beryllium	2.92E-03	1.4E-05	2.4E-03	3.4E-08	0.02	7.1E-04
Cadmium	1.33E-02	6.5E-05	1.8E-03	1.2E-07	0.02	3.2E-03
Chromium VI	1.45E-03	7.0E-06	1.2E-02	8.5E-08	0.1	7.0E-05
Cobalt	2.57E-03	1.2E-05	NA		0.1	1.2E-04
Lead	1.27E-02	6.2E-05	NA		1.5	4.1E-05
Managanese	1.36E-02	6.6E-05	NA		0.05	1.3E-03
Mercury (total)	3.67E-03	1.8E-05	NA		0.3	5.9E-05
Elemental mercury	3.31E-03	1.6E-05	NA		NA	
RGM	3.67E-04	1.8E-06	NA		NA	
Hg_p	Trace	NA	NA		NA	
Nickel	1.78E-02	8.7E-05	NA		0.09	9.6E-04
Phosphorous	1.08E-02	5.2E-05	NA		0.07	7.5E-04
Selenium	1.36E-02	6.6E-05	NA		20	3.3E-06
Inorganic Compounds						
Carbon disulfide	1.43E-01	6.9E-04	NA		700	
Total				**4.4E-07**		**9.3E-03**

*Polycyclic organic matter.
†Polynuclear aromatic hydrocarbons.

Note: The hourly emissions shown are for a single CT/HRSG and based on full load with duct burner firing.
The unit risk factors (URF) and reference air concentrations from prioritized chronic dose-response values: http://www.epa.gov/ttn/atw/toxsource/table1.pdf.

Sources: AECOM, 2009a and e.
ECT, 2009.

Table 4.2-48. Average Kemper Countywide Chronic Inhalation Risk Estimates from Kemper County IGCC Project

HAP	Maximum Short-Term Emissions (lb/hr)	Maximum Chronic Impact (µg/m^3)	NATA Kemper County Chronic Concentration (µg/m^3)	Total Kemper County Chronic Concentration (µg/m^3)	Cancer Unit Risk Estimate (µg/m^3)$^{-1}$	Maximum Cancer Risk	Reference Air Concentration (µg/m^3)	Chronic Hazard Quotient
VOCs								
Acetaldehyde	1.79E-02	6.1E-06	6.10E-01	6.1E-01	2.2E-06	1.3E-06	9	6.8E-02
Acrolein	1.58E-03	5.4E-07	2.40E-02	2.4E-02	NA		0.02	1.2E+00
Benzene	1.91E-02	6.5E-06	2.90E-01	2.9E-01	7.8E-06	2.3E-06	30	9.7E-03
Ethylbenzene	6.43E-03	2.2E-06		2.2E-06	NA		1,000	2.2E-09
Formaldehyde	8.61E-02	2.9E-05	2.60E-01	2.6E-01	5.5E-09	1.4E-09	9.8	2.7E-02
Toluene	1.92E-02	6.5E-06	3.29E-01	3.3E-01	NA		5,000	6.6E-05
Xylene	1.83E-02	6.2E-06	3.21E-01	3.2E-01	NA		100	3.2E-03
POM			2.99E-03	3.0E-03				
PAH	1.33E-04	4.5E-08		4.5E-08	1.1E-03	5.0E-11	200	2.3E-10
2-Mythlnapthalene	1.14E-03	3.9E-07			NA		NA	
Acenapthylene	8.25E-05	2.8E-08			NA		NA	
Benzo(a) anthracene	7.30E-06	2.5E-09		2.5E-09	1.1E-04	2.7E-13	NA	
Benzo(e)pyrene	1.75E-05	6.0E-09			NA		NA	
Benzo(g,h,i)perylene	3.02E-05	1.0E-08			NA		NA	
Napthalene	1.45E-03	4.9E-07	2.96E-03	3.0E-03	3.4E-05	1.0E-07	3	9.9E-04
Metals								
Antimony	1.24E-02	4.2E-06	8.98E-05	9.4E-05	NA		NA	
Arsenic	9.52E-03	3.2E-06	7.83E-07	4.0E-06	4.3E-03	1.7E-08	0.03	1.3E-04
Beryllium	2.92E-03	9.9E-07	2.48E-07	1.2E-06	2.4E-03	3.0E-09	0.02	6.2E-05
Cadmium	1.33E-02	4.5E-06	7.22E-07	5.3E-06	1.8E-03	9.5E-09	0.02	2.6E-04
Chromium VI	1.45E-03	4.9E-07	3.40E-05	3.4E-05	1.2E-02	4.1E-07	0.1	3.4E-04
Cobalt	2.57E-03	8.7E-07	2.73E-05	2.8E-05	NA		0.1	2.8E-04
Lead	1.27E-02	4.3E-06	8.31E-05	8.7E-05	NA		1.5	5.8E-05
Managanese	1.36E-02	4.6E-06	8.39E-05	8.9E-05	NA		0.05	1.8E-03
Mercury (total)	3.67E-03	1.2E-06	8.90E-07	2.1E-06	NA		0.3	7.1E-06
Elemental mercury	3.31E-03	1.1E-06			NA		NA	
RGM	3.67E-04	1.2E-07			NA		NA	
Hg_p	Trace	NA			NA		NA	
Nickel	1.78E-02	6.1E-06	1.68E-04	1.7E-04	NA		0.09	1.9E-03
Phosphorous	1.08E-02	3.7E-06		3.7E-06	NA		0.07	5.2E-05
Selenium	1.36E-02	4.6E-06		4.6E-06	NA		20	2.3E-07
Inorganic Compounds								
Carbon disulfide	1.43E-01	4.9E-05		4.9E-05	NA		700	6.9E-08
Total						**4.1E-06**		**1.3E+00**

Note: The hourly emissions shown are for a single CT/HRSG and based on full load with duct burner firing.
The URF and reference air concentrations from prioritized chronic dose-response values: http://www.epa.gov/ttn/atw/toxsource/ table1.pdf

Sources: AECOM, 2009a and e.
ECT, 2009.

Table 4.2-49. Maximum Acute Inhalation Risk Estimates from Kemper County IGCC Project

HAP	Maximum Short-Term Emissions (lb/hr)	Maximum Acute Impact (µg/m^3)	Acute Reference Air Concentration (µg/m^3)	Acute Hazard Quotient
VOCs				
Acetaldehyde	1.79E-02	2.0E-03	81,000	2.5E-08
Acrolein	1.58E-03	1.8E-04	0.19	9.2E-04
Benzene	1.91E-02	2.1E-03	29	7.3E-05
Ethylbenzene	6.43E-03	7.1E-04	350,000	2.0E-09
Formaldehyde	8.61E-02	9.6E-03	49	2.0E-04
Toluene	1.92E-02	2.1E-03	3,800	5.6E-07
Xylene	1.83E-02	2.0E-03	8,700	2.3E-07
POM				
PAH	1.33E-04	1.5E-05		
2-Mythlnapthalene	1.14E-03	1.3E-04	6,000	2.1E-08
Acenapthylene	8.25E-05	9.2E-06	NA	
Benzo(a) anthracene	7.30E-06	8.1E-07	100	8.1E-09
Benzo(e)pyrene	1.75E-05	1.9E-06	NA	
Benzo(g,h,i)perylene	3.02E-05	3.4E-06	10,000	3.4E-10
Napthalene	1.45E-03	1.6E-04	130,000	1.2E-09
Metals				
Antimony	1.24E-02	1.4E-03	5,000	2.8E-07
Arsenic	9.52E-03	1.1E-03	0.19	5.6E-03
Beryllium	2.92E-03	3.2E-04	25	1.3E-05
Cadmium	1.33E-02	1.5E-03	900	1.6E-06
Chromium VI	1.45E-03	1.6E-04	1,500	1.1E-07
Cobalt	2.57E-03	2.9E-04	2,000	1.4E-07
Lead	1.27E-02	1.4E-03	10,000	1.4E-07
Managanese	1.36E-02	1.5E-03	50,000	3.0E-08
Mercury (total)	3.67E-03	4.6E-04	1.8	2.5E-04
Elemental mercury	3.31E-03	4.1E-04	1.8	2.3E-04
RGM	3.67E-04	4.6E-05		
Hg_p	Trace			
Nickel	1.78E-02	2.0E-03	6	3.3E-04
Phosphorous	1.08E-02	1.2E-03	20	6.0E-05
Selenium	1.36E-02	1.5E-03	100	1.5E-05
Inorganic Compounds				
Carbon disulfide	1.43E-01	1.6E-02	6,200	2.6E-06
Total				**7.7E-03**

Note: The hourly emissions shown are for a single CT/HRSG and based on full load with duct burner firing.
The URF and reference air concentrations from prioritized chronic dose-response values: http://www.epa.gov/ttn/atw/toxsource/table1.pdf.

Sources: AECOM, 2009a and e.
ECT, 2009.

It can be concluded from the results of this screening assessment that the HAPs emitted from the Kemper County IGCC Project would not result in or contribute significantly to an inhalation human health risk.

Mercury Deposition—An assessment of mercury deposition that could result from potential mercury emissions from the HRSG stacks was conducted. The combustion of fossil fuels containing mercury might result in emissions of elemental mercury, reactive gaseous divalent mercury (Hg^{2+}) (RGM), and/or particle-bound mercury (Hg_p). Hg_p is emitted in particulate form, while both elemental mercury and RGM are released in the gaseous state. The deposition characteristics of each of these three mercury species differ. Elemental mercury has a long residence time in the atmosphere and travels long distances (i.e., greater than 30 miles) before it is ultimately deposited on the earth's surface. The other two forms of mercury, RGM and Hg_p, deposit locally (i.e., within approximately 30 miles) and regionally (i.e., from 30 to several thousand miles). The dispersion of elemental mercury is evaluated on regional and global scales and, therefore, was not considered for this analysis of local mercury deposition. The analysis focused on local deposition (i.e., within approximately 30 miles) and, because RGM is the form of mercury emissions (as opposed to elemental or particulate mercury) to dominate deposition at that scale, the analysis estimated the total deposition caused by potential RGM emissions from the proposed facilities. Dry, wet, and total RGM depositions were estimated using wet and dry algorithms contained in the current version of EPA's AERMOD dispersion model.

The proposed IGCC syngas treatment process would include an alumina-based metal sulfide system for mercury removal. Due to the nature of the IGCC process, emissions of Hg_p would be lower than conventional coal-fired power plants firing the same fuels. Combustion of the treated syngas would result in an estimated potential IGCC total mercury emission rate of 32.18 lb/yr per CT/HRSG stack. Of this total, 90 percent (i.e., 28.96 lb/yr) would be emitted as elemental mercury, 10 percent (i.e., 3.22 lb/yr) as RGM, and only trace amounts as Hg_p. The mercury emission rates and the IGCC HRSG stack parameters for each analysis case are summarized in Tables 2 and 3 of the respective report located in Appendix R.

The application of AERMOD for a deposition analysis requires additional parameters associated with the surrounding surface characteristics, transport characteristics of the pollutant, and meteorological data. The selection of each of these model input parameters is discussed in the following.

Dry gas deposition measures the mass of pollutant transferred to the ground in the absence of precipitation. Because vegetation removes RGM from the atmosphere, information concerning the surface characteristics surrounding the Kemper County site was required. Since the area surrounding the site is forested in all directions, source category 4 (forest) was selected for input to the model. In addition, the reactivity factor of RGM is required. An RGM reactivity factor of 1.0 was used in accordance with EPA guidance (EPA, 2004a). The transport and mobility of a pollutant are determined by the physical properties of the specific pollutant. For deposition modeling, AERMOD requires the following pollutant-specific parameters: (1) diffusivity in air; (2) diffusivity in water; (3) leaf cuticular resistance to lipid uptake; and (4) the Henry's Law constant. The values of these parameters selected to represent RGM are shown in Table 4.2-50.

Table 4.2-50. Physical Characteristics of RGM

Parameter	Value
Diffusivity in air (cm^2/s)	6.0 E-02
Diffusivity in water (cm^2/s)	5.25 E-06
Cuticular resistance (s/m)	1.0 E 7
Henry's law constant ($pa\text{-}m^3/mol$)	6.0 E-06

Source: AECOM, 2009a.

As shown in Figure 6 of each report located in Appendix R, the maximum dry deposition was found to occur along the southeast line of the power block portion of the facility site, and the maximum wet and total RGM depositions occurred along and just past the northeast fence line of the power block. The predicted deposition values are compared to deposition measured at the National Atmospheric Deposition Program (NADP) Oak Grove site in Mississippi, and the outlying landing field (OLF) site near Pensacola, Florida, as shown in the Table 4.2-51.

As can be seen, predicted wet deposition was estimated to be well below the measured values, while dry deposition was found to be within the range of the values measured at the OLF site. The maximum total deposition predicted from the IGCC project emission sources was estimated to be less than 12 percent of the total ambient deposition measured at the OLF site.

Table 4.2-51. Comparison of Modeled Mercury from Kemper IGCC Stacks with Measured Deposition ($g/m^2/yr$)

Pollutant	Maximum Annual Modeled Impact	NADP Mercury Deposition Network	OLF 2005 to 2008 Average Low/High Estimates
Mercury, wet deposition	3.44 E-07	1.68 E-05	1.47 E-05
Mercury, dry deposition	2.24 E-06	NA	1.22E-06/2.45E-06
Mercury, total deposition	2.46 E-06	NA	15.9E-06/17.2E-06

Note: $g/m^2/yr$ = gram per square meter per year.

Source: AECOM, 2009a.

Hazards Associated with Accidental Releases of Ammonia

Two substances that would be generated onsite were evaluated because of their potential for adverse impacts on the public if an accidental release were to occur. Ammonia and CO_2 would be captured from the syngas process. To assess the hazards associated with an inadvertent release of these substances, screening modeling was performed for two scenarios: a catastrophic release and a lesser release scenario. Since ammonia would be transported offsite in tanker trucks, a truck accident involving an almost instantaneous release of ammonia was also evaluated. Accidental releases of CO_2 are addressed subsequently under Linear Facilities.

As just mentioned, ammonia would be recovered from the syngas production process. A portion of the ammonia would be used onsite in the SCR NO_x postcombustion control system of the CT/HRSGs. More ammonia would be created than used in the SCR systems (which would only be required when firing natural gas); the excess would be sold as a useful byproduct. Approximately 70 tpd of ammonia would be produced. The ammonia would be stored in a pressurized aboveground tank of approximately 400-ton (approximately 160,000-gallon) capacity. Tanker trucks of approximately 18-ton capacity (approximately 7,200-gallon) would also be loaded from the tank.

Ammonia Acute Toxicity Levels—Levels of concern for toxic gas releases have been developed by the Emergency Response Planning Committee of the American Industrial Hygiene Association. The values are referred to as Emergency Response Planning Guidelines (ERPGs), and have the following meanings:

- ERPG 1—The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing other than mild transient adverse health effects or perceiving clearly defined odor.

- ERPG 2—The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair an individual's ability to take protective action.
- ERPG 3—The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening health effects, even though effects could be severe.

The ERPGs are not designed to be protective of extremely sensitive individuals, nor do they have safety factors that are normally built into many exposure guidelines. However, the ERPGs are considered to be appropriate for evaluating accidental releases, and are also used in the EPA risk management program analyses required under the CAA. Following are the EPRGs for ammonia:

- EPRG 1 = 25 ppm.
- EPRG 2 = 150 ppm.
- EPRG 3 = 750 ppm.

The routine emissions of ammonia from the CT/HRSG stacks, and very small amounts of fugitive emissions, would be expected to result in offsite impacts that would be much less than the ERPG 1 level of 25 ppm.

Model Selection for Ammonia Accidental Releases—The Areal Locations of Hazardous Atmospheres (ALOHA) model was selected for this analysis (EPA, 2007). This model was developed jointly by EPA and NOAA for use by people responding to chemical releases and for emergency planning and training. ALOHA is designed to simulate toxic gas dispersions, fires, and explosions. The relevant information concerning the physical properties and toxicity of the chemical are contained in the model. In addition to the dispersion of toxic gas, the model can simulate the effects of fires (i.e., heat exposure), and the blast force from a vapor cloud explosion.

Ammonia Accidental Release Scenarios—Three release scenarios were assessed:

- A catastrophic release where the entire contents of the tank were released in a relatively short time frame (e.g., less than 1 hour).
- A more likely release where a break in piping resulted in a much smaller release.
- A truck accident where the entire contents were released nearly instantaneously.

The simulated catastrophic release would involve a rupture of a storage tank and the release of the entire contents. The ammonia in the tank would be stored as a liquid under pressure at approximately 300 psia and at ambient temperature. A breach in the tank would result in a two-phase jet release, (i.e., ammonia gaseous and liquid aerosol). A 12.6-square-inch breach in the tank would result in the entire contents being emptied in 38 minutes at a rate of approximately 19,600 pounds per minute (lb/min). Since the exact location of the storage tank on the IGCC plant site has not yet been determined, a location in the vicinity of the main CT/HRSG stacks was assumed.

The tank puncture would result in a much lower rate of release (1,230 lb/min). It was assumed that this type of release could be stopped within several hours.

A typical tanker truck would be expected to carry up to 18 tons of ammonia (approximately 7,200 gallons). The truck release could occur anywhere from the plant site to its final destination. Since routes and destinations are unknown at this time, no attempt was made to estimate the population that could potentially be exposed to such an event. The release of the contents of the truck was assumed to occur within 5 minutes.

Ammonia Accidental Release Model Results—The three release scenarios were input to the ALOHA model, and the maximum distance at which ambient concentrations would exceed the short-term health based levels (i.e., ERPGs) were computed. The ammonia storage tank was assumed to be located at a point near the planned location of the CTs. The LandView^R 6 population estimation program was used to determine the population within the area defined by a circle with the radius equal to the distance to the toxic endpoint. The estimation of affected population was only performed for the storage tank scenarios, since the possible routes taken by the tanker trucks are not known at this time. The maximum distances to each of these endpoints for the accidental release scenarios and the maximum residential population that could be affected are as shown in Table 4.2-52.

As can be seen in this table, the maximum distance that concentrations would exceed the ERPG 1 was predicted to be more than 6 miles for all scenarios. Also, the distance to the ERPG 1 and 2 levels was predicted to exceed 1 mile for those scenarios. The tank rupture was shown to possibly affect the greatest population. However, the population that could actually be affected, even for these worst-case release scenarios, would likely be less than shown, since the plume from an accidental release would only affect a small downwind sector.

Table 4.2-52. Results for Ammonia Accidental Release Scenarios

Release Scenario	Toxic Endpoint (ppm)	Distance to Toxic Endpoint (miles)	Population Within Radius of Distance
Tank rupture	750 (ERPG 3)	1.7	35
	150 (ERPG 2)	5.0	1,007
	25 (ERPG 1)	>6.0	1,703
Tank puncture	750 (ERPG 3)	0.45	0
	150 (ERPG 2)	1.2	31
	25 (ERPG 1)	>6.0	1,703
Tank truck release	750 (ERPG 3)	1.2	NA
	150 (ERPG 2)	2.8	NA
	25 (ERPG 1)	>6.0	NA

Source: ECT, 2009.

Surface Lignite Mine

For the coal mining industry (which includes both underground and surface mining) the incidence of nonfatal injuries and illnesses averaged 335.6 per 10,000 full-time workers over the 5-year period from 2003 through 2007 (U.S. Department of Labor, 2009). The data show that injuries occur at a higher rate in the mining industry than in all United States' industries on average, but the trend over the 5 years of data for construction was downward. The number of fatal injuries in the United States' mining industry during the same 5-year period averaged 30 per year. As reported elsewhere by BLS (Department of Labor, 1999) for the period 1995 through 1999, the mining industry had an average fatality rate of 24.5 per 100,000 full-time workers.

A maximum of approximately 213 employees would operate the proposed Liberty Fuels Mine. Applying the industry incidence rates, an average of approximately seven injuries per year might be anticipated. No fatalities would be expected.

The Federal Mining Safety and Health Act (MSHA) regulates surface miner training under 30 CFR 48, Subpart B and §77.107. The regulations require that all new miners receive a minimum of 8 hours of training, including an introduction to the mining environment, hazard recognition, and task-specific health and safety issues, prior to assignment to work duties. All new miners must complete a minimum of 24 hours of new miner training before working without the supervision of an experienced miner. MSHA regulations also require all experienced miners to complete an annual refresher course that meets the standards outlined in 30 CFR 48.28.

The NACC Red Hills Mine operation in Ackerman, Mississippi, has worked more than 2 million man-hours since initiating commercial coal production activities in 2000. No fatal injuries have occurred at the Red Hills Mine, and the nonfatal injury incidence rates at Red Hills have been consistently below the national average (MSHA, 2008). MSHA has inspected the Red Hills Mine facility on 24 occasions. The U.S. Department of Labor has recognized the Red Hills Mine with three Sentinels of Safety Awards since 1999.

Linear Facilities

General Considerations of Operation

BLS statistics for the electric power transmission, control, and distribution category report the incidence of nonfatal injuries and illnesses averaged 143.5 per 10,000 full-time workers over the 5-year period from 2003 through 2007. The data show that injuries occur at a slightly higher rate than in all United States' industries on average. The number of fatal injuries in the United States' electric power transmission industry during the same 5-year period averaged 19.4 per year. No information on additional project-related employment associated with operations of the electric transmission lines and pipelines with which to estimate injuries is available.

A number of mandated protections would be built into the natural gas and CO_2 pipelines to make them safe to operate and to assure that people and properties would be protected throughout the life of the pipelines. The manner and method of pipeline design, construction, and operation are regulated by DOT in 49 CFR 192 (natural gas) and 195 (CO_2). These regulations address designing and constructing the pipeline to meet or exceed the government safety requirements, including using equipment and material that meet or exceed industry practices, coating the steel pipe with special protective compounds to minimize rust or corrosion, and conducting X-ray inspections of every weld joining each section of pipe. The regulations also address burying pipelines to a minimum ground cover, using low-voltage electricity on all surfaces to further protect against corrosion (cathodic protection), testing the pipe using water, and inspecting each stage of construction by qualified inspectors. After completion and being placed in service, the pipelines would be monitored and maintained on a regular basis to maintain their integrity. Leak surveys would also be conducted periodically.

Electromagnetic Fields (EMF)

As discussed in Subsection 3.20.3, there are many sources of power-level frequency EMF, including internal household and building wiring, electrical appliances, and electric power transmission and distribution lines. And there have been numerous scientific studies about the potential health effects of EMF. Yet after many years of research, the scientific community has not established that exposures to EMF cause any health hazards. Accordingly, state and federal public health regulatory agencies have not identified a direct link between exposure to EMF and human health effects and have determined that setting health-based numeric exposure limits is not appropriate.

The public could potentially be exposed to EMF effects as a result of the installation and operation of the new and upgraded electrical transmission lines. Most of the new and upgraded lines would be in rural areas and removed from the most populated areas. Mississippi does not have EMF rules (few states do).

The addition of new 230-kV transmission lines and the reconductoring of existing transmission lines would potentially increase EMF exposure within and near the rights-of-way. These field strengths would vary depending on conductor design, load conditions, and other factors, but would be similar to those of existing transmission lines of comparable size within the Mississippi Power transmission grid and of other utilities around the country. Based on the current scientific understanding of potential health effects of EMF, little or no EMF-related impacts would be expected from the addition/modification of transmission facilities.

Hazards Associated with Accidental Releases of CO_2

CO_2 would be captured from the gasification process and transported offsite for beneficial use. The gas would be compressed and dehydrated before being introduced into the pipeline. The pipeline would connect to an existing CO_2 pipeline system, which would continue to transport the gas to locations where it could be injected into deep geologic formations to aid in oil recovery (CO_2 EOR). This assessment only addresses the length of new pipeline that would be constructed to support the Kemper County IGCC Project, i.e., leaks related to the injection process at the wellhead and postsequestration leaks are not evaluated. Although not considered particularly toxic, in high concentrations, CO_2 can have adverse health effects. The CO_2 produced by the IGCC plant would also contain trace amounts of H_2S (at concentrations of less than 10 ppm). Since the concentration of H_2S in the pipeline, and in the ambient air following a release, would be at or below levels believed to result in adverse human health effects, the potential impacts of the H_2S in the accidental release are not assessed further.

COS would also be present in the pipeline gas at a concentration of 4.7 ppmv or less. Since this concentration would already be below the EPA acute exposure guideline level (AEGL), or any DOE protection action criteria (PAC) levels, for this substance, no adverse impacts would be expected from an accidental release from the pipeline. CO would also be present in the pipeline gas (0.08 to 0.16 percent). Air concentrations of CO could exceed the lowest PAC (i.e., PAC-1 equal to 83 ppm) in the event of a catastrophic pipeline rupture. However, the distance to this endpoint (i.e., less than 25 ft) would be much less than the distance to the toxic endpoint for CO_2. Therefore, releases of CO were not assessed.

The primary risk to the general population from the CO_2 would be a break in the pipeline. Therefore, the compression and dehydration of the gas onsite were not assessed. The new CO_2 pipeline would be 61 miles in length. As can be seen in Figure 2.2-1, the pipeline would proceed south from the plant site to the west side of the city of Meridian and then south-southwest to the west and southwest of the city of Heidelberg before connecting with the existing pipeline. After crossing I-20 west of Meridian, the pipeline would generally run parallel to and west of I-59 before it crossed I-59 northwest of Heidelberg. Generally, the route is sparsely populated with an absence of schools and hospitals in the near vicinity.

The pipeline would have an inside diameter of approximately 12 or 14 inches, corresponding to capture of 50 percent or 65 percent of the CO_2, respectively. The maximum distance between safety valves would be 20 miles. At water crossings, a safety valve would be located on each side or the stream or water body. The pipeline would be buried, which would provide insulation and safety from most types of accidents. The maximum amount of CO_2 that could be released, based on a break in a 20-mile section of pipe, would range from approximately 1,900 to 2,600 metric tons.

The CO_2 in the pipeline would be at 98-percent concentration and maintained at a pressure of 2,100 psi and 95°F (35°C). At this temperature and pressure, the gas would be in a supercritical fluid state and have characteristics of a substance between a gas and a liquid with of density of approximately 800 kilograms per cubic meter (kg/m^3).

Acute Toxicity Levels—For assessing accidental releases of CO_2, DOE's PAC levels (i.e., PAC-1 and 2 equal to 30,000 ppm and the PAC-3 level equal to 40,000 ppm) were used. These PAC levels have the following definitions:

- PAC-1 is the maximum concentration in air below which it is believed nearly all individuals could be exposed for up to 1 hour without experiencing more than mild transient adverse health effects or perceiving a clearly defined objectionable odor.
- PAC-2 is the maximum concentration in air below which it is believed nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action.
- PAC-3 is the maximum concentration in air below which it is believed nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening health effects.

As recommended, the PAC levels were evaluated as peak 15-minute time-weighted average concentrations. The PAC levels for CO_2 are similar to the National Institute for Occupational Safety and Health (NIOSH) immediately dangerous to life or health (IDLH) value of 40,000 ppm over a 30-minute period, and the short-term reference exposure level of 30,000 ppm for a 15-minute exposure to CO_2. The IDLH is the airborne concentration from which a worker could escape without irreversible health effects. The short-term exposure limit (STEL) is a 15-minute exposure that should not be exceeded at any time during a workday.

The following NIOSH-based exposure limits were considered for H_2S: the 30-minute IDLH of 100 ppm, the 15-minute STEL of 15 ppm, and the 10-minute ceiling of 10 ppm. The ceiling value should not be exceeded at anytime. Although the PAC levels are lower (i.e., PAC-1 is 0.51 ppm, PAC-2 is 27 ppm, and PAC-3 is 50 ppm), only PAC-1 is significantly lower than the initial levels of H_2S in the pipeline. Since it was determined that levels in the ambient air would be much less than the PAC-1 level (i.e., less than 1 millionth of the PAC-1 level after 15 minutes) immediately following a catastrophic release, no further evaluation is necessary.

Model Selection for CO_2 Accidental Releases—The SLAB model was selected to simulate accidental releases from the CO_2 pipeline (Ermak, 1990). SLAB was designed to simulate denser-than-air gas releases, which include the jet releases that would be associated with a pipeline accident. SLAB simulates the gravity spread and dispersion of a heavy gas cloud. Information on the source chemicals, release parameters, assumed meteorological conditions, site characteristics, and desired concentration averaging times are input to the model. The output consists of concentrations at various downwind distances, and various heights and distances from the plume centerline giving a three-dimensional view of the plume. SLAB is generally accepted as a state-of-the-art model for simulating heavy gas releases.

CO_2 Pipeline Release Scenarios—At the pipeline temperature and pressure, CO_2 would exist in a supercritical fluid state. With a rupture or break, the gas would be released at a high velocity in a choked flow condition. In a choked flow release, the speed of the gas is determined by the speed of sound for the gas at the initial pressure and temperature conditions. As a worst-case, the volume of gas released is determined by the density of the gas in the pipeline and the volume of pipeline between safety valves. For this simulation, the maximum volume based on 20 miles between safety valves and an inside pipe diameters of 12 and 14 inches were assumed. The time of release was estimated based on the initial velocity of the released gas, even though the speed of release would decrease as the gas was depleted from the pipeline. As the gas was released to the atmosphere, it would rapidly expand, and the temperature of the gas would decrease. This decrease in temperature would cause some of the CO_2 to solidify and deposit as dry ice snow. This material would slowly evaporate, and would not significantly add to the concentration in the gas cloud. It has been estimated that 26 percent of the volume of gas released would be in the solid phase (DOE, 2007b). Therefore, the volume released was adjusted in this scenario to account for this phenomenon.

The accidental releases that were assessed were a complete pipe rupture and a pipe puncture resulting in a 3-square-inch hole. The amount of material released was determined by the volume of the pipeline between safety valves and the density of the CO_2. The CO_2 in a 20-mile section of pipeline would take 10.8 minutes to be released if the pipe were ruptured near a safety valve. For the pipe puncture scenario, it would take the gas 407 minutes to be released. These release times are intended for worst-case scenarios and do not account for the reduction in pressure and release rate as the gas was depleted from the pipeline. Also, to simulate a worst-case release, a horizontal jet release was assumed, along with meteorological conditions that would result in the least dispersion (i.e., low wind speed and stable conditions). Flat terrain was assumed, and the potential for possible accumulation of CO_2 in low areas along the pipeline route was not assessed.

CO_2 Accidental Release Model Results—The SLAB model was run for the two release scenarios, and the maximum distances at which ambient concentrations would exceed the short-term limits (i.e., PAC levels) were estimated. The point along the pipeline where the maximum population density was believed to occur was selected for assessing potential population exposure. This point was located where the pipeline would cross MS 19 west of the city of Meridian. The LandView^R 6 population estimation program was used to determine the population within the area defined by a circle with the radius equal to the distance to the toxic endpoint (U. S. Census Bureau, 2003). The maximum distances to each of these endpoints for the accidental release scenarios and the maximum residential population that could be affected are shown in Table 4.2-53.

Table 4.2-53. Results for CO_2 Pipeline Accidental Release Scenarios

Release Scenario	Toxic Endpoint* (ppm)	Distance to Toxic Endpoint (miles)	Population Within Radius of Distance
12-Inch pipeline rupture	30,000	0.62	146
	40,000	0.25	146
12-Inch pipeline puncture	30,000	0.065	0
	40,000	0.05	0
14-Inch pipeline rupture	30,000	0.63	150
	40,000	0.73	192

*30,000 ppm is PAC-1 and PAC-2 level; 40,000 ppm is PAC-3 level.

Source: ECT, 2009.

As Table 4.2-53 shows, the maximum distance that levels would exceed a toxic endpoint was relatively short, even for the worst-case pipeline rupture scenario. The population affected would likely be less than shown, since the plume from an accidental release would only affect a small area (i.e., small wind sector). In addition, the predominate wind directions are north and south for this region of Mississippi, so it is probable that the plume from an accidental release would not be transported toward the population centers along the route of the pipeline.

4.2.19.3 Intentional Destructive Acts

Although concerns have been raised about the vulnerability of nuclear power plants to terrorist attack, the potential for such attacks on coal-based power plants has not been identified as a threat of comparable magnitude. However, as with any United States energy infrastructure, the proposed power plant could potentially be the target of terrorist attacks or sabotage. In light of two recent decisions by the U.S. Ninth District Court of Appeals (San Luis Obispo Mothers v. NRC, Ninth District Court of Appeals, June 2, 2006; Tri Valley Cares v. DOE, No. 04-17232, DC No. CV-03-03926-SBA, October 16, 2006), DOE has examined the potential environmental impacts from acts of terrorism or sabotage against the facilities proposed for the Kemper County IGCC Project.

Although risks of sabotage or terrorism cannot be quantified, because the probability of an attack is not known, the potential environmental effects of an attack can be estimated. Such effects may include localized impacts from releases of toxic substances at the proposed power plant and associated facilities, which may be similar to what would occur under an accident or natural disaster. Hazardous events considered for the proposed power plant caused by intentional destructive acts included gas releases and exposure to toxic gas clouds. A particular concern associated with the release of a gas is exposure to a toxic component within the dispersing gas cloud. The potential impacts of sabotage or terrorism would be expected to be similar to the impacts of releases of ammonia and/or CO_2 as described in Subsection 4.19.2.

4.3 IMPACTS OF NO ACTION

Under the no-action alternative, DOE would not provide continued funding under the cooperative agreement or provide a loan guarantee for the project. In the absence of DOE funding, Mississippi Power could reasonably pursue two options. First, the gasifiers, syngas cleanup systems, and CT/HRSGs and supporting infrastructure could be built as proposed without DOE funding; therefore, this option would be essentially the same as the proposed action. The connected actions would remain unchanged. The environmental and other impacts of the project would occur as described in this chapter.

Second, Mississippi Power could choose not to pursue the IGCC project. None of the connected actions would likely be built. This option would not contribute to the goal of the CCPI program, which is to accelerate commercial deployment of advanced coal technologies that provide the United States with clean, reliable, and affordable energy. Similarly, the no-action alternative would not contribute to the federal loan guarantee program goals to make loan guarantees for energy projects that “avoid, reduce, or sequester air pollutants or anthropogenic emissions of greenhouse gases” and “employ new or significantly improved technologies.”

Following the second no-action option, none of the environmental and other impacts—positive as well as negative—caused by the project would occur. The existing environmental and socioeconomic conditions described in Chapter 3 would remain.

Air pollutants resulting from power plant and mine operations would not be emitted under the no-action alternative, and the resulting impacts that have been estimated would be avoided. CO_2 that would be captured and used for EOR would not be available for that use. Noise from operations and resulting impacts on the surrounding area would not occur.

Reclaimed effluent from Meridian's wastewater treatment facilities would not be required. The opportunity for benefits arising from recycling the reclaimed effluent (e.g., improvements to water quality downstream of the WWTPs) would be missed.

Under the second option to the no-action alternative, wildlife and their habitats would likely remain as they have for decades in this rural area of Mississippi. Logging and agricultural conversion represent the current impacts to wildlife. Hunting through various leases would continue. Therefore, additional impacts could occur only if the properties were used for some other development, which could result in greater impacts than the current proposed project. However, such development plans are unknown at this time.

Under the no-action alternative, listed wildlife species and their habitats would likely continue as they currently exist. The linear facility corridors would not be cleared as described herein. However, other disturbances such as logging, agricultural conversion, or other developments could occur on these properties and might have impacts similar to or greater than the proposed project. Wetlands that would be impacted by power plant, mine, and linear facility construction would not be impacted under the no-action alternative.

In the absence of the proposed action, the local area would not experience the various predicted land use alterations (conversion of the power plant site from rural to industrial use, conversion of mine blocks during active mining and reclamation, use of largely rural corridors for transmission lines and pipelines). The no-action alternative would avoid the impacts to local roads that would result from power plant and mine construction worker traffic.

Under the no-action alternative, the significant, positive economic impacts to the local area and east-Mississippi area would not be felt. Construction jobs and opportunities for permanent employment at the power plant and mine would be lost, as would all of the positive secondary economic benefits. These jobs would add to the limited industrial base of Kemper County where many residents travel out of the county for employment. These jobs would also be relatively high-paying. The increase to the existing ad valorem tax base and other tax benefits of the plant and mine would not accrue to the county for upgrading public infrastructure.

Without the proposed action, important archaeological resources that might be recovered would be left in place where their fate would be uncertain.

In all, under the second option to the no-action alternative, where the proposed action would not be constructed, both negative and positive environmental and socioeconomic impacts would not occur.

4.4 COMPARATIVE IMPACTS OF PROJECT DEVELOPMENT ALTERNATIVES UNDER CONSIDERATION

Subsection 2.7.2 identified three alternatives for project development under consideration. These addressed water supply, linear facility routing, and levels of CO_2 capture. The comparative impacts of these alternatives are discussed here.

4.4.1 ALTERNATIVE SOURCES OF WATER SUPPLY

Mississippi Power plans to obtain water for plant uses primarily from two city of Meridian POTWs. Up to 1 MGD of ground water withdrawn from deep onsite wells might also be used on an as-needed basis. Potential impacts resulting from this plan were presented in Subsection 4.2.5.2.

As an alternative, the use of ground water to fully supply the water requirements for the generation facility was also considered. In this case, the well field would consist of several wells capable of withdrawing 6.5 MGD of ground water from the Massive Sand aquifer of the Tuscaloosa Group (instead of the 1-MGD withdrawal proposed for the backup well field). Ground water flow modeling using MODFLOW, as described in Subsection 4.2.5.2, was again used to evaluate the potential impacts associated with the greater, 6.5-MGD withdrawal.

ECT used the original Strom Model (Strom, 1998) MODFLOW files as the basis for an expanded model. In the case of the alternative analyses, the expanded model described in Subsection 4.2.5.2 was modified to include the withdrawal of 6.5 MGD divided equally between two ground water supply wells (instead of 1 MGD from one well). The resulting model was then used to simulate the drawdown impact associated with a constant ground water withdrawal of 6.5 MGD over the projected 40-year life of the facility on all area aquifers (see Section 3.7). Appendix O provides a more detailed description of the expanded model. As described therein, the model boundary conditions and other factors tended to result in overestimated drawdowns. Actual drawdowns would probably be somewhat less than those described here, which adds conservatism to this analysis of potential impacts.

Figure 4.4-1 depicts the potentiometric surface drawdown predicted in the Massive Sand aquifer (layer 5) after 40 years of constant pumping at the 6.5-MGD rate. The resulting estimated drawdowns are widespread and of a relatively high magnitude. Estimated drawdowns in the Massive Sand aquifer were predicted to range from 28 to 70 ft in Kemper County. The 6.5-MGD model predicted approximately 40 ft of drawdown at the nearest existing user of the Massive Sand aquifer, which is the town of De Kalb located approximately 9.5 miles northeast of the proposed power plant site. In addition, the 6.5-MGD simulation estimated 31 ft or less of drawdown at the wells located in the towns of Electric Mills and Scooba, located approximately 21 to 22 miles east-northeast of the power plant site. These estimated drawdowns would have the potential to cause adverse impacts to those existing users of the water from the Massive Sand aquifer (layer 5). Such impacts could likely be mitigated by retrofitting and/or upgrading the well pump assembly at impacted wells.

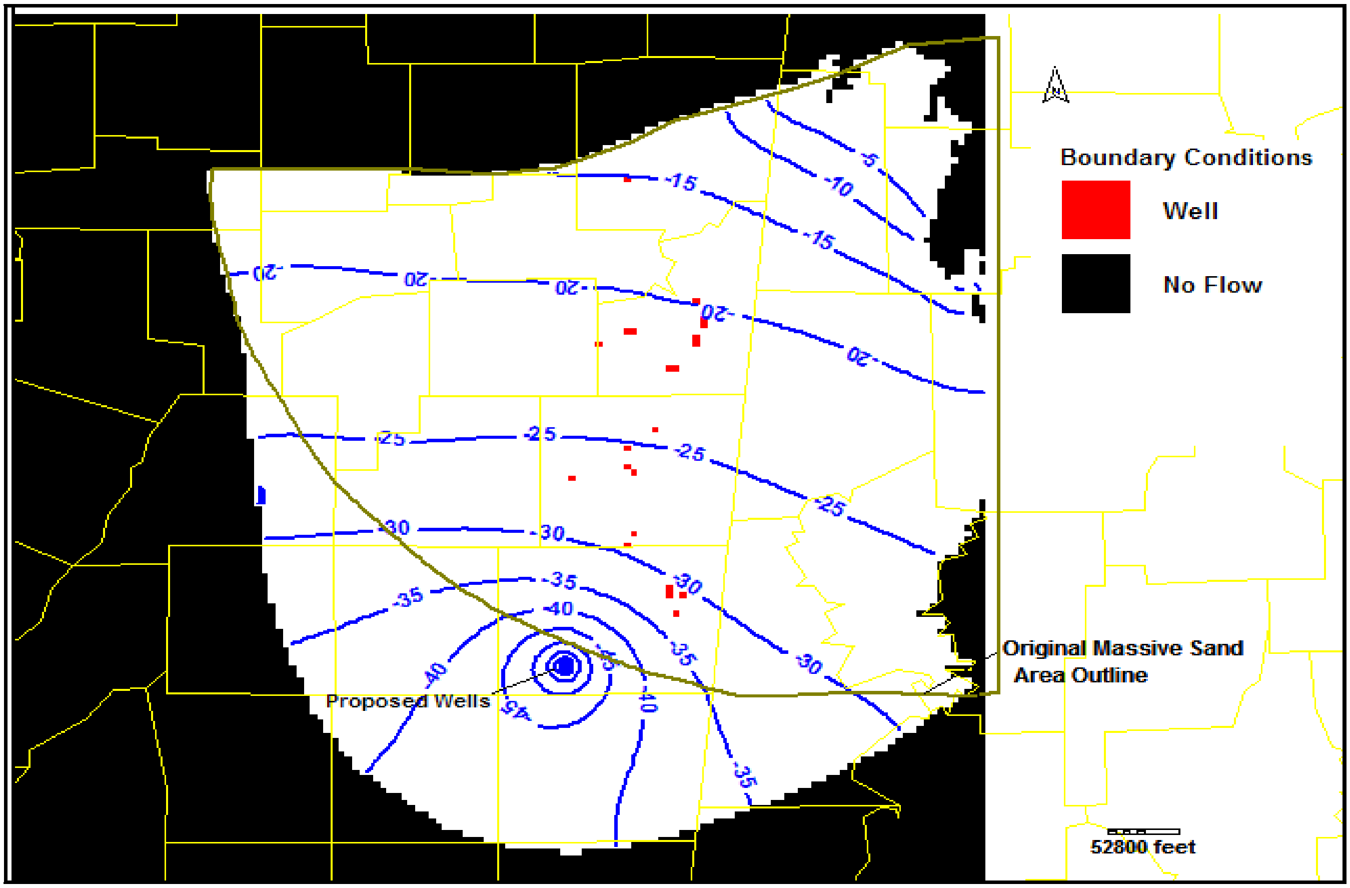

Figure 4.4-1. Predicted Drawdown in the Massive Sand (Layer 5) at the End of 40 Years of Pumping Based on 6.5-MGD Total Withdrawal from the Massive Sand

Sources: Strom, USGS, 1998. ECT, 2009 Strom_transexp_V5a2.gvw.

The 6.5-MGD model also estimated widespread and moderate to low amounts of drawdown in the underlying and overlying aquifers. The 6.5-MGD model estimated approximately 20 to 23 ft of drawdown in the underlying Lower Cretaceous aquifer (layer 6); however, currently there are no water wells screened in that aquifer in this region, according to the MDEQ database. Approximately 18 to 20 ft of drawdown was estimated in the overlying Coker aquifer (layer 4) throughout Kemper County. Currently, there are no water wells screened in the Coker aquifer within at least 20 miles of the power plant site, according to the MDEQ database; the closest well appears to exist approximately 30 miles to the north in Noxubbe County. The model estimated approximately 16 ft of drawdown at that Coker aquifer well location. Maximum drawdown estimates in the shallower Gordo aquifer (layer 3) were 11 ft or less, maximum drawdown estimates in the Eutaw-McShan aquifer (layer 2) were 10 ft or less, and maximum drawdown estimates in the Coffee Sand aquifer (layer 1) were 5 ft or less.

Based on these modeling results, the withdrawal of 6.5 MGD of ground water from the Massive Sand aquifer would have some potential to cause minor adverse impact to existing users of ground water from the Coker aquifer, and possibly the Gordo aquifer. No significant impacts would be expected relative to existing uses of ground water from the Eutaw-McShan aquifer or the Coffee Sand aquifer. Actual impacts to a water user's well are relative not only to the amount of drawdown experienced but also to the specific circumstances of a given well (e.g., well depth, pump setting, etc.). It is quite possible that a given amount of drawdown could cause adverse impacts at a given well via diminution of supply, whereas at other wells constructed differently that same given amount of drawdown might have insignificant effects.

As noted previously, the shallower Lower Wilcox aquifer is not included in the Strom Model or the expanded model used for this EIS. The base of the Lower Wilcox aquifer is separated from the top of the Eutaw-McShan (layer 2) aquifer by more than 1,400 ft of sediments that form an effective confining unit (see Table 3.7-8). No measurable drawdown would be expected to occur in the Lower Wilcox aquifer from a proposed withdrawal of 6.5 MGD of ground water from the Massive Sand aquifer (layer 5).

Accordingly, there is no significant potential for any impact to the even shallower surface features (e.g., wetlands, streams, etc.) from the proposed withdrawal of 6.5 MGD of ground water from the Massive Sand aquifer. Similarly, that withdrawal would not be expected to have a significant influence on land surface subsidence.

Consideration was also given to the potential effects of the proposed withdrawal of 6.5 MGD on ground water quality. The Massive Sand aquifer at the site is known to be saline, as described in Subsection 3.7.2.2 (e.g., the TDS concentration is 23,000 mg/L); as such, the site is situated on the saltwater side of the freshwater-saltwater interface, as defined by 10,000 mg/L TDS. The magnitude of the estimated drawdowns suggests a potential for inducing some amount of saltwater migration into freshwater potions of the underlying and overlying aquifers. Further analysis of the potential ground water flow gradients induced by the withdrawal might be necessary if this alternative were pursued. However, based on modeling performed for the Red Hills FEIS (TVA, 1998) under similar circumstances of pumping, position relative to the freshwater-saltwater interface, and hydrogeologic conditions (compare Tables 3.7-1 and 3.7-8), it is likely that such migration would be limited to a maximum of a few hundred feet in the underlying and overlying aquifers. Such migration would probably be insignificant.

In the Massive Sand aquifer, extrapolation of the Red Hills FEIS modeling results suggests that the position of the freshwater-saltwater interface might migrate approximately 1,000 to 2,000 ft toward the southwest in the region of the power plant site. This would slightly expand the freshwater portion of the Massive Sand aquifer locally and would not likely cause adverse impacts.

In conclusion, the alternative of using 6.5 MGD of ground water from the Massive Sand aquifer could adversely impact some users of water from that same aquifer, yet such impacts could be mitigated. In addition, the position of the freshwater-saltwater interface in some aquifers could be induced to migrate slightly, but probably not to such an extent as to constitute a significant adverse impact on the aquifer. The alternative of using 6.5 MGD of ground water from the Massive Sand aquifer might have some undesirable effects but would probably be feasible.

In addition to the potential impacts on ground water resources resulting from the alternative water supply plan, impacts to terrestrial ecological and other resources might also result. The use of the saline ground water in the IGCC facility’s two cooling towers would concentrate the dissolved salts to an even higher level, approximately 85,000 ppm, in the circulating water. A small amount of this highly saline water would be introduced into the surroundings as drift from the cooling towers (i.e., escaping water droplets).

The amount of salt potentially deposited in the surrounding area was assessed on this basis, and the study is included in Appendix N. These results were compared with information on the responses of sensitive vegetation to salt deposition. Literature indicates that salt deposition in the range of 4.5 to 9 gram per square meter per year ($g/m^2/yr$) could be an issue for sensitive species. This range translates to approximately 40 to 80 lb/ac per year. So, deposition averaging between 3.3 and 6.7 lb/ac per month could damage sensitive plants. Davis (1979), for example, gives salt thresholds for dogwood of 517 kilograms per square kilometer per month (kg/km^2/month) and 6.2 g/m^2/yr. These equate to 4.6 lb/ac per month and 55.3 lb/ac per year. White ash is another species with a low tolerance for salt. Tobacco and corn are reportedly as sensitive as dogwood to salt deposition. The modeling results presented in the appended report would seem to indicate that the potential for damage to sensitive species would exist, at least on the power plant site, itself. The model also indicated deposition in that range in some limited, nearby, offsite areas.

4.4.2 ALTERNATIVE LINEAR FACILITY ROUTES

Subsection 2.7.2.2 described the methodology Mississippi Power used to select routes for the proposed pipelines and new electrical transmission lines. Mississippi Power might revise or amend the precise final route for one or more of its linear facilities, although the analysis of impacts provided herein should cover any impacts resulting from modest revisions to those routes. It is not expected that any such route changes would result in any material differences in the analysis of impacts discussed in this document.

4.4.3 ALTERNATIVE LEVELS OF CO_2 CAPTURE

As discussed in Subsection 2.7.2.3, Mississippi Power has considered a range of alternative levels of CO_2 capture. Comparative impacts for two alternative levels of CO_2 capture—50 percent and 67 percent (natural gas equivalence)—are described in this subsection.

As shown in Table 2.5-1 and described in Subsection 2.7.2.3, there would be some increase in lignite coal consumption associated with the higher capture rate due to the increased parasitic load (i.e., more coal would be needed to achieve the same net output). The greater fuel consumption would result in correspondingly higher emission rates, also indicated in Table 2.5-1. And, corresponding to the differences in emissions, there would be differences in air quality impacts for these two levels of CO_2 capture. While the emission rates for criteria pollutants would not change appreciably for the two levels of CO_2 capture considered, the dispersion of the plume would be slightly different and result in modest differences in predicted ground-level concentrations. The air quality impacts were described previously in Subsections 4.2.1 (criteria pollutants) and 4.2.19 (HAPs). The differences vary by pollutant species and averaging times for the two CO_2 alternative capture levels. However, for each pollutant and averaging time, the higher impacts of the two capture cases were presented. See Appendix R for detailed results of the HAPs impacts assessments for the two cases.

In addition to differences in air quality impacts, the differences in CO_2 capture would result in differences in risks associated with transport via pipeline. As presented in Subsection 4.2.19, somewhat greater pipeline-related risks would attach to the higher capture rate, because the flow rate of CO_2 in the pipeline would be higher for the higher capture level.

Finally, the two capture cases would have small variations in outputs of byproducts. The higher rate of fuel consumption associated with the higher rate of CO_2 capture would result in slightly greater generation of ammonia, ash, and sulfuric acid.

Overall, the differences in operating characteristics and impacts would not alter the conclusions regarding the ability to permit the facility or the levels of potential impacts.

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