DOE/EA-1785

ENVIRONMENTAL ASSESSMENT

For The

Southeast Regional Carbon Sequestration Partnership Phase III Anthropogenic Test Project

U.S. DEPARTMENT OF ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY

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COVER SHEET

Responsible Agency: U.S. Department of Energy (DOE)

Title: *Southeast Regional Carbon Sequestration Partnership Phase III Anthropogenic Test Project* (DOE/EA-1785)

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Abstract: DOE prepared this EA to evaluate the potential environmental consequences of providing a financial assistance in a cooperative agreement with Southeast Regional Carbon Sequestration Partnership (SECARB). If SECARB received the funding, they would demonstrate the injection of 125,000 tons/year of carbon dioxide (CO_2) from a power plant into a deep saline aquifer for enhanced oil recovery and geologic sequestration. This funding would be used for drilling up to two injection wells, reconditioning of four existing wells for monitoring, and two new shallow water wells. Connected actions include the CO_2 source at the CO_2 capture unit at Plant Barry, the 12.3-mile long, 4.5-inch outside diameter pipeline to transport the CO_2 to the oilfield, and the two electric service lines for a total of 3,275 feet. No connected actions are receiving federal money.

DOE's proposed action would provide approximately $30.0 million in financial assistance in a cost-sharing arrangement to SECARB. The cost of the proposed project would be approximately $39.3 million.

This EA evaluates the environmental resource areas DOE commonly addresses in its EA's and identifies no significant adverse environmental impacts for the proposed project. The proposed project could result in beneficial impacts to the nation's energy efficiency and the local economy, and could contribute to a minor reduction of greenhouse gases.

Availability: The draft EA was available on DOE's National Energy Technology Laboratory website at http://www.netl.doe.gov/publications/others/nepa/ea.html and at:
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ACRONYMS AND ABBREVIATIONS

°C	Degrees Celsius
°F	Degrees Fahrenheit
%	Percent
ADCNR	Alabama Department of Conservation and Natural Resources
ADEM	Alabama Department of Environmental Management
AFC	Alabama Forestry Commission
AIPC	Alabama Invasive Plant Council
AL	Alabama
ANHP	Alabama Natural Heritage Program
AQCR	Air Quality Control Region
AQCR 005	Mobile-Pensacola-Panama City-Southern Mississippi
bls	Below Land Surface
bbl	barrels
BMP	Best Management Practice
C	Candidate
CAA	Clean Air Act
CCS	Carbon Capture and Storage
Citronelle Field	Citronelle Oilfield
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act (Superfund)
CFR	Code of Federal Regulations
cm	Centimeter
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CSP	Carbon Sequestration Program
CWA	Clean Water Act
dB	Decibel
dBA	A-weighted decibel
DBH	Diameter at Breast Height
de minimis	of Minimal Importance
Denbury	Denbury Onshore, LLC
DNFA	Determination of Non-competitive Financial Assistance
DNL	Day-night Average Sound Level
DOE	U.S. Department of Energy
DOT	Department of Transportation
E	Endangered
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EIV	Environmental Information Volume
EOR	Enhanced Oil Recovery
EPCRA	Emergency Planning and Community Right-to-Know Act
EPRI	Electric Power Research Institute

ESA	Endangered Species Act
ESP	Electrostatic Precipitator
etc.	*et cetera*, and so on
FAA	Federal Aviation Administration
FGD	Flue Gas Desulfurization
FEMA	Federal Emergency Management Agency
FONSI	Finding of No Significant Impact
ft	Feet or Foot
FTE	Full-time Equivalent
gal.	Gallons
GHG	Greenhouse Gas
H_2S	Hydrogen Sulfide
HDD	Horizontal Directional Drill
Hz	Hertz
ID	Inside Diameter
IPCC	Intergovernmental Panel on Climate Change
Kansai	Kansai Electric Co., Inc.
kg	Kilogram
km	Kilometer
kW	Kilowatt
L	Liters
lbs	Pounds
L_{eq}	Equivalent Sound Level
m	Meter
m^3	Cubic Meter
MAOP	Maximum Allowable Operating Pressure
MHI	Mitsubishi Heavy Industries
MLV	Mainline Valve
mm	Millimeter
MP	Mile Post
MVA	Monitoring, Verification, and Accounting
MW	Megawatt
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NETL	National Energy Technology Laboratory
NHPA	National Historic Preservation Act
NIOSH	National Institute for Occupational Safety and Health
NMFS	National Marine Fisheries Service
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSA	Noise Sensitive Area
NWI	National Wetlands Inventory

O_3	Ozone
OD	Outside Diameter
OSHA	Occupational Safety and Health Administration
Pb	Lead
PEM	Palustrine Emergent Wetlands
PFO	Palustrine Forested Wetlands
PM_{10}	Particulate Matter Less Than 10 Microns in Diameter
$PM_{2.5}$	Particulate Matter Less Than 2.5 Microns in Diameter
ppm	Parts per Million
psia	Pounds per Square Inch Absolute
PSS	Palustrine Scrub-Shrub Wetlands
R&D	Research and Development
RCRA	Resource Conservation and Recovery Act
RCSP	Regional Carbon Sequestration Partnership
ROW	Right-of-Way
RRC	Texas Railroad Commission
SCR	Selective Catalytic Reduction
SDWA	Safe Drinking Water Act
SECARB	Southeast Regional Carbon Sequestration Partnership
SHPO	State Historic Preservation Office (Officer)
SO_2	Sulfur Dioxide
SO_x	Sulfur Oxides
SP	State Protected
SPCC	Spill Prevention, Control, and Countermeasure Plan
SSEB	Southern States Energy Board
T	Threatened
THPO	Tribal Historic Preservation Officer
TMDL	Total Maximum Daily Load
tpy	Tons Per Year
U.S.	United States
UIC	Underground Injection Control
USC	United States Code
USDW	Underground Sources of Drinking Water
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
VOC	Volatile Organic Compounds
WMA	Wildlife Management Area
yd^3	Cubic Yards
$\mu g/m^3$	Micrograms per Cubic Meter

USE OF SCIENTIFIC NOTATION

Very small and very large numbers are sometimes written using scientific notation rather than as decimals or fractions. This notation uses exponents to indicate the power of 10 as a multiplier (i.e., 10^n, or the number 10 multiplied by itself n times; 10^{-n}, or the reciprocal of the number 10 multiplied by itself n times).

For example: $10^3 = 10 \times 10 \times 10 = 1{,}000$

$$10^{-3} = \frac{1}{10 \times 10 \times 10} = 0.001$$

In scientific notation, large numbers are written as a decimal between 1 and 10 multiplied by the appropriate power of 10:

4,900 is written $4.9 \times 10^3 = 4.9 \times 10 \times 10 \times 10 = 4.9 \times 1{,}000 = 4{,}900$.
0.049 is written 4.9×10^{-2}.
1,490,000 or 1.49 million is written 1.49×10^6.

A positive exponent indicates a number larger than or equal to one; a negative exponent indicates a number less than one.

1.0 INTRODUCTION

1.1 Summary

High concentrations of carbon dioxide (CO_2) in the atmosphere can exert a "greenhouse" effect that traps heat and increases temperature. Global emissions of CO_2 from human activity increased from an insignificant level two centuries ago to over 21 billion metric tons per year by 2003 (DOE, 2007a). The most notable human activity responsible for the generation of CO_2 is the combustion of carbon-based fossil fuels (including oil, natural gas, and coal. Many scientists, including the Intergovernmental Panel on Climate Change (IPCC), believe there is a danger from even a modest increase in the Earth's temperature (called "global warming") as it could alter the global climate and cause significant adverse consequences for human health and welfare (DOE, 2007a).

In one of many governmental efforts to address the concerns outlined above, the U.S. Department of Energy (DOE) established the Carbon Sequestration Program (CSP) in 1997 to conduct research and development (R&D) activities to evaluate and develop carbon sequestration technologies. Carbon sequestration involves capturing and storing CO_2 emissions prior to release into the atmosphere, as well as enhancing natural carbon uptake and storage processes. Geologic sequestration involves the permanent storage of CO_2 in coal seams, depleted oil and gas reservoirs, or saline (saltwater-filled) formations. Impermeable cap rocks and other geologic structures retain the CO_2 in the formation. As a part of this program, DOE formed a nationwide network of regional partnerships to help determine the best approaches for capturing and permanently storing gases that can contribute to global climate change. Geographical differences in fossil fuel use and available sequestration sinks across the United States dictate regional approaches to the sequestration of CO_2 and other greenhouse gases. The Regional Carbon Sequestration Partnerships (RCSP) are a government and industry effort to determine the most suitable technologies, regulations, and infrastructure needs for carbon capture, storage, and sequestration in different areas of the country.

This Regional Partnerships' initiative is being implemented in three phases:

- Phase I, Characterization (2003-2005): Characterized opportunities for carbon sequestration, including potential geologic storage formations and trapping mechanisms;
- Phase II, Validation (2005-2009): Conducting small scale field tests to verify the injection rates, storage media, and trapping mechanisms; and
- Phase III, Deployment (2008-2017): Conducting large volume carbon storage validation tests.

Phase I projects were competitively selected under Funding Opportunity Announcement DE-PS26-03NT41713, which closed April 1, 2003. DOE selected seven Partnerships to identify and characterize the geology of their geographic regions.

Phase II projects were competitively selected under Funding Opportunity Announcement DE-PS26-05NT42255, which closed March 15, 2005. DOE selected seven partnerships to begin validation (through field verification testing) of sequestration technologies and corresponding infrastructure approaches related to regulatory requirements, permitting and outreach. These

field verification tests were initiated (some projects are ongoing) at appropriate locations within each region that represented the best source and storage opportunities for large reductions in regional greenhouse gas emissions.

Phase III was selected using a non-competitive process because DOE determined that the public's best interest would be served by using the resources already developed through the small scale field projects. The seven regional partnerships selected in Phase II were required to submit project continuation applications that proposed a test within their region that would geologically sequester a large volume of CO_2 over a period of several years. Phase III projects were awarded as Amendments to the Phase II projects pursuant to a Determination of Non-competitive Financial Assistance (DNFA).

The seven partnerships that currently form this network include over 400 state agencies, universities, and private companies, spanning 43 states, and four Canadian provinces. In addition, agencies from six member countries of the Carbon Sequestration Leadership Forum are participating in the Validation Phase field tests.

The Southeast Regional Carbon Sequestration Partnership (SECARB) was established through a Cooperative Agreement between DOE's National Energy Technology Laboratory (NETL) and the Southern States Energy Board (SSEB). SECARB comprises a partnership among SSEB, the regulatory agencies and geological surveys from the eleven member states (Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Texas, and Virginia), portions of Kentucky and West Virginia, the Electric Power Research Institute, southern utility companies, academic institutions, Native American interests, and the private sector. SECARB is in Phase III of its investigations and this Environmental Assessment (EA) focuses on its proposed project in Mobile County, Alabama.

DOE's Proposed Action is to provide $30.0 million in financial assistance in a cost sharing arrangement with the project proponent, SECARB. The total cost of the project is estimated at $39.3 million.

1.2 Purpose and Need

DOE has a mission to implement a research, development, and demonstration program to resolve the environmental, supply, and reliability constraints of producing and using fossil energy sources. One aspect of that mission, the resolution of environmental constraints to producing and using fossil fuels, requires NETL to review, and where possible, mitigate projected impacts to global climate caused by the use of fossil fuels. One possible mitigation technique under review is the capture and long-term removal of CO_2 from the atmosphere through a process called carbon sequestration. NETL is implementing the DOE Carbon Sequestration Program, established in 1997, to evaluate and develop carbon sequestration technologies. The focus of this Carbon Sequestration Program involves capturing and storing CO_2 emissions prior to release into the atmosphere, as well as enhancing natural carbon uptake and storage processes. The principal goal of the Carbon Sequestration Program is to gain a scientific understanding of carbon sequestration options and to provide cost-effective, environmentally-sound technology options that ultimately may lead to a reduction in greenhouse gas intensity and stabilization of

atmospheric concentrations of CO_2 (DOE, 2007a). One of those options, geologic sequestration, is the placement of CO_2 or other greenhouse gases into subsurface porous and permeable rocks in such a way that they remain permanently isolated from the atmosphere.

In 2003, DOE selected seven Regional Partnerships to evaluate and pursue opportunities for carbon sequestration infrastructure development (Figure 1.2 below). The purpose of Phase III of the Partnership program is to test the application of large volume sequestration of CO_2 in regionally significant geological formations in North America (DOE, 2007a).

This project is needed to increase scientific understanding of geological carbon sequestration and to validate monitoring, verification, and accounting (MVA) technologies for sequestered CO_2. Reliable modeling and monitoring are required to demonstrate that geologic sequestration is an effective method for reducing atmospheric concentrations of CO_2 (DOE, 2008).

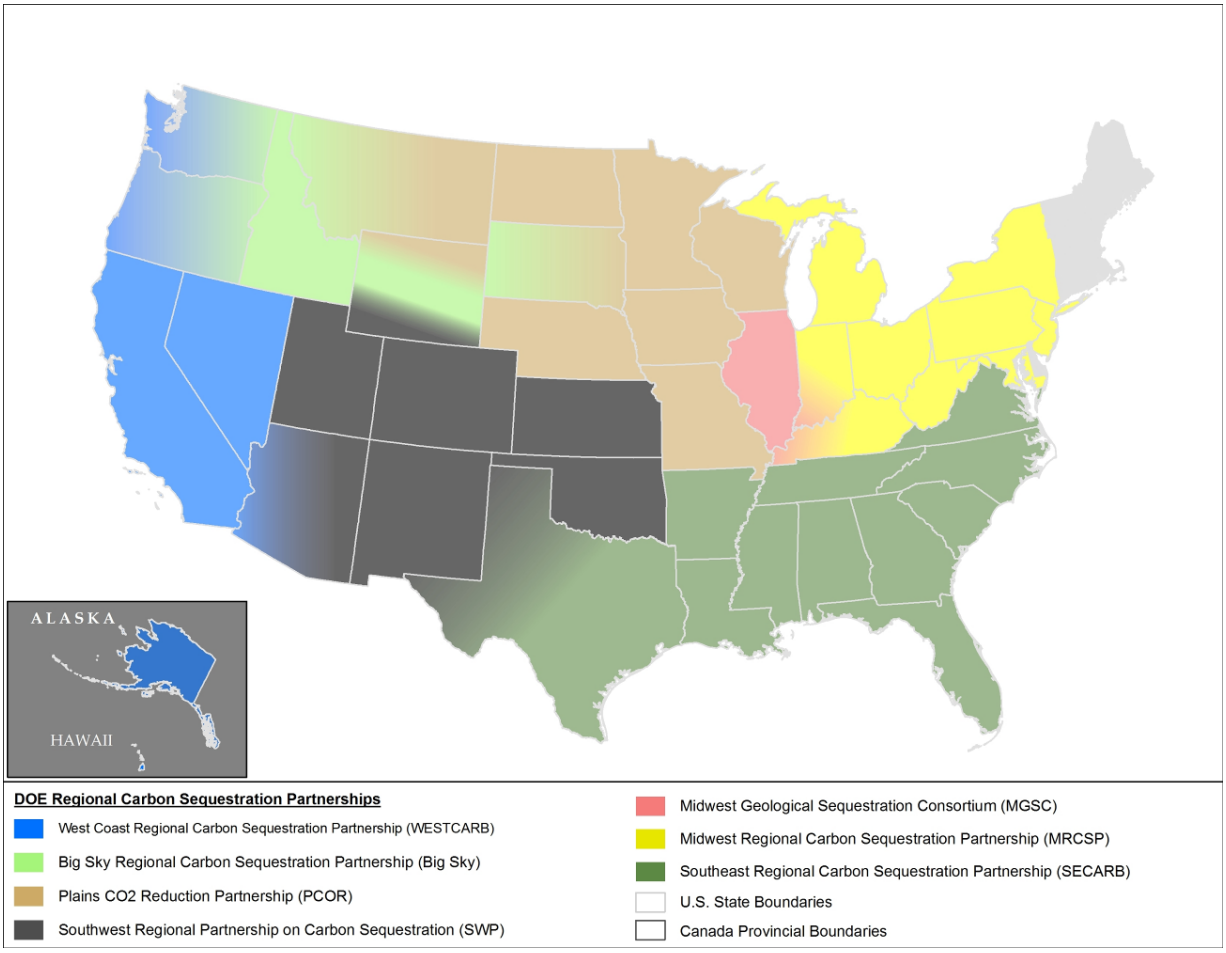


Figure 1.2. Map of Regional Carbon Sequestration Partnerships

Although the processes of geologic sequestration are relatively well known, there is a need for additional research to fill gaps in our scientific understanding of carbon sequestration; demonstrate permanent storage for the protection of human health and the environment; reduce costs; and facilitate the full-scale deployment of this technology. Extensive laboratory investigations, modeling studies, and limited small-scale field studies have been completed to

assess how CO_2 geologic sequestration would work in the subsurface. Comparing predictions from bench scale tests and numerical models with field results is necessary to validate the models and demonstrate that scientific understanding is correct (DOE, 2008).

The overall goal of the RCSP is to provide the foundation for the commercialization of carbon capture and storage technology. Funding of this proposed project would help the DOE in meeting its goals of advancement and development of feasible carbon sequestration technology to ultimately reduce greenhouse gas emissions.

1.3 SECARB Project Background

As a result of the efforts of Phases I and II, SECARB has determined that numerous thick, regionally extensive, and high porosity saline formations with thick shale confining zones exist within the Southeast and that these areas have the potential to effectively contain CO_2 emissions generated in the region. Early data collection and characterization done through Phases I and II have shown that the Lower Tuscaloosa Massive Sand Unit is a large, regionally extensive saline formation with the potential to hold centuries of CO_2 emissions in the Southeast (SECARB, 2008; Hill, 2007). The Tuscaloosa Group is estimated to have a CO_2 storage capacity of 10,760 million metric tons to 43,040 million metric tons (SECARB, 2008). The Lower Tuscaloosa Formation is a key component of a larger, regional group of similar formation called the Gulf Coast Wedge (SECARB, 2008; Hill, 2007; NETL, 2008a). The Gulf Coast Wedge is estimated to have enough capacity to store the estimated regional annual CO_2 emissions of 1.1 billion short tons (1 billion metric tons) for 300 to 1,200 years (NETL, 2008a).

Phase I and Phase II projects were subjected to NEPA review. Phase I focused on characterizing the geology and potential terrestrial sequestration options in the Southeast, culminating in the development of an action plan for small-scale geologic carbon sequestration field studies. Phase I received a Categorical Exclusion for characterization and data gathering activities. The field studies for Phase II were conducted at the locations in Table 1.3. The Phase II projects received Categorical Exclusions.

Phase III of SECARB is a continuation of the work that has been completed under Phases I and II. SECARB Phase III was divided into two tests: the Early Test and the Anthropogenic Test. The Early Test, conducted in Cranfield, Mississippi, demonstrated the feasibility of injecting CO_2 from a natural source into a regionally significant brine-bearing formation and the use of multiple tools to monitor the subsurface movement of the injected CO_2 (DOE, 2008). Data collected during this early phase has been used in the planning and future implementation of the Anthropogenic Test. The Early Test Project was previously evaluated for significant impacts under an Environmental Assessment, DOE/EA-1625, and a Finding of No Significant Impact (FONSI) was issued.

Table 1.3. SECARB Phase II Locations and Activities							
Project	**Host Company**	**Location**	**CO_2 Injection Volume (tons)**	**CO_2**	**Start**	**Finish**	**Comments**
Gulf Coast Staked Storage Project	Denbury Resources, Inc.	Cranfield, MS (near Natchez)	50,000 proposed 627,744 actual	Jackson Dome (Natural)	17-Jul-08	Ongoing	This test was conducted in an existing oilfield that was largely abandoned in 1960. Denbury performed a commercial CO_2 flood of this reservoir and allowed the BEG staff and collaborators to assess the performance of the flood as a method for storing CO_2 in an abandoned oil field and in associated brine-filled strata below the oil rim. Monitoring takes place in the injection zone in the lower Tuscaloosa Formation at depths of more than 10,000 feet below surface.
Central Appalachian Coal Seam Project	CNX Gas	Russell County, Virginia	1,000	Commercial	9-Jan-09	11-Feb-09	A single injection well field validation test performed in the Central Appalachian Basin in Virginia to provide an initial assessment of the capability of the coal to receive and adsorb significant volumes of CO_2 for geologic carbon sequestration and enhanced coalbed methane recovery. A mature coalbed methane was used for injection testing and two monitoring wells were drilled and cored.
Black Warrior Basin Coal Seam Project	El Paso Exploration & Production Company	Near Tuscaloosa, Alabama	277	Commercial	4-Jun-10	3-Aug-10	This project used an existing coalbed methane production well to test the sequestration capacity of three coal seams. Additional monitoring wells were drilled.
Saline Aquifer Test Center Project	Mississippi Power (Plant Daniel)	Escatawpa, Mississippi	30,200	Jackson Dome (Natural)	2-Oct-08	28-Oct-08	The project's goal was to locate suitable geologic CO_2 sequestration sinks in proximity to large coal-fired power plants. To achieve this goal, one (1) injection well and one (1) observation well were permitted and drilled to access the Lower Tuscaloosa Formation for injection and plume surveillance.

1.4 Connected Actions

The purpose of this EA is to analyze the potential environmental impacts of SECARB's Proposed Project (i.e. research monitoring, verification, and accounting activities for the injection of CO_2 from a man-made source into a sealed geologic formation) in order to assist DOE in its decision-making regarding whether or not to provide funding for the Project (SECARB's Proposed Project). In preparing this EA, the National Environmental Policy Act (NEPA) also requires DOE, to look for, and if found, analyze the potential environmental impacts of any connected actions. What this means is that if there are related actions that may pose environmental impact and are a part of an overall effort to implement SECARB's Proposed Project, these connected actions must be analyzed in the EA. In the case of SECARB's Proposed Project, there are three connected actions that will also be analyzed as well: the capture of the CO_2 at its source, the transport of the CO_2 to the Denbury injection wells, and the clearing of a right-of-way to supply electric power to the injection and characterization wells.

1.4.1 CO_2 Source

Alabama Power Company's Plant Barry coal-fired power plant is the host site for a 25-megawatt (MW) CO_2 capture and separation project that would serve as the source of the anthropogenic CO_2 for SECARB's Proposed Project. The CO_2 source is therefore included as a connected action in this EA review. Plant Barry is located near Bucks, Alabama on a site of approximately 1,000 acres. Alabama Power Company is a subsidiary of Southern Company. Alabama Power, Southern Company, the Electric Power Research Institute (EPRI), and other EPRI members are working with Mitsubishi Heavy Industries (MHI) to design, build, and test the post-combustion CO_2 capture and separation facility. The proposed CO_2 capture unit will not require federal funding.

The CO_2 capture unit will receive treated stack gas from Plant Barry Unit 5, a 773 MW coal-fired steam generation facility that started commercial operations on October 19, 1971. The total annual CO_2 emissions from Plant Barry Unit 5 in 2009 were 5,329,015 tons. The average annual Unit 5 CO_2 emissions during 1990-2009 were 4,426,569 tons (ENTRIX, 2010b).

Unit 5 is equipped with an electrostatic precipitator (ESP) to remove particulate matter and a selective catalytic reduction (SCR) system to reduce nitrogen oxides (NO_x).

A flue gas desulfurization (FGD) unit was added to Unit 5 and placed into operations in January 2010. The new FGD unit is a wet scrubber. Flue gas desulfurization is an important aspect of stack gas clean up that is needed prior to capturing CO_2. Hot stack gas from Unit 5 is routed to an FGD absorption tower where it reacts with a lime-slurry (calcium carbonate) mixture that removes sulfur from the stack gas and creates a liquid stream of calcium sulfite and calcium sulfate. A forced oxidation blower introduces excess air to the absorber tower and converts calcium sulfite to calcium sulfate. Calcium sulfate slurry is removed from the bottom of the absorber tower and sent to a dewatering facility. Stack gas is routed from the FGD absorber tower to a new 660-foot wet scrubber stack (ENTRIX, 2010b).

A slipstream of stack gases would be collected from the ductwork between the FGD absorber tower and the new wet scrubber stack. The temperature of the gas stream leaving the FGD absorber tower is 125-130 degrees Fahrenheit (°F) (51.6 to 54.4 degrees Celsius °C), and it has a composition of 10.866 percent (%) CO_2 and 5.7 parts per million (ppm) sulfur dioxide (SO_2) (ENTRIX, 2010b).

The Plant Barry Unit 5 CO_2 capture technology will be a post-combustion system that is based upon CO_2 absorption utilizing advanced amines. The technology that is being demonstrated is a technology jointly developed by MHI and Kansai Electric Co., Inc. (Kansai) beginning in 1990 (ENTRIX, 2010b).

In an amine-based process, CO_2 from the cooled power plant exhaust gas reacts with an aqueous solution of amine in an absorption tower. Stack gases that are routed to the capture unit are compressed and cooled. Then, the gases go to the absorption tower where the CO_2 binds to the amine solvent chemically. Most of the CO_2 is removed from the exhaust gas and the CO_2-rich solution (i.e. the solution containing the absorbed CO_2) flows to a lean/rich heat exchanger. The hot CO_2-lean solution coming from the stripper column (solvent regeneration) cools itself by giving up its heat to the CO_2-rich solution, which then goes to solvent regeneration. Here the solvent is regenerated by heat as the chemical bonds holding the CO_2 are decomposed thermally. The CO_2 and water vapor leaving the solvent regeneration "stripper" is next cooled and essentially pure CO_2 leaves the separation plant for compression and dehydration. At this point, the CO_2 is ready for the next step in the process, which is transport to the injection site.

1.4.2 Transport of the CO_2

The CO_2 originating from Plant Barry would be delivered to the injection site via an approximately 12.3-mile long, 4.5-inch outside diameter (OD) and 4-inch inside diameter (ID) pipeline that has been proposed by Denbury Onshore, LLC (Denbury). Denbury proposes a 95-foot wide construction right-of-way (ROW) and an estimated 40-foot wide permanent right of way (ROW) (ENTRIX, 2010c). The proposed pipeline would be funded, constructed, operated, and maintained by Denbury as a separate commercial activity and would not require federal funding for its construction. While the pipeline would not receive DOE funding for construction, a service fee would be negotiated between SSEB, Denbury, and DOE, with DOE paying portion of the costs. Therefore, it is included as a connected action to the SECARB Phase III project and this EA review.

Prior to initiating construction-related activities, Denbury would secure ROW easements from landowners whose properties would be crossed by the pipeline route. All owners, managers, tenants, and lessees of lands along the ROW would be notified in advance of construction activities that could affect their property, business, or operations.

The majority of the Denbury pipeline construction process would be accomplished using conventional open-cut overland construction techniques for small-diameter pipelines. Conventional open-cut overland installation of pipeline is best represented as a moving assembly line with a construction spread (crew and equipment) proceeding along the construction ROW in a continuous operation. Construction at any single point along the pipeline, from ROW

surveying and clearing to backfill and finish grading, would last several weeks. The entire process would be coordinated to limit the time of disturbance to an individual area, thereby minimizing the potential for erosion and the loss of normal use.

No new access roads would be required for installation or monitoring of the pipeline. Denbury proposes to access work areas where existing roads intersect the right-of-way. New aboveground facilities associated with the Denbury pipeline would include a mainline valve and a new pig launcher and receiver.

A trench would be excavated using rotary wheel ditching machines, backhoes, or rippers for installation of the Denbury pipeline. The trench would be excavated to a depth (typically about 4 feet) that would allow space for the pipeline, pipeline bedding, and the minimum amount of top cover required by Department of Transportation (DOT) specifications. Topsoil would be separated in accordance with landowner agreements and any applicable federal, state, and local requirements.

Once installation and backfilling are completed and before the pipeline begins operation, the pipeline would be hydrostatically pressure tested in accordance with DOT safety standards (49 Code of Federal Regulations (CFR) Part 195) to verify its integrity (ENTRIX, 2010c).

Hydrostatic testing consists of installing a hydrostatic test cap and manifold, filling the pipeline with water, pressurizing the pipeline to establish its Maximum Allowable Operating Pressure (MAOP), and maintaining that test pressure for a specified period. Any leaks detected during the test would be repaired and the pipeline would be re-tested.

Following completion of backfilling the trench, all remaining trash, debris, surplus materials, and temporary structures would be removed from the ROW, and disposed in accordance with applicable federal, state, and local regulations. All disturbed areas would have topsoil replaced, as applicable, and would be finish graded and restored as closely as possible to preconstruction contours and in accordance with the *Alabama Handbook for Erosion Control, Sediment Control, and Stormwater Management on Construction Sites and Urban Areas* (Alabama Handbook) and as negotiated in the individual landowner easements.

1.4.3 Supply Electric Power to the Injection Point

To provide electrical power to the proposed injection well pump and the characterization well electronic monitoring control panel, Denbury proposes to install two electric service lines that would extend from existing service lines to the injection and characterization wells within the Citronelle Oilfield (Citronelle Field), which would likely be approximately 3,275 feet total (ENTRIX, 2010d). Denbury would fund the proposed service line, but Alabama Power would be the lead for construction, operation, and maintenance of the 3-phase distribution electric service lines; which would be handled as part of the routine service at the Citronelle field and conducted by employees of Alabama Power stationed in the area or by its area subcontractors. While the service line would not receive DOE funding, the service line would be a connected action to the SECARB Phase III Project and, therefore, would need to be included in the SECARB Phase III Project NEPA review.

Direct and indirect effects to vegetation, land use, and wildlife species may result from limited vegetation and ground disturbance during installation of the service line. Further, routine vegetation maintenance of the right-of-way would result in a permanent change in some forested vegetative communities and would result in the occasional disturbance of wildlife species and their habitats. All installation and maintenance activities would be conducted within the Citronelle Field and would not deviate substantially from other industrial activities that typically occur in that area. The environmental impacts associated with the proposed service line would be minimized by obtaining relevant permits, installation in accordance with applicable laws and regulations, and implementation of appropriate mitigation measures.

The potential consequences of the proposed service lines and a No-Action Alternative were evaluated. Under the No-Action Alternative, a less reliable electricity source, such as electric generators, would be used to power the injection and characterization well. The use of generators could result in decreased reliability and would require additional ongoing maintenance and create additional air emissions, and, was therefore, not determined to be a suitable alternative.

1.5 Related Projects

The following are related projects that were considered for cumulative environmental impacts, due to their proximities to the proposed project location.

Project Number: DE-FC26-06NT42391 (DOE, 2010)
Project Name: Demonstration of a Coal-Based Transport Gasifier
Summary: This project is located in Kemper, Mississippi, which is 151 miles from Mobile, Alabama (AL) and 140 miles from Citronelle, AL. This proposed project is the subject of an ongoing Environmental Impact Statement, DOE/EIS-0409.

Project Number: DE-FE0002225
Project Name: Actualistic and Geomechanical Modeling of Reservoir Rock, CO_2 and Formation Flue Interaction, Citronelle Field, Alabama (DOE, 2010)
Summary: This project will create a framework for two- and three-dimensional visualization that can be used by the spectrum of professionals needed to design and operate systems for geological sequestration in pre- and post-processing geosystems simulation. This project is located within the same oil field as the proposed project. This project received a Categorical Exclusion (CX) dated November 23, 2009.

Project Number: DE-FC26-08NT0000749 (DOE, 2010)
Project Name: National Carbon Capture Center at the Power Systems Development Facility
Summary: This project is located in Wilsonville, AL, which are 234 miles from Mobile, AL and 180 miles from Citronelle, AL. This project was previously evaluated for significant impacts under an Environmental Assessment, DOE/EA-1616, and a FONSI was issued.

Future projects inside the city limits of Citronelle, AL (Marks, 2010)

- 7620 Irwin Street – Not funded by DOE.

- 8160 Alabama Street - Not funded by DOE.
- 19355 North Third Street –Not funded by DOE.

1.6 Scope of DOE Decision

The decision for DOE is to either fund or not fund SECARB's Proposed Project, which focuses on data acquisition and includes the drilling and CO_2 injection activities associated with that data acquisition. The Southern Company intends to conduct CO_2 capture activities at the Plant Barry location regardless of DOE's decision to fund or not fund SECARB's Proposed Project. If DOE decided not to fund SECARB's Proposed Project and there was no destination, point for the captured CO_2, Southern Company would simply vent the captured CO_2 to the atmosphere. With regard to the proposed CO_2 delivery pipeline, Denbury may wish to secure the right-of-way and continue with its construction in future years in order to have infrastructure for possible future CO_2 Enhanced Oil Recovery (EOR) purposes. Table 1.6, below, is based on these premises and illustrates that, other than venting captured CO_2 to the atmosphere at the Plant Barry facility, there is little difference in potential environmental impacts between SECARB's Proposed Project and the No-Action Alternative.

Table 1.6. Comparison of Impacts

Resource	No-Action Alternative	SECARB's Proposed Project
Air Quality	All the CO_2 captured at the Plant Barry facility would be vented to the atmosphere. Such a release would contribute, in some small way to climate change.	Some temporary *de minimis* decrease in localized air quality due to increased emissions of diesel engines used during CO_2 injection activities; however, the project is not expected to produce emissions that would impede the area's conformity with the State Implementation Plan under the Clean Air Act.
Geology and Soils	There is the potential for higher pressures in the reservoir if CO_2 injection is employed for EOR activity. Some soil and subsurface impacts from the installation of the CO_2 pipeline.	There is the potential for localized higher pressure in the reservoir due to the CO_2 injection. Some soil and subsurface impacts from the installation of the CO_2 pipeline.
Water Resources	Same as SECARB's Proposed Project.	Any changes to water quality and quantity would be expected to occur at the lowest detectable levels. Full recovery would occur in a reasonable time.
Wetlands and Floodplains	Same as SECARB's Proposed Project.	No significant impacts to local wetlands and/or floodplains are expected and any impacts to wetlands and/or floodplains would be confined to the immediate project area and would not cause any regional impacts.

Table 1.6. Comparison of Impacts		
Resource	**No-Action Alternative**	**SECARB's Proposed Project**
Terrestrial Vegetation	Same as SECARB's Proposed Project.	Some minor removal of trees along ROWs would occur; however, any changes to native vegetation would be limited to a small area and would not be expected to affect the viability of the resources. Full recovery would occur in a reasonable time, considering the size of the project and the affected resource's natural state.
Wildlife	Same as SECARB's Proposed Project.	Some local disturbance and displacement of wildlife may occur because of ROW activity; however, any changes to wildlife would be limited to a small portion of the population and would not be expected to affect the viability of the resource. Full recovery would occur in a reasonable time, considering the size of the project and the affected species' natural state.
Land Use	Same as SECARB's Proposed Project.	Any change in land use would be limited to a small area and would not noticeably alter any particular land use at the project site or in adjacent areas. The affected areas would fully recover in a reasonable time once the project is completed.
Population and Employment	Same as SECARB's Proposed Project.	Changes to the normal or routine functions of the affected community are expected to be short-term and are not expected to alter existing social or economic conditions in a way that would be disruptive or costly to the community.
Infrastructure	Same as SECARB's Proposed Project.	The project would not noticeably affect or disrupt the normal or routine functions of public institutions, roads, electricity and other public utilities and services in the project area.
Parks & Recreation	Same as SECARB's Proposed Project.	Any disturbance would be minor, temporary in duration, and in character with existing uses of the study area.
Visual Resources	Continued oil extraction activity at the proposed site would not permanently change the visual landscape, because a number of wells have existed in the area since the 1950s.	Same as No-Action.
Noise	Noise levels in the project area would not exceed ambient noise level standards as determined by the Federal, State, and/or local government.	Some additional localized noise may occur due to utilization of additional drilling equipment; however, this noise would not exceed ambient noise level standards as determined by the Federal, State, and/or local government.

Table 1.6. Comparison of Impacts		
Resource	**No-Action Alternative**	**SECARB's Proposed Project**
Environmental Justice	Same as SECARB's Proposed Project.	Neither minority nor low-income groups within the affected community would experience proportionately greater adverse effects than other members of the community would.
Human Health and Safety	Same as SECARB's Proposed Project.	The project, with current and planned mitigation measures, would pose no more than a minimal risk to the health and safety of on-site workers and the local population.
Cultural Resources	Same as SECARB's Proposed Project.	The action would not affect the context or integrity features (including visual features) of a site listed or eligible for listing on the National Register of Historic Places or of other cultural significance.
Waste Management	Same as SECARB's Proposed Project.	The action, along with planned mitigation measures, would not cause air, water, or soil to be contaminated with hazardous material that poses a threat to human or ecological health and safety.

1.7 Legal Framework

DOE has prepared this EA in accordance with the Council on Environmental Quality (CEQ) "Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act," codified in Title 40 of the *Code of Federal Regulations* in Parts 1500 through 1508 (40 CFR 1500-1508) and DOE's regulations for implementing NEPA (10 CFR 1021). These regulations implement the procedural requirements of the NEPA, found in Title 40 of the *United States Code* in Section 4321 and following sections (42 USC § 4321 *et seq*.).

NEPA requires federal agencies to consider the potential environmental consequences of a Proposed Action in their decision-making processes. NEPA encourages federal agencies to protect, restore, or enhance the environment through well-informed federal decisions.

The CEQ NEPA regulations specify that an EA be prepared to:

- Provide sufficient analysis and evidence for determining whether or not to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI).
- Aid in an agency's compliance with NEPA when no EIS is deemed necessary.
- Facilitate EIS preparation when one is necessary.

Further, the CEQ NEPA regulations encourage agencies to integrate NEPA requirements with other environmental review and consultation requirements. Relevant environmental requirements are contained in other federal statutes, such as the Clean Air Act and the Clean Water Act, and their state counterparts. The following federal and state statutes and regulations are relevant to this EA. Federal and state permits that may be required are also listed.

Clean Air Act

The Clean Air Act (CAA), 42 USC § 7401 *et seq.*, establishes the National Ambient Air Quality

Standards (NAAQS) developed by the United States Environmental Protection Agency (USEPA) for the pervasive pollutants SO_2, carbon monoxide (CO), ozone (O_3), nitrogen dioxide (NO_2), lead (Pb), and particulate matter (both PM_{10} and $PM_{2.5}$). The NAAQS are expressed as concentrations of the criteria pollutants in the ambient air, the outdoor air to which the public is exposed. The CAA also contains emission control permit programs to protect the nation's air quality and establishes New Source Performance Standards that establish design standards, equipment standards, work practices, and operational standards for new or modified sources of air emissions. Where the NAAQS emphasize air quality in general, the New Source Performance Standards focus on particular industrial categories or sub-categories (e.g., fossil fuel fired generators, grain elevators, steam-generating units). Regulations implementing the CAA are found in 40 CFR Parts 50-95. Alabama has been delegated CAA authority under Title 22 Chapter 28 of the *Code of Alabama*, and its relevant regulations are found in Air Pollution Control Act sections 1-23 (see: http://www.legislature.state.al.us/CodeofAlabama/1975/coatoc.htm).

Clean Water Act

The Clean Water Act (CWA), 33 USC § 1251 *et seq.*, establishes a comprehensive framework of standards, technical tools, and financial assistance to address "point source" pollution from municipal and industrial wastewater discharges and "nonpoint source" pollution from urban and rural areas. Applicants for federal licenses or permits to conduct any activity that may result in a discharge to navigable waters must provide the federal agency with a state CWA Section 401 certification that the discharge will comply with applicable provisions of the CWA. CWA Section 404 establishes permit programs to regulate the discharge of dredged and fill material into waters of the United States, including wetlands. CWA Section 402 establishes the National Pollutant Discharge Elimination System (NPDES), which requires point sources of pollutants to obtain permits to discharge effluents and storm water to surface waters. Regulations for implementing relevant CWA programs are found in 33 CFR Parts 320-331 and 40 CFR Parts 400-503. Alabama has been delegated CWA authority under Title 22 Chapter 22 of the *Code of Alabama*, and its relevant regulations are found in Water Pollution Control Law (see: http://www.legislature.state.al.us/CodeofAlabama/1975/coatoc.htm).

Safe Drinking Water Act

The Safe Drinking Water Act (SDWA), 42 USC *300 et seq.*, gives USEPA the responsibility and authority to regulate public drinking water supplies by establishing drinking water standards, delegating authority for enforcement of drinking water standards to the states, and protecting aquifers from hazards such as injection of wastes and other materials into wells. Important for this EA are the SDWA provisions relating to injection wells. Congress passed the Safe Drinking Water Act in 1974. In part, the SDWA requires USEPA to develop minimum federal requirements for Underground Injection Control (UIC) programs and other safeguards to protect public health by preventing injection wells from contaminating underground sources of drinking water. Alabama has been delegated SDWA authority under the Safe Drinking Water Act, Title 22 Chapter 23 of the *Code of Alabama*, and its relevant regulations are found in Article 2 (see: http://www.legislature.state.al.us/CodeofAlabama/1975/coatoc.htm). UIC comes under the

jurisdiction of the Alabama State Oil and Gas Board (see: http://www.ogb.state.al.us/ogb/gw_prot.html).

Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA), 42 USC § 6901 *et seq.*, regulates the treatment, storage, and disposal of solid and hazardous wastes. RCRA sets "cradle to grave" standards for both solid waste and hazardous waste management. Certain wastes, such as domestic sewage and septic tank waste, agricultural wastes, industrial discharges, some nuclear wastes, and mining overburden are excluded, specifically, because they are regulated under other statutes. RCRA regulations are found in 40 CFR Parts 239-282. Alabama has been delegated RCRA authority under Title 22 Chapter 27 of the *Code of Alabama,* and its relevant regulations are found in Article 1 sections 1-8 (see: http://www.legislature.state.al.us/CodeofAlabama/1975/coatoc.htm).

Comprehensive Environmental Response, Compensation, and Liability Act/Emergency Planning and Community Right-to-Know Act

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 USC § 9601 *et seq*., also known as "Superfund," established a tax on the chemical and petroleum industries and provided broad federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment. CERCLA also establishes requirements for closed and abandoned hazardous waste sites, provides for the liability of persons responsible for the release of hazardous substances, and establishes a trust fund to pay for orphan facility cleanup and closure. Regulations for implementing CERCLA can be found in 40 CFR Parts 300-312.

The Emergency Planning and Community Right-to-Know Act (EPCRA), 42 USC § 1001 *et seq.*, requires federal agencies to provide information on hazardous and toxic chemicals to state emergency response commissions, local emergency planning committees, and USEPA. EPCRA's goal is to provide this information to ensure that local emergency plans are sufficient to respond to unplanned releases of hazardous substances. Regulations implementing EPCRA are found in 40 CFR Parts 350-374.

National Historic Preservation Act

The National Historic Preservation Act (NHPA), 16 USC § 470 *et seq.*, requires DOE to consult with the State Historic Preservation Officer (SHPO) prior to any construction to ensure that no historical properties would be adversely affected by a proposed project. DOE must also afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on the proposed project. Regulations for implementing NHPA are found in 36 CFR 800-812. Alabama's historic preservation authority is found in Title 41 Chapter 10 of the *Code of Alabama* (see: http://www.ador.alabama.gov/salestax/Rules/6332.html).

Archaeological Resources Protection Act

The Archaeological Resources Protection Act, 16 USC § 470aa *et seq.*, requires a permit for excavation or removal of archaeological resources from publicly held or Native American lands. The Act requires that excavations further archaeological knowledge in the public interest, and that the resources removed remain the property of the United States. Regulations for implementing the Act are found in 43 CFR 7 and 36 CFR 296. Alabama's archaeological protection authority is found in Title 41 Chapter 10 of the *Code of Alabama*.

American Indian Religious Freedom Act

The American Indian Religious Freedom Act, 42 USC § 1996, establishes policy to protect and preserve the inherent and Constitutional right of Native Americans to believe, express, and exercise their traditional religions. The law ensures the protection of sacred locations, access of Native Americans to those sacred locations and traditional resources that are integral to the practice of their religions, and establishes requirements that would apply to Native American sacred locations, traditional resources, or traditional religious practices potentially affected by construction and operation of proposed facilities. Regulations for implementing the Act can also found in 43 CFR 7.

Native American Graves Protection and Repatriation Act

The Native American Graves Protection and Repatriation Act, 25 USC § 3001, directs the Secretary of the Interior to guide the repatriation of federal archaeological collections and collections that are culturally affiliated with Native American tribes and held by museums that receive federal funding. DOE would follow the provisions of this Act if any excavations associated with the proposed construction led to unexpected discoveries of Native American graves or grave artifacts. Regulations for implementing the Act are found in 43 CFR 10.

Endangered Species Act

The Endangered Species Act (ESA), 16 USC 1531 *et seq.*, establishes a national program for the conservation of threatened and endangered species of fish, wildlife, and plants, as well as the preservation of the ecosystems on which they depend. ESA Section 7 requires any federal agency authorizing, funding, or carrying out any action to ensure that the action is not likely to jeopardize the continued existence of any endangered species or threatened species, or result in the destruction or adverse modification of critical habitat of such species. Regulations implementing the ESA interagency consultation process are found in 50 CFR Part 402. Alabama's endangered species protection authority is found in Title 9 Chapter 11 of the *Code of Alabama*.

Fish and Wildlife Conservation Act/Fish and Wildlife Coordination Act

The Fish and Wildlife Conservation Act, 16 USC § 2901 *et seq.*, encourages federal agencies to conserve and promote conservation of non-game fish and wildlife species and their habitats. In addition, the Fish and Wildlife Coordination Act, 16 USC § 661 *et seq.*, requires federal agencies

undertaking projects affecting water resources to consult with the U.S. Fish and Wildlife Service and the state agency responsible for fish and wildlife resources. Compliance with these statutes is internalized in the DOE NEPA process. Alabama's fish and wildlife authority is found in Title 9 Chapter 11 of the *Code of Alabama*.

Noise Control Act

The Noise Control Act of 1972, 42 USC § 4901 *et seq.*, directs federal agencies to carry out programs in their jurisdictions to the fullest extent within their authority and in a manner that furthers a national policy of promoting an environment free from noise that jeopardizes health and welfare. This would involve complying with applicable municipal noise ordinances to the maximum extent practicable.

Farmland Protection Policy Act

The Farmland Protection Policy Act, 7 USC § 4201 *et seq.*, directs federal agencies to identify and quantify adverse impacts of federal programs on farmlands in order to minimize the unnecessary and irreversible conversion of agricultural land to non-agricultural uses. Regulations implementing the Act are found in 7 CFR 658. Alabama's farmland protection authority is contained in Title 2 of the *Code of Alabama*.

Occupational Safety and Health Act

The Occupational Safety and Health Act, 29 USC § 651 *et seq.*, requires employers to furnish employees a place of employment that is free from recognized hazards that cause or are likely to cause death or serious physical harm to employees, and to comply with occupational safety and health standards promulgated by the Occupational Safety and Health Administration (OSHA). OSHA standards are implemented under regulations found in 29 CFR Parts 1900-2400. Alabama regulates OSHA requirements through its Department of Labor.

Pollution Prevention Act

The Pollution Prevention Act, 42 USC § 13101 *et seq.*, establishes a national policy for waste management and pollution control that focuses first on source reduction, and then on environmentally safe waste recycling, treatment, and disposal. Three executive orders provide guidance to agencies to implement the Pollution Prevention Act: Executive Order 12873, "Federal Acquisition, Recycling, and Waste Prevention," Executive Order 13101, "Greening the Government through Waste Prevention, Recycling, and Federal Acquisition" and Executive Order 13148, "Greening the Government through Leadership in Environmental Management."

Federal Aviation Administration Act

49 USC § 106(f) and (g) give the Administrator of the Federal Aviation Administration (FAA) a number of powers, including the authority to regulate objects affecting navigable airspace. Regulations requiring FAA notification if any structure of more than 200 feet (approximately 60 meter (m)) high would be constructed are found in 14 CFR Part 77. The FAA then determines if

the structures would or would not be an obstruction to air navigation. Alabama regulates navigable airspace under Title 4 of the *Code of Alabama*.

Executive Orders

A number of presidential executive orders, in addition to those noted above, provide additional guidance in developing this EA. The most relevant of them include:

- Executive Order 11514, "Protection and Enhancement of Environmental Quality"
- Executive Order 11988, "Floodplain Management"
- Executive Order 12856, "Right to Know Laws and Pollution Prevention Requirements" Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations"
- Executive Order 13112, "Invasive Species"
- Executive Order 13186, "Responsibilities of Federal Agencies to Protect Migratory Birds"
- Executive Order 13423, "Strengthening Federal Environmental, Energy, and Transportation Management"

Federal executive orders can be accessed at http://www.archives.gov/federal-register/codification/.

Federal and State Permitting

The following are potentially applicable federal and state permitting requirements to construct and operate the proposed facilities.

- Acid Rain Permit, 40 CFR Part 72
- Airspace Obstruction Control Permit, 14 CFR Part 77
- Clean Air Act Prevention of Significant Deterioration permit, Acid Deposition Control permit, and Operating Permit, 40 CFR Parts 50-96
- Clean Water Act, Section 401 Certification, Section 402 NPDES Permit, Section 404 Wetlands Permit, and Pretreatment Authorization for Discharge of Wastewater to Municipal Collection System, 40 CFR Parts 104-140, 403
- Safe Drinking Water Act Underground Injection Control Permit, 40 CFR Part 144
- Rivers and Harbor Act Permit, 33 CFR Part 322
- Notice to the Federal Aviation Administration, 14 CFR Part 77
- RCRA, 40 CFR Parts 239 through 299
- Sales Tap Approval, 18 CFR 157.211. Approval would be required to tap into or modify existing interstate gas pipelines.

2.0 PROPOSED ACTION AND ALTERNATIVES

DOE's Proposed Action is to provide SECARB with $30,000,879 in financial assistance in a cost-sharing arrangement to facilitate the injection of CO_2 captured from a power plant into a deep saline aquifer for enhanced oil recovery and geologic sequestration. This project would demonstrate the geologic sequestration of 125,000 tons of CO_2 per year for three years. This Proposed Action would demonstrate geologic sequestration on a large scale, validate the storage capabilities of a regionally significant target formation, and advance strategies for reducing greenhouse gas emissions.

2.1 SECARB's Proposed Project

The proposed installation and operation of the SECARB Phase III Project facilities within the Citronelle Field would include:

- Drilling new injection well(s) at an existing well pad;
- Drilling new site characterization/monitoring well(s) at an existing well pad;
- Reconditioning of four existing wells and well pads for Project in-zone and above-zone monitoring; and
- Drilling of two new shallow water wells on or near existing well pads to monitor groundwater for post-injection changes.

One or two injection wells would be utilized to inject approximately 125,000 tons to 182,500 metric tons per year (or 375,000 to 547,500 total metric tons injected over 3 years) of CO_2 annually into the saline water section of the Paluxy Formation over the course of three years (from 2011 to 2014). The data collected from the characterization well would determine if one or two injection wells were needed. If the data indicates two wells are needed, then the "characterization" well would be the second injection well and one or two deep monitoring wells would be drilled on the same well pad site.

Baseline characterization of the subsurface conditions and the existing penetrations within the area of review, which is the area that the UIC permit modeling showed CO_2 could migrate, would be conducted as part of the required UIC permitting process prior to injection. Monitoring would occur throughout the injection period and would continue an additional three years after the completion of CO_2 injection activities (through 2017). Throughout the injection and monitoring periods, the SECARB Team would implement its research monitoring, verification, and accounting (MVA) program. The basic goals of the MVA program would be to monitor CO_2 movement and pressure after injection, detect migration, and verify well integrity.

2.1.1 Project Location

The Project, as proposed by SSEB, would be in a saline formation located within the Citronelle Oilfield in Mobile County, Alabama (see Figure 2.1.1-1 below).

This saline formation within the Citronelle Field unit is ideally suited for the study because no CO_2 EOR floods have occurred locally and it has exceptional geologic containment strata. Additionally, the study participants have the resources and expertise necessary to manage this

type of injection and related down-hole technology. The SECARB's Proposed Project, which would enable SECARB to conduct monitoring, verification, and accounting activities for CO_2 injected by Denbury, would consist of the installation of a new injection well and a new characterization well and the use of four previously installed wells that would be retrofitted for monitoring activities (see Figure 2.1.1-2 below). Two shallow (600 foot or 180 meters) groundwater-monitoring wells would also be drilled on existing well pads.

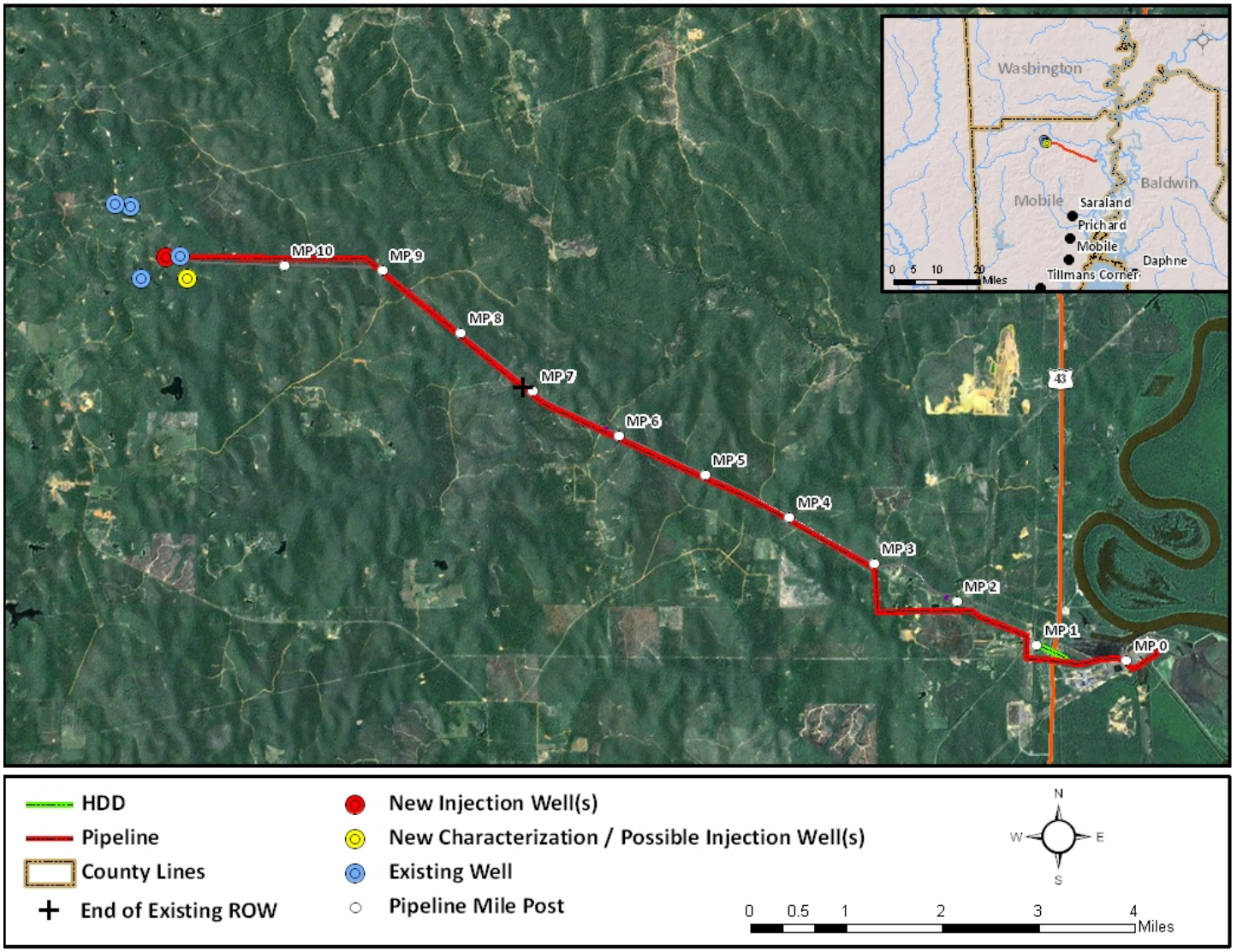


Figure 2.1.1-1. Site Map (CO_2 Source, Pipeline, Injection Point)

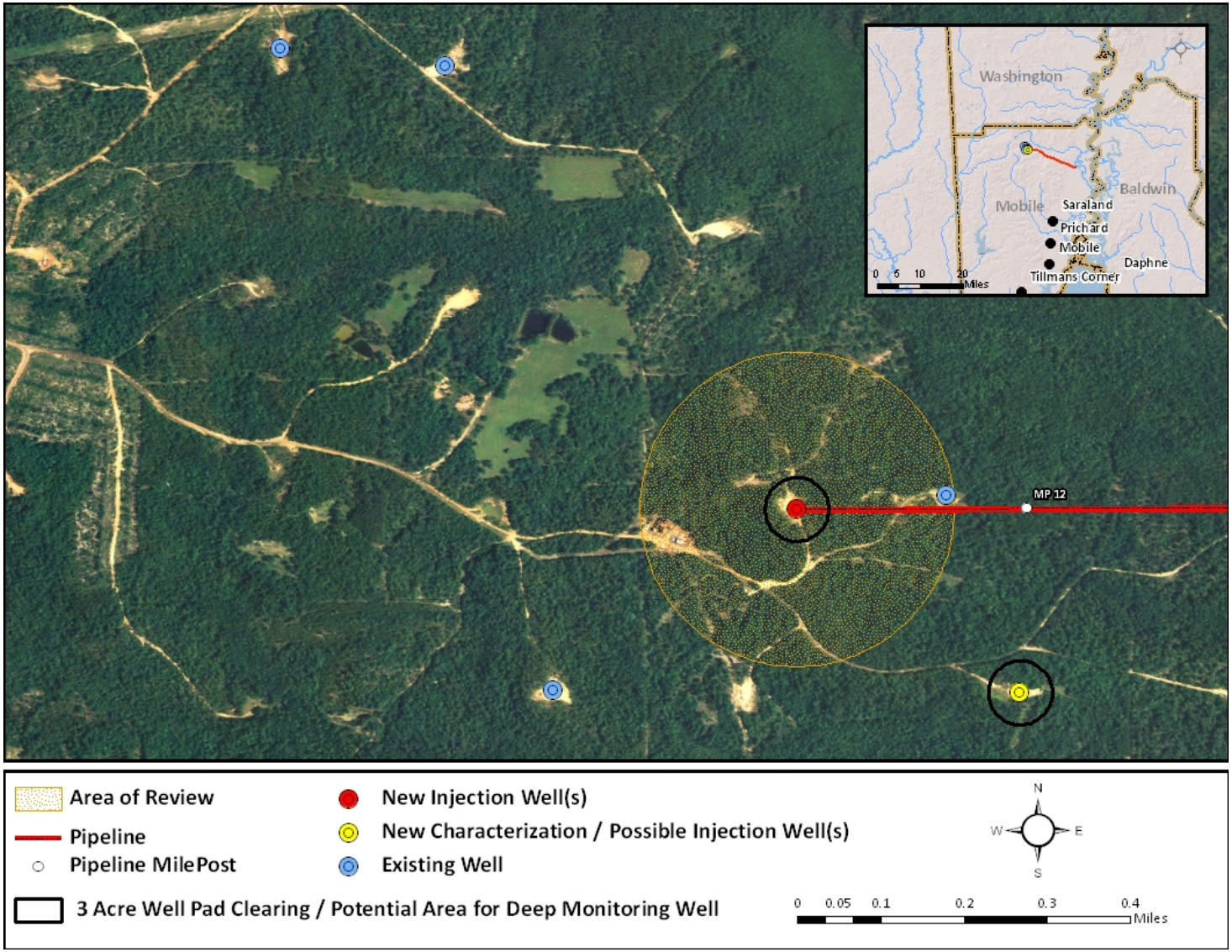


Figure 2.1.1-2. Injection Test Site

2.1.2 Construction

Project construction activities would consist of the drilling and installation of one or two new injection wells, one or two new characterization/monitoring wells, and the use of four existing wells that may require reconfiguration for monitoring. Additionally, two shallow groundwater monitoring wells would be drilled to an approximately 600 foot depth. All Project-related installation would be conducted at existing well pads in the Citronelle Field.

Drilling of the injection and characterization wells would use standard oil and gas well construction methods and technologies and would be conducted in accordance with all applicable regulations. Drilling work areas would be cleared and graded to provide a level work area for drilling equipment. Typical well drilling includes the installation of the surface casing, the protection casing, injection tubing and packer, and the wellhead. All casings would be fabricated from carbon steel and the well would be sealed with a cement mixture that is resistant to the corrosive effects of injected CO_2.

During drilling of the injection and characterization well, a borehole would be drilled past the Underground Sources of Drinking Water (USDW). At that depth (approximately 2,500 feet (ft) or 760 meters below land surface, an approximately 9.6-inch (24 centimeters) diameter surface casing would be installed and a cement mixture would be inserted between the casing and the outside of the borehole from the ground surface to approximately 2,500 feet (760 meters). A slightly smaller borehole would then be drilled from the bottom of the surface casing through the injection zone (9,400 to 10,500 feet (2,865 to 3,200 meters) to the well's total depth (approximately 11,700 feet or 3,566 meters). A 5.7-inch (17.78 centimeters) diameter protection casing would be installed that would extend from the ground surface for the well's total depth. Cement would then be added to the outside of the protection casing that would extend from the injection zone, into the surface casing's cement string, and up to the ground surface. The 2.875-inch (7.3 centimeter) thick injection tubing and injection packer would then be installed inside of the protection casing for injection at the injection well. The annular fluid between the injection tubing and the protective casing would consist of freshwater. At this time, the SECARB Team has not determined if the characterization well would have a tubing and packer installed. Perforations in the protection casing would be made between approximately 9,400 and 10,500 feet (2,865 to 3,200 meters) for the injection well. A similar wellhead configuration would be used at both the injection and characterization wells (ENTRIX, 2010b).

Drilling of the new wells would require various aboveground equipment and facilities, including a drilling rig, mud pit, various trailers, water tanks, pipe racks and ramp, and mud pumps.

After installation, the SECARB Team would conduct cement bond evaluations to ensure a secure cement bond between the wellbore's injection zone and the confining unit intervals. The SECARB Team would conduct mechanical integrity testing after the installation of the packer, and prior to the start of injection, in accordance with state guidelines.

Existing wells would be adapted to function as monitoring wells to detect CO_2 migration, plume extent, and in- and above-zone pressure. Monitoring wells would have subsurface components

that are of a similar configuration as the injection well, but would include additional in-well monitoring equipment to perform monitoring for various parameters and tests (such as pressure, temperature, seismic, pulsed neutron logging, and in-situ fluid sampling).

2.1.3 Injection and Monitoring

CO_2 would be transported to the Citronelle Field from a capture unit located at Plant Barry via a pipeline that Denbury has proposed for construction. The pipeline would be funded, constructed, and operated by Denbury as a separate commercial activity and is not a part of the decision by the DOE to fund or not fund the SECARB's Proposed Project; however, because it is considered a Connected Action its potential environmental impacts are a part of the analysis of this EA. Operation of the wells would require an annual power consumption of approximately 24,100 kilowatt (kW) hours, which would be delivered via approximately 675 foot and 2,600 foot (206 to 790 m) service lines that would be connected to existing secondary power lines present in the Citronelle Field (ENTRIX, 2010d). CO_2 injection would be regulated by Denbury at the surface through the control of pressure and injection volume using standard industry practices. The CO_2 would be injected into the Paluxy Formation at a depth between 9,400 and 10,500 feet (2,865 to 3,200 meters). CO_2 would be injected at a pressure between 2,000 and 3,000 pound per square inch absolute (psia) and at an annual volume of approximately 125,000 tons of CO_2 for three years (ENTRIX, 2010a). CO_2 would be delivered to the injection site in a supercritical phase; therefore, no compression facilities or on-site heating equipment would be required at the injection well.

Multiple ongoing monitoring activities would take place at the injection site, characterization well, and the multiple monitoring well locations. The basic goals of the research monitoring program are to monitor CO_2 movement and pressure after injection, detect the occurrence of any migration, and verify well integrity. As part of their research MVA program, the SECARB Team has established a rigorous monitoring program that includes in-zone and above-zone pressure and fluid chemistry monitoring, monitoring of the CO_2 plume extent, monitoring of groundwater for CO_2 migration, and monitoring well integrity.

Several measures would be implemented ARI and Denbury to ensure that data in support of the Project goals are collected and that CO_2 migration is detected and corrected. In support of Denbury's UIC permitting, a detailed monitoring plan has been developed.

Measures that have been identified as the cornerstones of the MVA program include:

- **Injection Well Integrity:** Because CO_2 migration through the well annulus or the wellbore is a potential pathway for CO_2 migration, injection well integrity monitoring would be conducted. To verify a satisfactory cement bond along the wellbore's injection zone and confining unit intervals cement bond evaluations would be conducted. In addition, periodic internal mechanical integrity testing, with radioactive tracer surveys, annular pressure tests, and temperature logs, would be conducted on the injection well to verify that it is in good operating condition. The injection tubing and annular pressure would also be monitored at the wellhead to verify external mechanical integrity.
- **Pressure Monitoring:** To provide evidence that the permitted maximum injection pressure is not exceeded and to monitor for the occurrence of any CO_2 leakage, in- and

above-zone pressure would be monitored at one or more wells. Pressure would be monitored within the injection interval and in the saline reservoir located above the confining unit.

- **CO_2 Plume Monitoring:** The extent of the CO_2 plume would be monitored using a variety of methods, including seismic, pulsed neutron logging surveys, and in-situ fluid sampling. Pre-injection conditions would be established through the use of seismic runs and pulsed neutron logs in the observation well (and potentially other Citronelle Field wells). These methods would also be employed in time-lapse during and after injection to monitor for changes in the reservoir that occur as a result of CO_2 injection and post-injection equilibration. Further, the reservoir's fluid would be directly sampled from the observation well prior to injection and periodically after injection to monitor for the presence of CO_2 and water chemistry changes.
- **Shallow CO_2 Migration Monitoring**: Groundwater wells would be drilled in the Citronelle Field near the observation and injection wells to sample groundwater chemistry for evidence of CO_2 migration. Another existing water supply well near D4-13 would also be used as an up dip groundwater-monitoring site.

The table below provides estimates of materials expected to be used during well drilling if the project moves forward.

Table 2.1.3. Materials Used and Produced During the Project Well Drilling

Materials Used		Materials Produced	
Material	**Quantity**	**Material**	**Quantity**
Water (2-4 wells)	84,000-168,000 gallons (gal). (318,000-636,000 Liters (L))	Wastewater (2-4 wells)	84,000-168,000 gal). (318,000-636,000 L)
Diesel fuel (2-4 wells)	10,000-20,000 gal. (37,850-75,700 L)	Solid waste (2-4 wells)	2,000-4,000 pounds (lbs). (907-1,814 kilograms (kg))
Steel pipe (2-4 wells)	356-712 short tons (322,958-645,916 kg)	Drill cuttings (2-4 wells)	Approximately 840-1,680 cubic yards (yd^3) (642-1,284 cubic meters (m^3))
Explosives (1-2 injection wells)	11-22 pounds for wellbore stimulation (5-10 kg)		
Gravel (2 well pads)	15,000 yd^3 (12,542 m^3)		
Drilling mud (2-4 wells)	40,000-80,000 lbs (18,144-36,288 kg)		

2.1.4 Post-Project Decommissioning

Plans for post-project decommissioning have not yet been determined. If Denbury determines that the use of the project injection, characterization, or monitoring wells are no longer required beyond the project time period, all wells would be abandoned and plugged in accordance with applicable federal and state regulations. In accordance with regulatory requirements, wells would be plugged in a manner that would ensure that these wells would not serve as conduits for future CO_2 movement into USDWs.

2.2 Alternatives

DOE's selections under Funding Opportunity Announcement, DE-PS26-05NT42255 *Regional Carbon Sequestration Partnerships - Phase II* determined which of the proposed projects would be eligible for non-competitive progression to Phase III, and limited DOE's alternatives.

Because DOE's Proposed Action is limited to providing financial assistance in cost-sharing arrangements to projects submitted by applicants in response to a competitive funding opportunity, DOE's decision is limited to either accepting or rejecting the project as proposed by the proponent, including its proposed technology and selected sites.

DOE's consideration of reasonable alternatives is therefore limited to the No-Action Alternative for this project.

2.3 No-Action Alternative

Under the No-Action Alternative, DOE would not provide funds to the proposed projects. As a result, these projects would be delayed as they look for other funding sources to meet their needs, or abandoned if other funding sources are not obtained. Furthermore, demonstration of geologic sequestration on a large scale, validation of the storage capabilities of the target formation, and the advancement of strategies for reducing greenhouse gas emissions would not occur or would be delayed. DOE's ability to achieve its objectives under the RCSP program would be impaired.

2.4 Issues Considered and Dismissed

The Purpose and Need section above highlighted the importance of the overall program of evaluating carbon capture and storage (CCS) as one tool among many to address global climate change while providing this nation with a secure energy future. Because of the lack of potential impact to certain issues due to the specific characteristics of the SECARB's Proposed Project, the following issues were considered but dismissed from detailed analysis:

- Increase Local Govt. Expenditures – The expected population dynamics of the temporary workforce are not expected to impose additional local govt. expenditures through need for new roads, schools, etc.
- Impact Property Values – This is a minor expansion of an existing industrial facility and not a new construction on a green-field site.
- Alter Local Hydrology Patterns – None of the proposed construction would affect drainage in the local watershed.
- Wild and Scenic Rivers – No listed Wild and Scenic rivers are within the general area of the proposed project site.

3.0 THE ENVIRONMENTAL ANALYSIS APPROACH

This chapter describes how the environmental review team analyzed the potential impacts of SECARB's Proposed Project (i.e., injection and analysis of potential for geologic storage of CO_2). Chapter 4 provides a description of the affected environment and the potential environmental effects of the SECARB's Proposed Project along with an analysis of environmental effects if the SECARB's Proposed Project was not implemented.

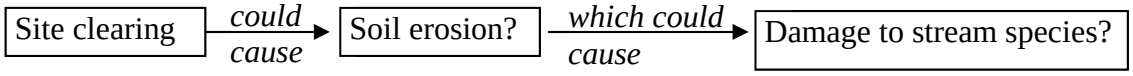
3.1 Approach to the Analysis

It is the intention of an Environmental Assessment to be a clear, focused, analysis of impacts and not intended to be merely a compilation of encyclopedic information about the project or about the environment. Accordingly, the environmental review team used a systematic approach to identifying, and then answering, the relevant impact questions.

The initial step was to develop a detailed description of the components of the CO_2 injection process to be used along with those components that would be added by NETL to study the potential of geologic sequestration of CO_2 at this site. This description was presented in Chapter 2.

For each project component, (e.g., underground injection of CO_2) the team sought to identify all the types of direct effects which that activity could cause on any environmental resource. For example, clearing a site of vegetation could cause soil erosion. In doing this preliminary identification of the types of impacts that potentially could occur the team drew upon their experience with previous projects.

For each potential direct effect, the team then sought to identify the potential indirect effects on other environmental resources. For example, soil erosion could cause sedimentation in nearby streams, which could in turn harm the fish and other species in the stream.



This served as the framework for the analysis of impacts. That is, the team focused their efforts on answering these questions as to whether these effects would in fact occur, and if so, how extensive, how severe, and how long lasting they would be. This was then compared to the significance levels found in Table 3.2 below.

3.2 Analysis of Significance

The review team used a systematic process to evaluate the importance, or significance, of the predicted impacts. This process involved comparing the predictions to the significance criteria established by the team and illustrated below in Table 3.2. These significance criteria were based on legal and regulatory constraints and on team members' professional, technical judgment.

Table 3.2. Impact Significance Thresholds	
Resource Area	**Impact Significance Thresholds** **An impact would be significant if it EXCEEDS the following conditions**
Air Quality	The project would not produce emissions that would impede the area's conformity with the State Implementation Plan under the Clean Air Act.
Geologic Formations	The SECARB's Proposed Project would cause no measurable migration of CO_2 from the storage formation to the surface or into another area in the subsurface, and there is no more than an imperceptible risk of inducing seismic events due to increased reservoir pressure.
Soils	Any changes in soil stability, permeability, or productivity would be limited in extent. Full recovery would occur in a reasonable time*, considering the size of the project. Mitigation, if needed, would be simple to implement and proven to be effective in previous applications.
Surface Water	Any changes to surface water quality or hydrology would be confined to the immediate project area. Full recovery would occur in a reasonable time, considering the size of the project and the affected area's natural state.
Groundwater	Any changes to groundwater quality and quantity would be at the lowest detectable levels. Full recovery would occur in a reasonable time. Mitigation, proven to be effective in previous applications, would be implemented, if needed.
Wetlands and Floodplains	Any impacts to wetlands and/or floodplains would be confined to the immediate project area and would not cause any regional impacts. Planned mitigation measures would fully compensate for lost wetland values in a reasonable time.
Terrestrial Vegetation	Any changes to native vegetation would be limited to a small area and would not affect the viability of the resources. Full recovery would occur in a reasonable time, considering the size of the project and the affected resource's natural state. Mitigation, proven to be effective in previous applications, would be implemented, if needed.
Wildlife	Any changes to wildlife would be limited to a small portion of the population and would not affect the viability of the resource. Full recovery would occur in a reasonable time, considering the size of the project and the affected species' natural state.
Threatened or Endangered Species	Any effect to a federally listed species or its critical habitat would be so small that it would not be of any measurable or perceptible consequence to the protected individual or its population. This negligible effect would equate to a "no effect" or a "not likely to adversely affect" determination in U.S. Fish and Wildlife Service terms.
Land Use	Any change in land use would be limited to a small area and would not noticeably alter any particular land use at the project site or in adjacent areas. The affected areas would fully recover in a reasonable time once the project is completed.
Population and Employment	Changes to the normal or routine functions of the affected community are short-term or do not alter existing social or economic conditions in a way that is disruptive or costly to the community.
Infrastructure	The project would not noticeably affect or disrupt the normal or routine functions of public institutions, roads, electricity, and other public utilities and services in the project area.

Table 3.2. Impact Significance Thresholds	
Resource Area	**Impact Significance Thresholds** **An impact would be significant if it EXCEEDS the following conditions**
Parks and Recreation	Any disturbance would be minor, temporary in duration, and in character with existing uses of the study area.
Visual Resources	The action, along with planned mitigation, would not permanently change the visual landscape in a way that is objectionable to a number of local residents or frequent visitors. (or) The action, along with planned mitigation, would not change the visual resource classification of the affected area.
Noise	Noise levels in the project area would not exceed ambient noise level standards as determined by the Federal, State, and/or local government.
Environmental Justice	Neither minority nor low-income groups within the affected community will experience proportionately greater adverse effects than other members of the community.
Human Health and Safety	The project, with current and planned mitigation measures, would pose no more than a minimal risk to the health and safety of on-site workers and the local population.
Cultural Resources	The action would not affect the context or integrity features (including visual features) of a site listed or eligible for listing on the National Register of Historic Places or of other cultural significance. Following consultations with the SHPO/Tribal Historic Preservation Officer (THPO) and consultations with any other potentially affected groups including Indian Tribes, local governments, and the National Park Service (NPS), the determination of effect under Section 106 of the NHPA would be *no adverse effect*.
Waste Management	The action is unlikely to cause air, water, or soil to be contaminated with hazardous material that poses a threat to human or ecological health and safety.

* Recovery in a reasonable time: Constant, sustainable improvement is apparent and measurable when the site is routinely observed, and full recovery is achieved over a period of no more than several years.

4.0 DESCRIPTION OF THE AFFECTED ENVIRONMENT AND ENVIRONMENTAL EFFECTS

4.1 Air Quality

4.1.1 Description

This is a description of regional climate, ambient air quality with respect to attainment of NAAQS, and identification of applicable air quality regulations.

4.1.1.1 National Ambient Air Quality Standards and Attainment Status

USEPA Region 4 and the State of Alabama Department of Environmental Management (ADEM), regulate air quality in Alabama. The CAA (42 USC 7401-7671q), as amended, gives USEPA the responsibility to establish the primary and secondary NAAQS (40 CFR Part 50) that set acceptable concentration levels for seven criteria pollutants: PM_{10}, $PM_{2.5}$, SO_2, CO, NO_x, O_3, and lead. Short-term standards (1-, 8-, and 24-hour periods) have been established for pollutants contributing to acute health effects, while long-term standards (annual averages) have been established for pollutants contributing to chronic health effects. Each state has the authority to adopt standards stricter than those established under the Federal program do; however, the state of Alabama accepts the federal standards.

The SECARB Phase III study area is completely within the Mobile-Pensacola-Panama City-Southern Mississippi Air Quality Control Region (AQCR 005) (40 CFR 81.68). Federal Regulations designate AQCR 005 as an attainment area for all criteria pollutants (40 CFR 81.68). Because the SECARB Phase III study area is in an attainment region, the air conformity regulations do not apply. Even though the area is in attainment, SECARB Proposed Project's emissions of criteria pollutants and the applicability thresholds under the general conformity rules were used to conduct a more detailed analysis to determine the level of impact under NEPA.

4.1.1.2 Local Ambient Air Quality

Worst-case ambient air quality conditions can be estimated from measurements conducted at air-quality monitoring stations (Table 4.1.1.2). Please note that the cited stations provide data from urban and industrial counties, such as Jefferson County (Birmingham), which is a non-attainment area and is not representative of the more rural study area. Jefferson County data is used to demonstrate overall air quality in the region. Hence, the levels outlined on Table 4.1.1.2 can be considered a conservative worst case.

With the exception of the eight-hour O_3 standards, air-quality measurements are below the NAAQS for the Mobile County area (USEPA, 2010a). The reported maximum of 0.085 ppm for the eight-hour level exceeds the standard by 0.005 ppm within the region. However, the 3-year average of the fourth highest daily maximum 8-hour average ozone concentrations over each year has not exceeded 0.08 ppm; hence, the attainment status.

Table 4.1.1.2. NAAQS and Monitored Air Quality Concentrations				
Pollutant and Averaging Time	**Primary NAAQS[1]**	**Secondary NAAQS[1]**	**Monitored Data[2]**	**Location of Station**
CO				
8-Hour Maximum[3] (ppm)	9	(None)	*(no data available)*	-
1-Hour Maximum[3] (ppm)	35			
NO_2				
Annual Arithmetic Mean (ppm)	0.053	0.053	*(no data available)*	-
Ozone				
8-Hour Maximum[4] (ppm)	0.08	0.12	0.085	Mobile County
$PM_{2.5}$				
Annual Arithmetic Mean[5] (µg/m^3)	15	15	10.3	Mobile County
24-Hour Maximum[6] (µg/m^3)	35	35	31.2	
PM_{10}				
Annual Arithmetic Mean[7] (µg/m^3)	50	50	27	Mobile County
24-Hour Maximum[3] (µg/m^3)	150	150	55	
SO_2				
Annual Arithmetic Mean (ppm)	0.03	(None)	0.003	Jefferson County
24-Hour Maximum[3] (ppm)	0.14	(None)	0.017	
3-Hour Maximum[3] (ppm)	-	0.5	0.052	

1 - Source: 40 CFR 50.1-50.12.
2 - Source: (USEPA, 2010a).
3 - Not to be exceeded more than once per year
4 - The 3-year average of the fourth highest daily maximum 8-hour average O_3 concentrations over each year must not exceed 0.08 ppm.
5 - The 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from must not exceed 15.0 µg/m^3.
6 - The 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor must not exceed 65 µg/m^3.
7 - The 3-year average of the weighted annual mean PM_{10} concentration at each monitor within an area must not exceed 50 µg/m^3.
ppm = parts per million
µg/m^3 = micrograms per cubic meter

4.1.1.3 Climate and Greenhouse Gasses

The SECARB Phase III study area is in Mobile County, Alabama. The humid subtropical climate is characterized by high humidity (especially in summer) and typically mild winters. The area has no dry season; even the driest summer month receives at least 4.9 inches (125 millimeters (mm)) of rain on average. Precipitation is evenly distributed throughout the year, but is markedly greater during summer or early spring, especially during frequent thunderstorms. Tropical hurricanes strike the coastal areas occasionally and can bring very heavy rains. Snowfall is rare and melts almost immediately. January, historically the coldest month, temperatures range from an average low of 48.5° F (9.2°C) to an average high of 60.4° F (15.7° C). In July, historically the warmest month, temperatures range from an average low of 69.0° F (20.6° C) to an average high of 92.6° F (33.7° C) (Idcide, 2010).

Greenhouse gases (GHGs) are components of the atmosphere that trap heat relatively near the surface of the earth, and therefore, contribute to the greenhouse effect and global warming. Most

GHGs occur naturally in the atmosphere, but increases in their concentration can result from human activities such as the burning of fossil fuels. Global temperatures are expected to continue to rise as human activities continue to add carbon dioxide, methane, nitrous oxide, and other greenhouse (or heat-trapping) gases to the atmosphere. Most of the U.S. is expected to experience an increase in average temperature. Precipitation changes, which are also very important to consider when assessing climate change effects, are more difficult to predict. Whether or not rainfall would increase or decrease remains difficult to project for specific regions (USEPA, 2010b; IPCC, 2007).

The extent of climate change effects, and whether these effects prove harmful or beneficial, would vary by region, over time, and with the ability of different societal and environmental systems to adapt to or cope with the change. Human health, agriculture, natural ecosystems, coastal areas, and heating and cooling requirements are examples of climate-sensitive systems. Rising average temperatures are already affecting the environment. Some observed changes include shrinking of glaciers, thawing of permafrost, later freezing and earlier break-up of ice on rivers and lakes, lengthening of growing seasons, shifts in plant and animal ranges and earlier flowering of trees (USEPA, 2010b; IPCC, 2007).

4.1.2 Effects of SECARB'S Proposed Project

Short-term minor adverse and long-term minor beneficial impacts to air quality would be expected with the implementation of the SECARB's Proposed Project. Short-term emissions would be limited to fugitive dust and diesel emissions from drilling and construction equipment during well, electric service line, and pipeline development. Direct and indirect air emissions would not be expected to exceed applicability thresholds, be "regionally significant," or contribute to a violation of any Federal, state, or local air regulation. Therefore, expected emissions from SECARB's Proposed Project would not impede the area's conformity with state air emission standards. Long-term beneficial effects would be due to the sequestration of greenhouse gases - primarily CO_2.

4.1.2.1 Estimated Emissions and General Conformity

The general conformity rules require Federal agencies to determine whether their action(s) would increase emissions of criteria pollutants above preset threshold levels (40 CFR 93.153(b)). These *de minimis* (of minimal importance) rates vary depending on the severity of the non-attainment and geographic location. Because AQCR 005 is in attainment, the general conformity regulations do not apply. However, all direct and indirect emissions of criteria pollutants were estimated and compared to applicability threshold levels of 100 short tons (91,000 kg) per year (tpy) to determine whether implementation of the SECARB's Proposed Project would cause significant impacts.

The total direct and indirect emissions associated with the following activities were accounted for:

- Site preparation & drilling of injection facilities,
- Site preparation & construction of the electric service line, and
- Site preparation & construction of the transport pipeline.

Emissions would primarily be due to the use of heavy construction equipment, diesel powered drilling rigs, mud pumps, diesel generators, deliveries to the site, and fugitive dust. Drill rig operations during well construction are anticipated to occur 24 hours per day and 7 days per week for three months. There are no planned operational activities along the proposed pipeline, power lines, or the well sites, that would generate emissions of criteria pollutants.

The total direct and indirect emissions associated with SECARB's Proposed Project would not exceed applicability threshold levels (Table 4.1.2.1). Because AQCR 005 is an attainment area, there is no existing emission budget. However, due to the limited size and scope of SECARB's Proposed Project, it is not likely that the estimated emissions would make up 10 percent or more of regional emissions for any criteria pollutant and would not be regionally significant. A detailed breakdown of drilling and construction emissions is located in Appendix A.

Table 4.1.2.1. Project Emissions Compared to Applicability Thresholds

	Annual emissions (Short Tons Per Year)						***De minimis* threshold (Short Tons Per Year)**	**Would emissions exceed applicability thresholds? [Yes/No]**
Activity	**CO**	**NO_x**	**VOC**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**		
Site preparation, Drilling, and Construction	6.3	8.2	1.2	< 0.1	0.4	0.4	100	No
Operational Emissions	*<none>*							

Notes: VOC is volatile organic compounds, and SO_x is sulfur oxides.

4.1.2.2 Regulatory Review

New stationary sources of emissions may be subject to both Federal and State permitting requirements. These requirements include, but are not limited to, New Source Review, Prevention of Significant Deterioration, and New Source Performance Standards for selected categories of industrial sources. The rules for ADEM's Air Pollution Control Program are found in Division 3 of the ADEM Administrative Code. Division 3 regulations include emission standards and control requirements on both a pollutant specific basis and process/equipment/ industry specific basis. Division 3 also sets forth the permitting requirements for stationary emission sources. No new stationary sources of air emissions would be associated with the SECARB's Proposed Project; therefore, no ADEM air permit is required for construction or operation.

4.1.2.3 Greenhouse Gasses and Global Warming

Direct and Indirect CO_2 Emissions. CO_2 would be transported from the source at Plant Barry to the Citronelle injection site and sequestered. It is likely that 137,800 short tons (125,000 metric tons) per year of CO_2 would be sequestered during the SECARB's Proposed Project period. However, the overall amount of CO_2 generated as a result of SECARB's Proposed Project would

increase by approximately 398 short tons (361 metric tons) due to the burning of diesel fuel during drilling, the additional electrical demand (estimated at 24,100 kilowatt hours per year for the operation of the wells), and worker commutes. This constitutes a net decrease of between 374,602 and 547,102 short tons (340,545 and 497,365 tons) of CO_2 emissions over the life of SECARB's Proposed Project (Table 4.1.2.3), which is equivalent to 23,900 to 34,915 passenger vehicles, or 15,150 to 22,119 household's electricity usage (USEPA, 2010c). Notably, this is less than 0.0001% of the global CO_2 emissions. In addition, the CEQ recently released draft guidance on when and how Federal agencies should consider GHG emissions and climate change in NEPA analyses. The draft guidance includes a presumptive effects threshold of 27,563 tons (25,000 metric tons) of CO_2 equivalent emissions from a proposed action on an annual basis (CEQ, 2010). The GHG emissions associated with the SECARB's Proposed Project fall well below the CEQ threshold.

Table 4.1.2.3. Net CO_2 Emissions for the SECARB's Proposed Project

Activity/Source	Emissions (Short Tons)
Drilling and Pipeline Construction	165
Electricity Usage	52
Worker Commutes	181
Sequestration	(375,000-547,500)
Total Emissions	**(374,602-547,102)**

Fugitive CO_2 Emissions. Because transport and compression of CO_2 is an integral part of activities for SECARB's Proposed Project, fugitive air emissions of CO_2 could occur during routine operations. Sources of emissions during operations associated with the proposed project would include injection and monitoring wells; and aboveground valves, piping, and wellheads that comprise parts of the transmission pipeline. Fugitive CO_2 that would be vented from the area would otherwise have been released without SECARB's Proposed Project. Therefore, these sources of fugitive emission would not increase overall CO_2 emissions.

4.1.3 Effects of No-Action

Selecting the No-Action Alternative could have minor indirect impacts to air quality. No-Action, meaning that SECARB's Proposed Project would not be carried out in any setting would delay planned larger-scale sequestration projects by perhaps several years. The increased understanding of subsurface behavior of CO_2 would not be gained, nor could an example of successful and safe sequestration, on any scale, be offered to the public in support of a larger, more expensive project. The complexities of a larger pilot might translate to long delays in public and regulatory approval, thereby jeopardizing goals of rapid action on climate change issues.

4.1.4 Cumulative Effects

The state accounts for all significant stationary, area, and mobile emission sources in the development of its State Implementation Plan. Air pollutants from construction equipment would be limited to the immediate vicinity of the construction area and would be temporary sources. Estimated emissions generated by the SECARB's Proposed Project would be *de*

minimis and would not be regionally significant. Therefore, the SECARB's Proposed Project would not threaten the region's attainment status, and not exceed the impact significance threshold.

4.2 Geology and Soils

4.2.1 Description

4.2.1.1 Geology

The SECARB test site for the Phase III Project is located within the Citronelle Dome in southern Alabama. The Citronelle Dome is a large anticline that has a salt core and is found in the eastern Mississippi Interior Salt Basin (DOE, 2007b). The site of SECARB's Proposed Project and related pipeline and service lines is located within the East Gulf Coastal Plain physiographic region of the U.S. (USGS, 2003). This region consists mainly of undulating hills and flatter, low-lying areas. Elevations across the test site range from 68 feet above sea level up to about 350 feet above sea level at the topographic high point of the Citronelle Dome. The proposed injection well would be located at an elevation of about 160 feet above sea level. The location selected for the injection well is along the southeastern flank of the topographic high point (ENTRIX, 2010c).

SECARB's Proposed Project would include the injection of carbon dioxide to a depth of at least 9,400 feet into the Paluxy sandstone formation. The subsurface stratigraphy as shown in Figure 4.2.1.1 (ARI, 2010) at the site of SECARB's Proposed Project listed from youngest to oldest is:

- Citronelle Formation (Pliocene)
- Pensacola Clay (Miocene)
- Undifferentiated Oligocene deposits
- Jackson Group (Mid-Tertiary)
- Claiborne Group (Mid-Tertiary)
- Wilcox Group (Lower Tertiary)
- Midway Group (Lower Tertiary)
- Selma Group (Upper Cretaceous)
- Eutaw Formation (Upper Cretaceous)
- Tuscaloosa Group (Upper Cretaceous)
- Washita-Fredericksburg Interval (Lower Cretaceous)
- Paluxy Formation (Lower Cretaceous)
- Mooringsport Formation (Lower Cretaceous)
- Ferry Lake Anhydrite (Lower Cretaceous)

System	Series	Stratigraphic Unit	Major Sub Units	Potential Reservoirs and Confining Zones
Tertiary	Plio-Pliocene		Citronelle Formation	Freshwater Aquifer
	Miocene	Undifferentiated		Freshwater Aquifer
	Oligocene		Chicasawhay Fm.	Base of USDW
		Vicksburg Group	Bucatunna Clay	Local Confining Unit
	Eocene	Jackson Group		Minor Saline Reservoir
		Claiborne Group	Talahatta Fm.	Saline Reservoir
		Wilcox Group	Hatchetigbee Sand	Saline Reservoir
	Paleocene		Bashi Marl	
			Salt Mountain LS	
		Midway Group	Porters Creek Clay	Confining Unit
Cretaceous	Upper	Selma Group		Confining Unit
		Eutaw Formation		Minor Saline Reservoir
		Tuscaloosa Group	Upper Tusc.	Minor Saline Reservoir
			Mid. Tusc. Marine Shale	Confining Unit
			Lower Tusc. Pilot Sand / Massive sand	Saline Reservoir
Cretaceous	Lower	Washita-Fredericksburg	Dantzler sand	Saline Reservoir
			Basal Shale	Primary Confining Unit
		Paluxy Formation	'Upper' 'Middle' 'Lower'	Proposed Injection Zone
		Mooringsport Formation		Confining Unit
		Ferry Lake Anhydrite		Confining Unit
		Rodessa Fm.	Upper Donovan	Oil Reservoir
			Middle Donovan	Minor Saline Reservoir
			Lower Donovan	Oil Reservoir
		Hosston		Potential Saline Reservoir
Jurassic		Cotton Valley Group		Potential Saline Reservoir
		Haynesville Formation		Confining Unit
		Buckner Anhydrite		Confining Unit
		Smackover Fm.		Potential Saline Res.
		Norphlet Formation		Potential Saline Reservoir

Figure 4.2.1.1. Subsurface Stratigraphy at Project Site
Source: (Riestenburg, 2010)

The peak of the Citronelle Dome site is the highest point on location and sits on top of Miocene-Pliocene fluvial deposits. These deposits include the Citronelle formation, Hattiesburg Clay, and coastal alluvium. The Miocene series is characterized by thinly bedded clays, sands, and sandy clays and is about 1,000 feet thick. This region is the shallowest source of municipal water for the Citronelle region (ARI, 2010).

The Oligocene deposits beneath the Miocene formations follow and are about 200 feet thick. Here the composition is mostly carbonates, clays, and sands. At about 1,200 feet, the Chickasawhay Formation may house the deepest protected source of drinking water below the surface in the region. Just below the Oligocene formations, the Eocene stratigraphy is found with a thickness of about 3,250 feet. This group runs from the Jackson formation to the Wilcox formation, and it alternates in composition from shale to sandstone to limestone (ARI, 2010). As with the site of SECARB's Proposed Project in general, the deposition of these beds is thought to be due to the actions of fluvial deposition and coastal movement.

The next formation found in the subsurface of the site of SECARB's Proposed Project is Paleocene stratigraphy, which includes the Midway group. Within the Midway group, there are the Clayton formation, Porter's Creek Clay, and the Naheola Formation. The Porter's Creek Clay is of particular importance because it is a regionally extensive clay layer at least 600 feet thick and may act as a second confining zone for sequestered carbon dioxide (ARI, 2010).

Underlying the Midway group are the Mesozoic formations of the Mississippi Salt Basin. Within this formation, there are alternative beds of marine chalks as well as some marl and limestone. The Selma chalk, in particular, has significance because it is characterized by low permeability, which qualifies the formation as a possible secondary seal for the vertical migration of carbon dioxide (ARI, 2010). The Eutaw formation is located at a depth of about 5,900 feet and is about 150 feet thick. It consists of shale interbedded with sandstone and serves as a saline reservoir in the Citronelle region (UAB, 2007). Beneath the Eutaw, formation is the Tuscaloosa Group. There are three divisions within the group and they total 1,300 feet in total thickness. The lower Tuscaloosa groups are dominated by sandstone and have high porosity and permeability. The lower Tuscaloosa group is further divided into two formations, the Pilot Sand and the Massive Sand. The Pilot Sand is a known oil reservoir in the region although not in the Citronelle Dome, while the Massive Sand interval was the injection location for Phase II of SECARB's test in Mississippi (ARI, 2010, UAB, 2007).

The Marine Tuscaloosa formation may be the most regionally extensive sealing target for carbon sequestration at the site of SECARB's Proposed Project. Shale characterizes the lower portion of the formation acting as a barrier to the vertical migration of substrates. Deposition that occurred during the early Cretaceous Period was based on a cycle of marine and delta sedimentation and deposition. The high porosity and permeability of the sandstones in the region are due to the cycles of deposition throughout time. An oceanic retreat deposited the target of SECARB's Proposed Project, the Paluxy Formation. Following this deposition was another marine transgression, which deposited the shales, limestones, and sandstones that are known as the Washita-Fredericksburg Shale. This shale would be the primary confining seal for carbon dioxide sequestered in the Paluxy Formation (ARI, 2010).

The Paluxy Formation is found at a depth of 9,400 feet. The porosity of the formation is believed to have an average of 23% and a permeability of 130 millidarcies. Specific measurements of the Paluxy Formation at the Citronelle Dome are not available, but estimates have been made based on the logs of two wells that are approximately four miles from the site of SECARB's Proposed Project (ARI, 2010).

The Citronelle Dome is a well-known oil field located in the Mississippi Interior Salt Basin. As such, oil is actively extracted from the Donovan Sand members of the Cretaceous Age Rodessa formation at a rate of about 50,000 barrels (bbl) per month and since 1961 has contributed about 169 million bbl total (Esposito et al., 2008). The use of CO_2 for enhanced oil recovery (EOR) is a potential future action and may increase oil reserves in the Citronelle oil field by 85 million bbl within the Donovan Sand of the Lower Cretaceous strata (Kuuskraa, et. al. (2004) in Esposito et al., 2008). There is no potential for oil extraction above the proposed injection zone as the formations consist of saline aquifers or function as confining units.

There are no known faults in the Citronelle Dome site, thus seismic hazards on a local basis are low. Additionally, no karst features were located within 16 miles of the site of SECARB's Proposed Project. Landslides can pose significant hazards in areas deemed susceptible to these land movements. Due to the character of the geology and soils in the area of SECARB's Proposed Project, landslide risk is low (ENTRIX, 2010c).

4.2.1.2 Soils

The soils at the site of SECARB's Proposed Project have been mapped by the Natural Resources Conservation Service (NRCS) (Figure 4.2.1.2). The soils in this area are mainly comprised of loams, sandy loams, and clay loams. The drainage of each is generally well drained, with the exception of the Bethera series and the Smithton series. Each of these is paired with soils of high drainage therefore their drainage potential increases.

The most prevalent soils series' in the area of consideration for this project and connected action areas are the Smithton-Benndale series, the Troup-Benndale series, the Troup-Heidel series, the Izagora-Bethera series, and the Dorovan-Levy series. The project well pads and electric service lines would cross the Smithton-Benndale series, the Troup-Benndale series, and the Troup-Heidel series. The proposed pipeline would cross these soil associations in addition to the Izagora-Bethera and the Dorovan-Levy series. In terms of erosion potential, each series is listed as having slight potential for erosion, except for the Dorovan-Levy series. The Smithton-Benndale series and the Izagora-Bethera series both have low potential for compaction (ENTRIX, 2010c). All soils series listed have fair to good re-vegetation potential with the exception of the Troup component of certain series and the Dorovan-Levy series (ENTRIX, 2010a).

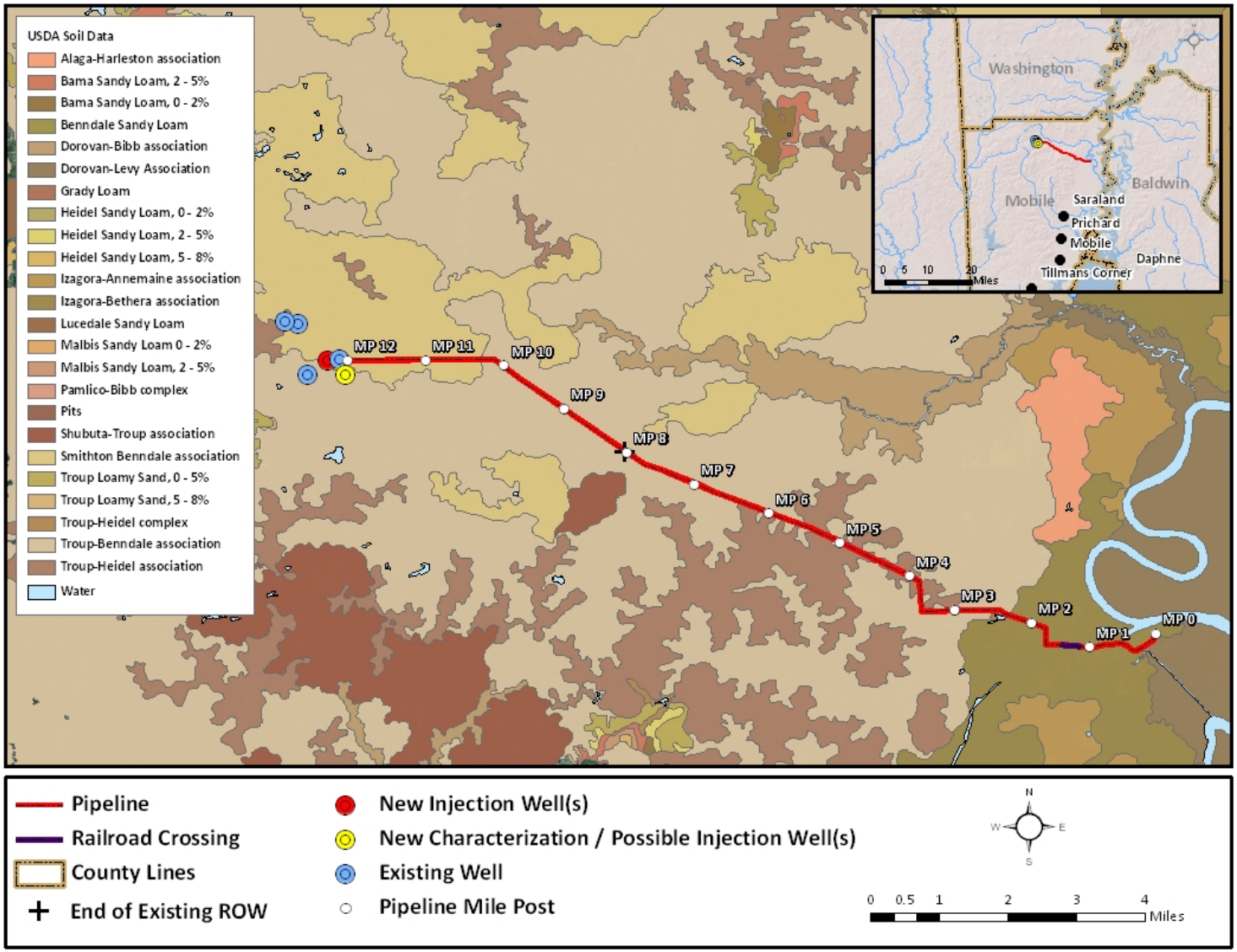


Figure 4.2.1.2. Soils in Project Area

Along with the Agriculture and Food Act of 1981, Congress included the Farmland Protection and Policy Act (Subtitle I of Title XV, Section 1539-1549). According to the NRCS, the intent of the act is "to minimize the impact Federal programs have on the unnecessary and irreversible conversion of farmland to nonagricultural uses" (NRCS, No date). There is no land designated as Prime Farmland along the service line ROWs, the pipeline ROW, or within the injection well sites (ENTRIX, 2010a; ENTRIX, 2010c; ENTRIX, 2010d).

4.2.2 Effects of SECARB's Proposed Project

4.2.2.1 Geology

SECARB's Proposed Project would increase the pressure gradients within a localized portion of the Paluxy Formation, which can result in the movement of multi-phase fluids. Although unlikely due to the number of confinement layers, carbon dioxide surface migration is a possible effect of injection. The UIC permitting process, as well as the implementation of best management practices, would address this issue. Plume monitoring is an objective during the test injection, thus a monitoring well would be drilled in conjunction with the use of older area wells for monitoring (ENTRIX, 2010a). Increasing formation pressures may increase the potential of well casing failures and gas migration from aging wells to a minor extent. However, if operational protocols are followed, the activities planned for this CO_2 storage are not expected to cause measurable migration of CO_2 from the storage formation to the surface.

The connected actions of pipeline and service lines construction are not expected to impact sub-surface geology. With the construction of a new pipeline, there would be some horizontal excavation, but this would be limited to a few feet below the surface. The geology along the existing ROW is consistent with the geology analyzed for the entire site area and is not expected to be impacted by construction.

4.2.2.2 Soils

Actual and potential impacts to soils may occur at all stages of this project and during the construction of the pipeline and service lines. All major activities that may affect soils include compaction by heavy equipment and light vehicles, as well as drilling pads and pipeline construction. Drilling muds and drill cuttings (containing additives and oily saline cuttings) would be produced and land treated. There is a potential for fuels, lubricants, coolants, drilling muds and produced fluids to be spilled to ground. The potential for contamination is addressed by Denbury through its existing Spill Prevention, Control, and Countermeasure Plan (SPCC) (ENTRIX, 2010a). Implementation measures in the case of such a spill would be enacted and the effects would be mitigated as necessary.

Impacts to soils could result a minor loss of fluids collected from the sampling program. Migration from the injection formation, up into the soil profile, is a possibility, and could result, from pipeline ruptures, casing leaks or formation fracturing. CO_2 gas accumulations in soil can cause root function inhibition and oxygen deprivation to soil microbes and surface vegetation.

To minimize impacts to soils and subsurface geology if the operational phase of the SECARB Study is implemented, Denbury and SECARB plan to:

- Verify abandoned well integrity through the review of plug and abandonment records.
- Integrate SECARB operations into Denbury commercial operations and maintenance into the EOR project to gain operational efficiencies.
- Monitor well casing vent flows.
- Test well completion integrity.
- Undertake soil-gas surveys using shallow auger holes resulting in minimal surface soil disturbance.
- Either plug and abandon observation wells or squeeze off, drill out and run liner over perforations made between approximate depths of 9,400 and 10,500 feet (2,800 to 3,200 meters) at the end of the SECARB study to help prevent CO_2 and saltwater migration up the wellbores.
- Monitor the site at least three (3) years after the CO_2 injection has been terminated.
- Collect and then dispose of any brinish water produced because of sampling to a permitted Class II injection well.

The soils in the location of SECARB's Proposed Project have a slight potential for erosion. Erosion potential could be decreased by reducing the amount of clearing to only the amount necessary for SECARB's Proposed Project. Land clearing, grading, and heavy equipment usage would follow best management protocols in order to decrease the likelihood of adverse soil impacts. By using these best management practices, impacts to soils at the site of SECARB's Proposed Project would be expected to be below the threshold of significance.

4.2.3 Effects of No-Action

4.2.3.1 Geology

Under the No-Action Alternative, there would not be any sub-surface drilling or construction activities related to the pipeline or service lines. There would not be any new impacts to the site of SECARB's Proposed Project if the No-Action Alternative were implemented beyond those associated with an active oil extraction area.

4.2.3.2 Soils

Under the No-Action Alternative, there would not be any new drilling or construction activities related to the service line. Soils would continue to be affected by the current activities at and around the Denbury ROW. There would not be any new impacts to the site of SECARB's Proposed Project if the No-Action Alternative were implemented beyond those associated with an active oil extraction area.

4.2.4 Cumulative Effects

4.2.4.1 Geology

Cumulative impacts are possible when considering the possibility of future injections of both

carbon dioxide and water if EOR operations are initiated near the proposed site. With the increase in monitoring wells and the data they provide, cumulative impacts could be maintained below the level of significance.

4.2.4.2 Soils

There are no additional planned activities, which would involve significant soil disturbance, within the site of SECARB's Proposed Project, thus there would be no cumulative impacts.

4.3 Water Resources

4.3.1 Description

4.3.1.1 Groundwater

The site of SECARB's Proposed Project and connected actions is situated above two large aquifers, the Sand and Gravel Aquifer and the Floridian Aquifer. The Sand and Gravel Aquifer provide potable water for Citronelle and the surrounding areas. These two aquifers are separated by the Pensacola Clay layer (ENTRIX, 2010c).

The Sand and Gravel Aquifer in this region can be found at a depth of 800 to 1000 feet below surface and is about 6,500 square miles in area size. It primarily consists of layers of sand, gravel, and clay. The aquifer contains low concentrations of dissolved solids (ENTRIX, 2010a). Groundwater movement generally follows the topography moving from the Citronelle Dome upland area down towards the Mobile River (ARI, 2010). The State of Alabama has adopted enforceable regulations controlling levels of dissolved solids through the Alabama Department of Environmental Management (ADEM Code R. 335-7-3-.02 to 335-7-3-.03) (Hairston, 2001). Water extracted from this aquifer meets these regulations and is the primary source of drinking water for the area.

The Pensacola Clay layer serves as the base and confining layer for the Sand and Gravel Aquifer. The Floridian Aquifer sits below the Sand and Gravel Aquifer and is divided into the Upper Floridian and Lower Floridian Aquifers. Within the project area, the Floridian Aquifer ranges from 200 to 400 feet thick. This aquifer typically has higher concentrations of dissolved solids although it is a potential source of drinking water (ENTRIX, 2010a). The Safe Drinking Water Act and requirements presented in 40 CFR & section 144.1(g) established the UIC permitting program to protect USDW (USEPA, 2008). Following these guidelines, eligible sources of protected drinking water continue to a depth of 1,200 feet below ground level (ENTRIX, 2010a). The Alabama Office of Water Resources indicated that there are no public water system wells within 3.5 miles of the project site or the connected action areas (ENTRIX, 2010c). Pipeline facilities near the Mobile River would be the closest point to the identified public water well.

4.3.1.2 Surface Water

Surface waters at the site of SECARB's Proposed Project and along the pipeline and service lines ultimately drain to the Mobile River, which is about 9.8 miles to the south of the injection

site and approximately 0.15 miles from the pipeline origin. The watershed within the Citronelle Field, which contains the injection and monitoring wells and the service lines, drains to the Little Creek tributary which flows about 12 miles to Cedar Creek and then to the Mobile River (ENTRIX, 2010a). The pipeline would cross several watersheds, including Upper Cedar Creek, Lower Cedar Creek, and Big Chippewa Lake watersheds, all of which also drain to the Mobile River. Total Maximum Daily Loads (TMDLs) are established for water bodies deemed impaired by the USEPA. None of the surface waters in the area of SECARB's Proposed Project has been deemed impaired.

4.3.2 Effects of SECARB's Proposed Project

SECARB's Proposed Project, along with its connected actions would include sub-surface drilling and the construction of both a CO_2 pipeline and electric service lines. The construction of the electric service lines would not be expected to impact water resources beyond the threshold of significance. Some temporary soils disruption could occur contributing to temporarily higher turbidity in storm water soil runoff. However, SECARB would obtain the necessary permits from the Alabama Department of Environmental Management. The effects of heavy machinery and construction on the area would be minimized by best management practices.

At the initiation point of the pipeline, Plant Barry is located about 0.15 miles from the Mobile River. The proposed pipeline would cross a number of perennial and intermittent streams. At the Upper Cedar Creek watershed, the pipeline would cross one perennial water body in three locations and one intermittent water body. At the Lower Cedar Creek watershed, the pipeline would cross four perennial water bodies and four intermittent streams. Along the Big Chippewa watershed, the pipeline would cross two intermittent streams and one unnamed canal (ENTRIX, 2010c). Pipeline construction has the potential to adversely affect these surface water bodies. As none are listed as impaired, best management practices would be implemented to maintain stream integrity. This may include stream bank stabilization techniques and erosion reduction procedures. Impacts to surface waters would be expected to remain below the threshold of significance.

At the injection site, as well as the characterization well sites, special care would be required to ensure the integrity of the drinking water aquifer sources. Casing for each of the wells would be extended to the deepest area of protected drinking water, estimated at about 1,200 feet. The effect of casing failures could be the migration of fluids into confined domestic use aquifers. Surface spills could result in infiltration to aquifers and flow to surface water bodies.

To minimize soil and therefore groundwater and surface water impacts during the operational phase, the SECARB Team would implement, develop, maintain, and monitor the SECARB Proposed Project following the strategy outlined in Section 2.0 above. By following best management practices, impacts to ground water are expected to be below the threshold of significance.

4.3.3 Effects of No-Action

In the No-Action Alternative, there would not be any drilling or construction of electric service

lines, thus no new impacts to water resources at the location would result.

4.3.4 Cumulative Effects

No activities are planned that would involve drilling or excavation within the area of SECARB's Proposed Project beyond those associated with an active oil extraction area, thus no cumulative impacts would be expected. Cumulative impacts to water resources are possible when considering past and future injections of both carbon dioxide and water were EOR operations implemented near the proposed site. With the increase in monitoring wells and the data they provide, cumulative impacts could be maintained below the level of significance.

4.4 Wetlands and Floodplains

4.4.1 Description

According to the National Wetlands Inventory (NWI), there are a number of wetlands in and around the area of SECARB's Proposed Project (see Figure 4.4.1-1). Most are riverine wetlands associated with small tributaries that flow to the Mobile River. The proposed pipeline would cross wetlands that are listed as palustrine forested wetlands (PFO), palustrine scrub-shrub wetlands (PSS), and a small amount of palustrine emergent wetlands (PEM) (ENTRIX, 2010c). Most of the PFO wetlands observed occur at the base of topographic slopes (ENTRIX, 2010a). The electric service line would not cross any of the listed wetlands (ENTRIX, 2010d). Within the proposed construction spaces in which new wells would be drilled, there are no NWI listed wetlands with the closest about 150 feet from a well.

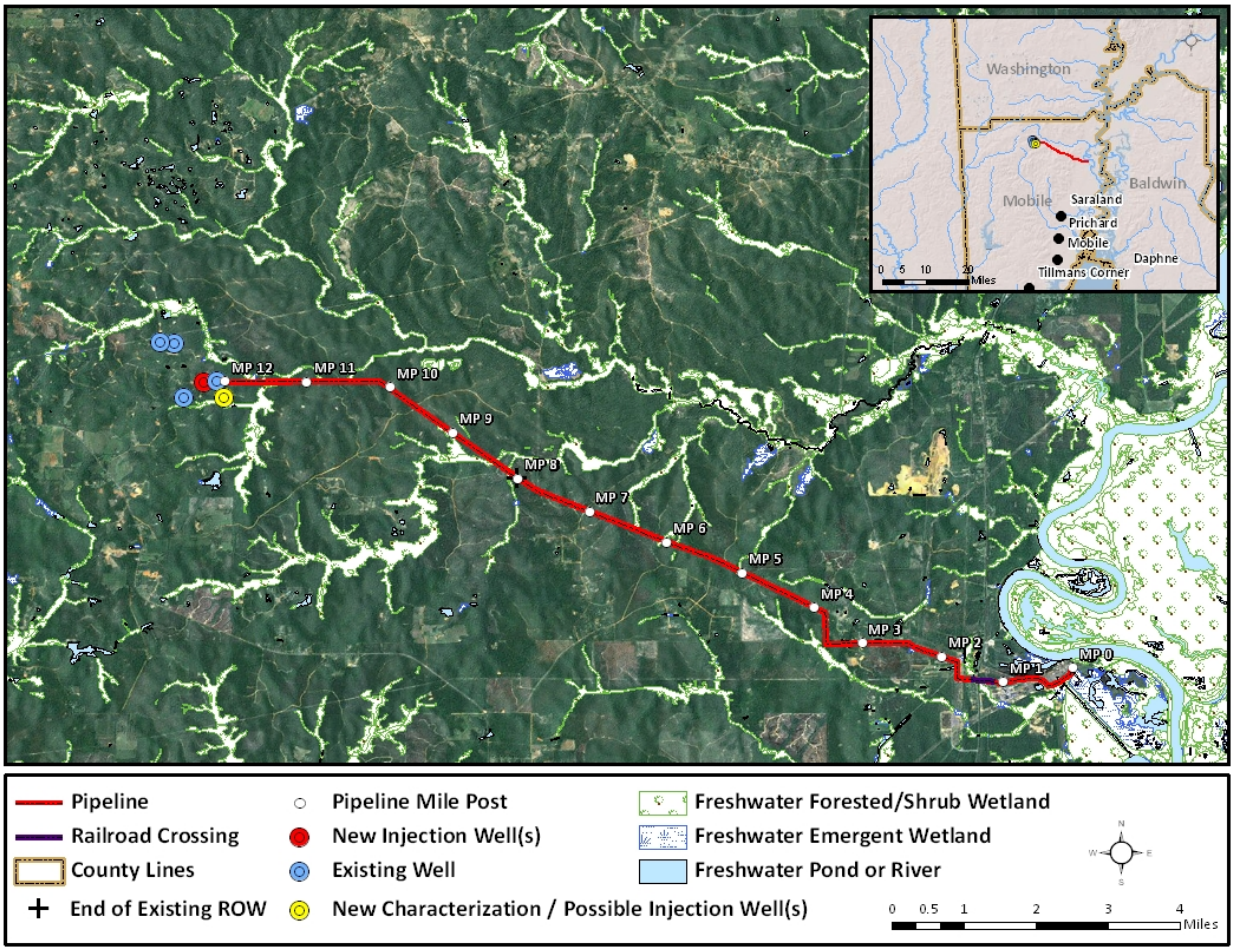


Figure 4.4.1-1. Wetlands in Project Area

The Federal Emergency Management Agency (FEMA) has analyzed flood hazards along floodplains that include 100-year floods and 500-year floods. According to the local FEMA floodplain map (Figure 4.4.1-2), there are a number of designated floodplains within the site area. The pipeline would cross the 100-year floodplain about four times and one of the wells would be located within the 100-year floodplain.

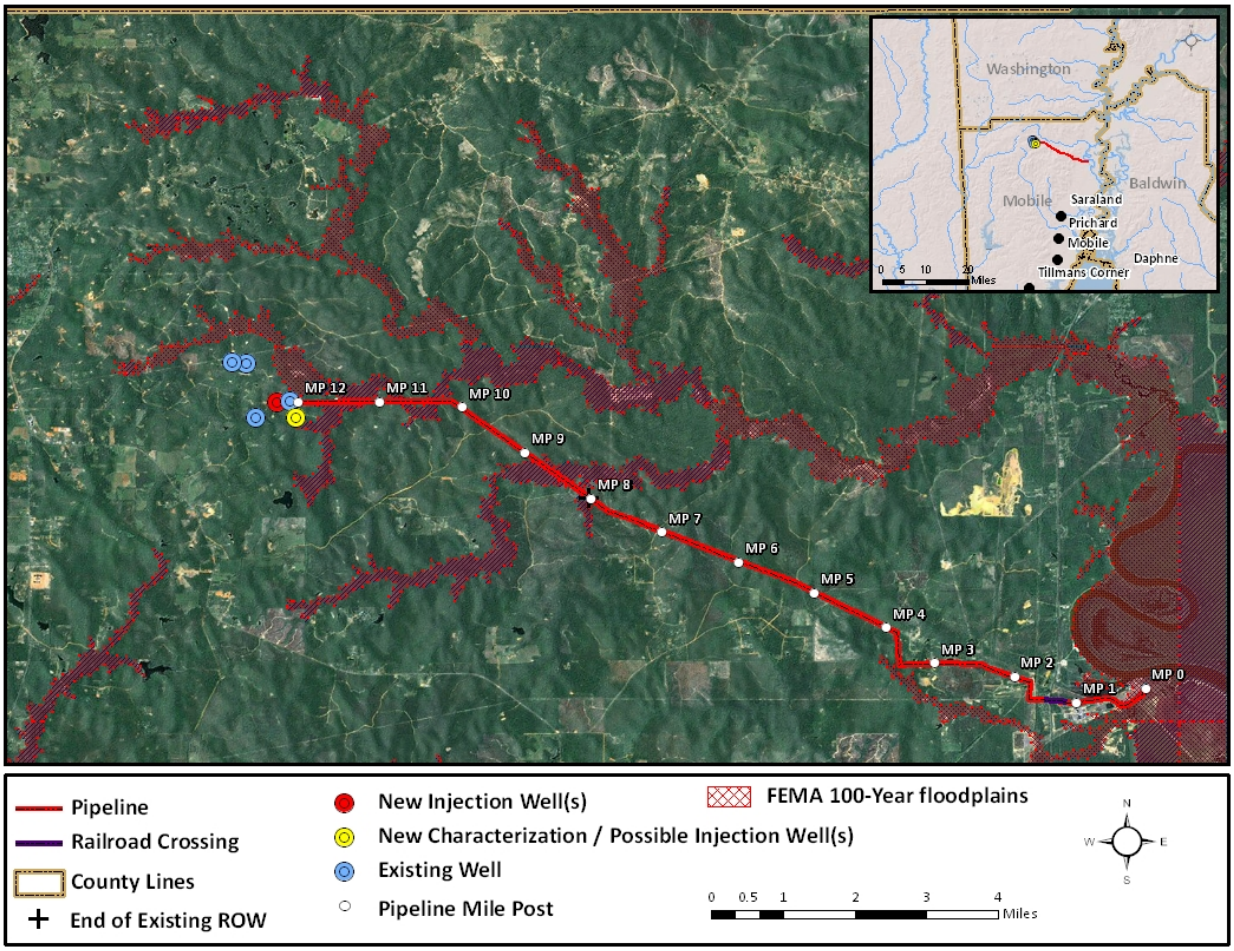


Figure 4.4.1-2. Floodplains in the Project Area

4.4.2 Effects of SECARB's Proposed Project

SECARB's Proposed Project would include drilling for injection and characterization wells in addition to the connected actions of constructing an electric service line and pipeline. These actions would take place in areas that have designated wetland habitats and floodplains.

The construction of the electric service lines would not be expected to impact wetlands or floodplains above the threshold of significance in the site of SECARB's Proposed Project (ENTRIX, 2010d). Best management practices would be implemented to reduce soils impacts and thus storm water runoff into the wetlands.

The construction of the pipeline would cross PFO, PSS, and PEM wetlands. Delineations would take place prior to the start of construction along the right-of-way. ENTRIX estimated that approximately 9.1 acres of wetlands would be disturbed during the construction of the pipeline. 3.4 acres of the total number would be permanently converted from PFO/PSS to PEM wetlands. The wetlands comprising the remaining acres would be allowed to return to their prior classification. No wetlands would be expected to be permanently filled with the construction of the pipeline. Construction including pipeline trenching could adversely affect the wetlands to

some degree. The majority of these effects surround the actual construction period, although regeneration to PFO status may take up to 30 years (ENTRIX, 2010c). Trench excavation may have an impact on the movement of water within the wetland sites along the pipeline. Denbury would conduct the delineation to identify these sites and would work to restore grading to pre-construction condition where practical. Soils would be properly segregated, as appropriate, so that soil mixing does not occur (ENTRIX, 2010c). Wetland permitting and mitigation may be required in the construction of the pipeline and related actions. Impacts to wetlands would be expected to be long-term and adverse but, with regulatory oversight and mitigation, less than significant.

Aboveground disturbances at the injection and monitoring well pads and wells would not take place within NWI identified wetland areas. Storm water runoff has the potential to deliver eroded soil caused by construction disturbance. SECARB would implement erosion control practices as outlined in the Alabama Handbook as well as follow best management practices (BMPs) to decrease this risk (ENTRIX, 2010a).

Floodplains would not be expected to be impacted above the threshold of significance. All of the drilling activities planned take place outside of the FEMA-delineated floodplains. One proposed well is located within the 100-year floodplain, but work would take place on an existing well pad (ENTRIX 2010a). Therefore, following BMPs and regulations, the impacts to wetlands and floodplains would be less than the significance threshold.

4.4.3 Effects of No-Action

Under the No-Action Alternative, there would not be any new drilling or construction activities related to the pipeline or service lines. Wetlands would continue to be affected by the current activities at the Citronelle Field. There would not be any new impacts to the site of SECARB's Proposed Project if the No-Action Alternative were implemented.

4.4.4 Cumulative Effects

No activities are planned that would involve wetland work within the area of SECARB's Proposed Project, thus there would be no cumulative impacts. Cumulative impacts are possible when considering past and future injections of both carbon dioxide and water if EOR operations are implemented in the area. With the increase in monitoring wells and the data they provide, cumulative impacts can be maintained below the level of significance.

4.5 Terrestrial Vegetation

4.5.1 Description

SECARB's Proposed Project is located in the Southern Pine Plains and Hills of the Southeastern Plains Ecoregion. The Southern Pine Plains and Hills Level 4 Ecoregion is characterized by Southern mixed forest and longleaf pine forest; the latter community provides habitat for several federally-listed species, as discussed in Section 4.6, including the red-cockaded woodpecker (*Picoides borealis*), gopher tortoise (*Gopherus polyphemus*), and eastern indigo snake

(*Drymarchon couperi*). Wide areas of this ecoregion are now covered by loblolly (*Pinus taeda*) and slash pine (*Pinus elliottii*) plantations. SECARB's Proposed Project would be located along the higher elevations of this ecoregion, which is generally sandy, gravelly, porous, and more resistant to erosion than the underlying Miocene sandstones (USEPA, 2009; ENTRIX, 2010a).

The pipeline would be located in the Southern Pine Plains and Hills of the Southeastern Plains Ecoregion and the Floodplains and Low Terraces the Southeastern Coastal Plains Ecoregion (USEPA, 2010; ENTRIX, 2010c). Floodplains and Low Terraces of the Southeastern Coastal Plain consist of the broad floodplains and terraces of major rivers, such as the Mobile River. Swamp forests of bald cypress and water tupelo and oak-dominated bottomland hardwood forests provide important wildlife habitat in this ecoregion (GADNR, 2010).

Site reconnaissance was conducted in August of 2009 to ascertain the general vegetative community types within the injection and monitoring well areas, as was described in the SECARB Phase III Project EIV (ENTRIX, 2010a). These field observations were supplemented with published vegetation descriptions and review of aerial imagery to describe the existing vegetative resources within the overall project area. Vegetation species located along the proposed pipeline would generally be similar to those observed in the Citronelle Field. This section provides a detailed description of the vegetation cover types that are found to occur within the general project area. In addition, this section provides a brief list of some of the common plant species observed in each cover type. Vegetation observed in the palustrine forested wetland communities is summarized in Section 4.6.

Vegetative communities were classified according to the Alabama Forestry Commission (AFC) Vegetation Classes (AFC, 2008). The term disturbed, as used in this EA, describes areas of land that are largely un-vegetated; or lack mature woody species; or are dominated by pioneering, exotic/invasive and/or disturbance-associated species; and/or managed routinely to control vegetative growth. Graded dirt roads and primitive trails are also included in this designation. In general, disturbed areas are the cleared areas associated with existing well pads and access roads.

4.5.1.1 Mixed Upland Forest

Mixed forest upland communities comprise the majority of undisturbed upland areas. In general, due to historic and current Citronelle Field operations, the mixed upland forest vegetation is highly fragmented in the Project area. Dominant canopy species include slash pine *(Pinus elliottii),* longleaf pine (*Pinus palustris*), southern magnolia (*Magnolia grandiflora*), and water oak (*Quercus nigra*). Dominant subcanopy species include red bay (*Persea borbonia*), turkey oak (*Quercus laevis*), laurel oak (*Quercus hemisphaerica*), bluejack oak (Q*uercus incana*), red cedar (*Juniperus virginiana*), and post oak (*Quercus stellata*). The understory, or shrub stratum, is dominated by yaupon holly (*Ilex vomitoria),* Elliott's blueberry (*Vaccinium elliottii*), sparkleberry (*Vaccinium arboreum*), wax myrtle (*Myrica cerifera*), persimmon (*Diospyros virginiana*), beautyberry (*Callicarpa americana*), and bitter gallberry (*Ilex glabra*). Dominant groundcover species include panic grasses, gopher apple (*Lycania michauxii*), and numerous other shade-tolerant grasses, herbs, and forbs. Vines, including catbrier (*Smilax spp*.), blackberry (*Rubus spp*.), and muscadine (*Vitis spp*.) are present (GADNR, 2010; AFC, 2008).

4.5.1.2 Herbaceous and Open Land

Grasses and herbaceous vegetation comprise the majority of vegetative species occurring in disturbed areas at existing well pads and rights-of-way. Dominant species include torpedo grass (*Panicum repens*), other panic grasses (*Panicum spp*.), cogon grass (*Imperata cylindrica*), bahiagrass (*Paspalum notatum*), grassleaf goldenaster (*Pityopsis graminifolia*), rustweed (*Polypremum procumbens*), broomsedge (*Andropogon virginiana*), dog fennel (*Eupatorium capillifolium*), vanilla leaf (*Carphephorus odorata*), sourdock (*Rumex crispus*), and yellowdicks (*Helenium amarum*) (GADNR, 2010; AFC, 2008).

4.5.1.3 Protected Species

The U.S. Fish and Wildlife Service (USFWS) has identified one federally listed endangered, threatened, or candidate species of flowering plant as potentially occurring within Mobile County, Alabama (USFWS, 2010; ANHP, 2009). The species of vegetation that are federally listed and identified as potentially occurring in Mobile County, Alabama and its management status are included in Table 4.5.1.3. In a correspondence dated July 22, 2009, Alabama Natural Heritage Program (ANHP) indentified the East Gulf Coastal Plain Seepage Bog vegetative community as potentially occurring within the Project area (ENTRIX, 2010a; ENTRIX, 2010c; ENTRIX, 2010d). Neither this community nor any other rare natural communities listed on the ANHP list of rare, threatened, and endangered species nor natural communities list for Mobile County, Alabama (ANHP, 2009) were observed during the field assessment of SECARB's Proposed Project injection and monitoring well sites. East Gulf Coastal Plain Seepage Bogs may be present within the general project vicinity, but this special community is not present within the areas where the injection and monitoring wells are proposed. In correspondence dated April 7, 2010, ANHP did not identify any rare natural communities, including East Gulf Coastal Plain Seepage Bogs, within a 12-quadrangle area (approximately 730 square miles) centered on the pipeline alignment (ENTRIX, 2010c). Denbury would follow a similar survey and consultation procedure for the proposed pipeline and electric service lines.

Table 4.5.1.3. Federally Listed Vegetation Species Potentially Occurring in the Mobile County, Alabama Vicinity

Species	Identified within General Project Area[a]	Status	
		Federal	Alabama
Vascular Plants			
Louisiana Quillwort *(Isoetes louisianensis)*	No	E	--

NOTES:
Source: (ANHP, 2009; USFWS, 2010).
[a] Identified by ANHP as being present within a 9-quadrangle topographic map area centered on the Citronelle East Topographic Quadrangle or through USFWS consultation.
[b] E = endangered; T = threatened; C = candidate; and SP = state protected

Louisiana Quillwort *(Isoetes louisianensis)*

The Louisiana quillwort is a small, grass-like, seedless aquatic plant closely related to the fern. The leaves of this species can grow up to 40.6 centimeter (cm) (16 inches) long. It occurs

predominantly on sandbars of smaller streams. Louisiana quillwort lives in cool, clear creeks and roots in sand and gravel a few inches to a few feet under water (CPC, 2009). This species is known to exist in certain counties in Louisiana and Mississippi. In Alabama, the Louisiana quillwort has been confirmed in Monroe County. Plant samples, possibly of this species, have been retrieved from Conecuh and Escambia Counties, Alabama, but species confirmation is still pending. The Louisiana quillwort, however, has the greatest potential to live and thrive in Mobile and Washington Counties (AFC, 2009).

4.5.1.4 Invasive Species

The Alabama Invasive Plant Council (AIPC) maintains a list of invasive plants that occur or have potential for occurring in Alabama (AIPC, 2007). Species on this list and observed within the injection and monitoring area in the Citronelle Field, and assumed to occur throughout the entire project and connected action areas, include torpedo grass (*Panicum repens*), cogon grass (*Imperata cylindrica*), lespedeza (*Lespedeza* sp.), tallow tree (*Triadica sebifera*), sicklepod (*Senna obtusifolia*), and Japanese climbing fern (*Lygodium japonicum*). The majority of occurrences of these species were within previously disturbed well pads. One or more of these invasive species were observed at well pads within the project area (ENTRIX, 2010a). Invasive species often exploit disturbed areas when normal succession is interrupted, as fast-colonizing invasive species have an opportunity to multiply and spread before native species.

4.5.2 Effects of SECARB's Proposed Project

Generally, the severity of vegetative impacts depends on the type of vegetation impacted, the size of the area cleared, the time required for vegetation to become re-established, and subsequent maintenance practices in cleared areas. SECARB's Proposed Project would result in a relatively minor amount of vegetative clearing. The primary direct impact of the Project on vegetative cover types would be the clearing and removal of mixed forest vegetation within the drilling workspace at the injection and characterization wells and clearing for the service lines and pipeline rights-of-way. The SECARB Team would maintain any newly cleared areas required for well drilling through the injection and monitoring period by spreading gravel and mowing where necessary. After installation of the service lines and pipeline, the right-of-way would be allowed to re-vegetate to an open land cover and would undergo occasional mowing.

Vegetative impacts have been extensively minimized through project planning that uses existing cleared well pads and rights-of-way to the maximum extent possible. No vegetation beyond the previously disturbed well pads would be disturbed for the monitoring wells. The two well drilling work areas would be located at previously cleared well pads and would be configured to minimize the need for clearing of the mixed forest that currently surrounds the well pads. Because the SECARB Team would use existing cleared well pads and would configure workspace to minimize mixed forest clearing, SECARB's Proposed Project drilling would likely encumber much less than three acres of mixed forest total. The primary impact of the proposed pipeline on vegetative cover types would be the clearing and removal of vegetation along the proposed pipeline route. The pipeline would likely be collocated with existing rights-of-way for approximately 56 percent of its length to minimize the need for clearing. After installation of the service lines, any mixed forest vegetation cover within the permanent transmission line rights-of-

way would be converted to an herbaceous/open land vegetative cover type. Due to the small quantity of mixed forest vegetation that would be cleared, the Project would not result in significant impacts to vegetative resources.

The construction right-of-way would be cleared of vegetation and then graded where necessary to create a level and safe working surface for construction equipment. Vegetation would be removed by mechanical cutting or by hand. Denbury would cut stumps as low to the ground as possible and, if necessary for safe installation of the pipe, stumps would be removed. As required, Denbury would cut timber from the right-of-way and either sell the timber whole, cut timber and provide it to the landowner, or remove the timber from the area. Limbs and brush would be buried, chipped, burned or otherwise disposed as directed by the landowner and in accordance with federal, state, and local regulations.

Permanent right-of-way maintenance, including regular mowing, cutting, and trimming, would result in long-term and permanent impacts to non-herbaceous vegetation resources within the permanent right-of-way.

Herbicides may be used in the right-of-way (ROW) for vegetation control. However, the herbicides that would be used would be low in toxicity and biodegradable. The permanent ROW would be kept clear for maintenance accessibility and as such would not represent good quality habitat for species that may be adversely affected by herbicide application. By using USEPA approved products and best management practices any adverse effects are expected to be minimal and less than significant.

Impacts to open lands would be short term, as these areas would typically return to their herbaceous or shrub status within one to two years following construction, cleanup, and restoration. Impacts to mixed forested areas would be longer-term in areas disturbed for construction that are located outside of the permanent right-of-way due to the time required for re-growth to preconstruction conditions, typically 30 years or more. Those mixed forest areas located within the permanent right-of-way would be permanently converted to open or scrub-shrub vegetation types.

To minimize further forest fragmentation associated with the permanent conversion of mixed forest vegetation to open land, the pipeline would be routed adjacent to existing utility rights-of-way for approximately 6.9 miles (11.10 kilometer (km)), or 56%, of the pipeline route. To further minimize the pipeline impacts to vegetative resources, Denbury is currently evaluating the feasibility of overlapping the pipeline right-of-way with existing rights-of-way with which the Denbury pipeline would be collocated.

The unlikely event of migration of injected CO_2 to the surface could pose detrimental effects on vegetation near or at some distance from the project site. Although atmospheric CO_2 promotes plant growth, increased concentrations in the soil could lead to root asphyxiation and plant death (International Energy Agency, 2007). Impacts of seepage on on-shore ecosystems could also include altered biological diversity and changes to the composition and numbers of species in the local environment. The range of effects on terrestrial ecosystems could extend to entire ecosystems and could be chronic, acute, or lethal depending on species affected and

concentrations of CO_2. As described in Section 4.2, it is highly unlikely that CO_2 would migrate into the soils in the Project area in sufficient quantities to significantly affect soil chemistry. As also discussed in Section 4.2, the geology of the injection site in combination with compliance of the Project to applicable federal and state regulations make it unlikely that CO_2 would migrate into soils that would have an impact on vegetative resources.

Any changes to native vegetation would be limited to a small area and would not affect the viability of the resources. Full recovery would occur in a reasonable time, considering the size of the project and the affected resource's natural state. Therefore, impacts on terrestrial vegetation would not be expected to exceed the significance threshold.

4.5.2.1 Protected Species

Neither individuals nor habitats for the vegetative species identified as possibly occurring in the Project injection or monitoring well work areas were observed during field assessments and ANHP has no record of their occurrence near the SECARB's Proposed Project area (ENTRIX, 2010a; ENTRIX, 2010c, ENTRIX, 2010d). Based on the lack of habitat and the lack of occurrence records for the SECARB's Proposed Project area, SECARB's Proposed Project would have no effect on protected species.

4.5.2.2 Invasive Species

Exotic plants or seeds could be brought to the site with fill material or on equipment. New introductions could allow exotic plants to become established and spread, especially in areas where the ground is disturbed by construction activities. Exotic plants currently growing in the area can also become established and spread on newly disturbed substrates. Steps would be implemented to reduce the risks of introducing invasive species, according to applicable regulations.

4.5.3 Effects of No-Action

Under the No-Action Alternative, the Southeast Regional Carbon Sequestration Partnership Phase III Anthropogenic Test project would not be implemented. No impacts to terrestrial vegetation would occur because of this alternative beyond impacts that would occur regardless of SECARB participation.

4.5.4 Cumulative Effects

Vegetation in the Citronelle Unit has been previously cleared for construction of wells, roads, and related infrastructure as part of past oil and gas operations. Each of these activities involves removal, trampling, or destruction of vegetation and disturbance of ground cover. Additionally, if enhanced oil recovery by Denbury is successful, other oil fields in the general area of the project site may be worked over again, contributing to vegetation impacts in the region. Land clearing as part of the proposed project would be limited to well pad sites of three acres or less, associated road-reconditioning necessary to provide access to the sites, and CO_2 pipeline construction. Most of this activity would occur on property already disturbed by prior drilling

and other commercial oilfield operations including CO_2 enhanced oil recovery operations, if it should be implemented in the future. Overall, cumulative impacts from the proposed project when added to other past, present, and reasonably foreseeable future actions would not exceed the significance threshold.

4.6 Wildlife

4.6.1 Description

Numerous native species of reptiles, amphibians, birds, and mammals have the potential to occur in the rural areas in Mobile County, Alabama near and in the Project area (Mirarchi, 2004). Common species likely to occur within or near the Project area are described below. This information is not intended to represent an exhaustive list of all species that may be present or have habitat present within the Project area. Habitats in the Phase III Project area were described based on available vegetation communities in the SECARB Phase III Project EIV (ENTRIX, 2010a; ENTRIX, 2010c, ENTRIX, 2010d). Similar habitats would be expected to occur in areas crossed by the proposed pipeline.

Common reptiles that have potential to occur within the Project area include: southern black racer (*Coluber constrictor priapus*), rat snakes (*Scotophis spp*.), king snakes (*Lampropeltis spp*.), timber rattlesnake (*Crotalus horridus*), pigmy rattlesnake (*Sistrurus miliarius*), eastern diamondback rattlesnake (*Crotalus adamanteus*), box turtles (*Terrapene spp*.), musk turtles (*Sternotherus spp*.), green anole (*Anolis carolinensis*), and the six-lined racerunner (*Aspidoscelis sexlineata sexlineata*) (Mirarchi, 2004).

Common amphibians that have potential to occur in the Project area include: American toad (*Bufo americanus* or *Anaxyrs americanus*), oak toad (*Bufo quercicus* or *Anaxyrs quercicus*), southern toad (*Bufo terrestris* or *Anaxyrs terrestris*), northern cricket frog (*Acris crepitans*), southern cricket frog (*Acris gryllus*), green tree frog (*Hyla cinerea*), barking tree frog (*Hyla gratiosa*), squirrel tree frog (*Hyla squirella*), chorus frogs (*Pseudacris spp*.), spotted dusky salamander (*Desmognathus conanti*), southern two-lined salamander (*Eurycea cirrigera*), three-lined salamander (*Eurycea guttolineata*), eastern newt (*Notophthalmus viridescens* ssp.), and the lesser siren *(Siren intermedia*) (Mirarchi, 2004).

Common birds that have potential to occur within the Project area, as either residents or migrants, include the Carolina chickadee (*Poecile carolinensis*), American crow (*Corvus brachyrhynchos*), brown thrasher (*Toxostoma rufum*), gray catbird (*Dumetella carolinensis*), northern mockingbird (*Mimus polyglottos*), tufted titmouse (*Baeolophus bicolor*), red-breasted nuthatch (*Sitta canadensis*), brown-headed nuthatch (*Sitta pusilla*), common grackle (*Quiscalus quiscula*), boat-tailed grackle (*Quiscalus major*), blackbirds (*Euphagus spp*.), vireos (*Vireo spp*.), red-shouldered hawk (*Buteo lineatus*), red-tailed hawk (*Buteo jamaicensis*), and numerous other passerines and raptors (Mirarchi, 2004).

Common mammals that have potential to occur in the Project area include the white-tailed deer (*Odocoileus virginianus*), opossum (*Didelphis virginiana*), raccoon (*Procyon lotor*), eastern cottontail rabbit (*Sylvilagus floridanus*), nine-banded armadillo (*Dasypus novemcinctus*), eastern

mole (*Scalopus aquaticus*), eastern gray squirrel (*Sciurus carolinensis*), and wild boar (*Sus scrofa*) (Mirarchi, 2004).

Species directly observed, heard, or inferred to occur during the August 2009 field assessments based on scat, tracks, burrows, and/or nests near the assessment area included: white-tailed deer, raccoon, bobcat (*Lynx rufus)*, six-lined racerunner, eastern cottontail rabbit, eastern gray squirrel, woodpecker (*Melanerpes* sp.), bronze frog (*Lithobates clamitans clamitans*), pine woods tree frog (*Hyla femoralis*), cricket frog (*Acris* sp.), red-tailed hawk, wild boar, Carolina chickadee, northern cardinal (*Cardinalis cardinalis*), American crow, and the northern mockingbird (GADNR, 2010; AFC, 2008). Federally protected species with potential for occurrence within the Project area are discussed in Section 4.6.1.3.

4.6.1.1 Habitat

Because vegetation type is an important environmental component which helps define wildlife habitat, and thus wildlife species distribution, the vegetation community types described in Section 4.5 have been adapted below to define wildlife habitat types.

Mixed Upland Forest

The mixed forest upland community within the SECARB Proposed Project area is relatively diverse and moderately well stratified; however, the understory stratum is dense and of lower diversity in most areas, presumably due to fire suppression. In general, due to historic and current Citronelle Field operations, the mixed upland forest habitat is highly fragmented by access roads and well pads. The longleaf and slash pine-dominated canopy was approximately 30 to 40 feet (9 to 12 meters) in height with individual trees averaging an 8-inches (20 centimeters) diameter at breast height (DBH). The dense understory prevents sunlight from penetrating to the groundcover stratum, resulting in a sparse coverage of groundcover herbs, forbs, and grasses. In areas where the understory is less dense, the age and size distribution of canopy and subcanopy species provides sufficiently diverse habitat for a variety of birds, many of which utilize different strata for nesting, roosting, and feeding. Standing dead snags serve as refuges and perches for various birds including woodpeckers and birds-of-prey. The mammal species common to Mobile County, Alabama have potential to utilize this community, as most of these species are habitat generalists. The majority of the reptiles commonly found in this area have potential to utilize this community as sufficient refuge, foraging, and breeding habitats are present in the form of decaying logs, leaf litter, stump holes, and small mammal burrows. Toads (*Bufo spp.* or *Anaxyrus spp*.) would be the primary amphibian expected in this habitat as the other common amphibians would be more likely to occur within and near the wetland communities within the Project area (GADNR, 2010; AFC, 2008). The mixed forest upland habitat and wildlife species along the proposed pipeline and electric service lines would be similar to those described for the proposed Project injection and monitoring areas.

Herbaceous and Open Land

Grasses and herbaceous vegetation comprise the majority of vegetative species occurring in disturbed areas at existing well pads. Open lands generally provide poor to moderate quality

wildlife habitat relative to the higher quality mixed forest habitat, but herbaceous vegetation within open land areas does provide habitat for small and large mammals, birds, and other species. Small mammals are commonly hunted by raptors in these areas, and many of the bird species identified under the mixed forest habitat occur within open lands (GADNR, 2010; AFC, 2008). The herbaceous and open land habitat and wildlife species along the proposed pipeline and electric service lines would be similar to those described for the proposed Project injection and monitoring areas.

Wetlands and Aquatic Habitat

The proposed pipeline would cross a number of perennial and intermittent streams, which are discussed further in Section 4.3, Surface Water. Small ponds, streams, and wetlands that occur within mixed forest habitat in the Citronelle Field, which may be near work areas, may support similar wildlife species as the above-mentioned habitats, but they would also provide habitat for species that are dependent upon abundant sources of water. The palustrine forested wetland habitat along the intermittent bodies of water in the Citronelle Field is generally characterized by a relatively open understory, well-stratified community structure, diverse species composition, tussocked trees, loop roots, intermittent surface water flow channels, moist substrate, and refugia in the form of fell logs, exposed roots, and leaf litter. Many species of birds, reptiles, amphibians, and mammals may be expected to utilize this type of wetland dependent on their life-cycle requirements (Entrix, 2010a; Entrix, 2010b; Entrix 2010c).

Specially Managed Habitat

The Frank W & Rob M Boykin Wildlife Management Area (Boykin WMA; WMA) is the nearest managed wildlife habitat, located approximately 2.5 miles north of Citronelle Field (ADCNR, 2009). Boykin WMA is 18,025 acres in size and allows big game and small game hunting. No WMAs, National Parks, National Forests, National Wilderness Areas, or National Wildlife Refuges are located within one mile of the Project area (NationalAtlas.gov, 2009a; NationalAtlas.gov, 2009b; NationalAtlas.gov, 2009c; ASP, 2009).

4.6.1.2 Fish and Aquatic Species

Because proposed pipeline crosses several perennial and intermittent streams common aquatic species likely to occur in water bodies within or near the Citronelle Field were identified based on their usual geographic range as cited in the Alabama Wildlife checklist (Mirarchi, 2004). Water bodies closest to or most likely affected by Project work areas are described in Sections 4.3 and 4.4 (wetlands and surface water). The discussion presented below is intended to represent a list of the potential aquatic species that may utilize stream habitat near the Project area and should not be considered exhaustive.

Common fish species found within Mobile County having the potential to occur in the Citronelle Field include a variety of carps and minnows such as the large-scale stoneroller (*Campostoma oligolepis)*, Alabama shiner (*Cyprinella callistia)*, cypress minnow (*Hybognathus hayi*), clear chub (*Hybopsis winchelli*), striped shiner (*Luxilus chrysocephalus*), blacktip shiner (*Lythrurus atrapiculus*), silver chub (*Macrhybopsis storeriana*), blue head chub (*Nocomis leptocephalus*),

Golden Shiner (*Notemigonus crysoleucas*), orangefin shiner (*Notropis ammophilus*), rough shiner (*Notropis baileyi*), silverjaw minnow (*Notropis buccatus*), silverside shiner (*Notropis candidus*), fluvial shiner (*Notropis edwardraneyi*). A variety of suckers also have the potential to occur in the Citronelle Field, including highfin carp sucker (*Carpiodes velifer*), southeastern blue sucker (*Cycleptus meridionalis*), creek chub sucker (*Erimyzon oblongus*), smallmouth buffalo (*Ictiobus bubalus*), spotted sucker (*Minytrema melanops*), and the golden red horse (*Moxostoma erythrurum*) (Mirarchi, 2004).

A variety of sunfish, temperate bass, and perch, such as yellow bass (*Morone mississippiensis*), bluegill (*Lepomis macrochirus*) longear sunfish (*Lepomis megalotis*), red spotted sunfish (*Lepomis miniatus*), naked sand darter (*Ammocrypta beanie),* southern sand darter (*Ammocrypta meridiana*), red spot darter (*Etheostoma artesiae*), rainbow darter (*Etheostoma caeruleum*), harlequin darter (*Etheostoma histrio*), tombigbee darter (*Etheostoma lachneri*), gold stripe darter (*Etheostoma parvipinne*), black banded darter (*Percina nigrofasciata),* and the spotted sea trout (*Cynoscion nebulosus*) may be present in the water-bodies in or near the Citronelle Field (Mirarchi, 2004).

Other common fish that have the potential to occur in the Citronelle Field include chestnut lamprey (*Ichthyomyzon castaneus*), least brook lamprey (*Lampetra aepyptera*), spotted gar (*Lepisosteus oculatus*), bowfin (*Amia calva*), threadfin shad (*Dorosoma petenense*), yellow bullhead (*Ameiurus natalis*), channel catfish (*Ictalurus punctatus*), speckled madtom (*Noturus leptacanthus*), flathead catfish (*Pylodictis olivaris*), and inland silverside (*Menidia beryllina*) (Mirarchi, 2004).

Common mollusks present in Mobile County include the cylinder campeloma (*Campeloma regulare*), banded mystery snail (*Viviparus georgianus*), sharp-crest elimia (*Elimia carinifera*),mud amnicola (*Amnicola limosa*), golden fossaria (*Fossaria obrussa*), mimic Lymnaea (*Pseudosuccinea columella*), tadpole physa (*Physella gyrina*), bayou physa (*Physella hendersoni*), pewter physa (*Physella heterostropha*), ash gyro (*Gyraulus parvus*), two-ridge rams-horn (*Helisoma anceps*), and bugle sprite (*Micromenetus dilatatus*) snails as well as the fragile ancylid limpet (*Ferrissia fragilis*) (Mirarchi, 2004). Common crayfish that have the potential to occur in the Citronelle Field include Cajun dwarf crayfish (*Cambarellus shufeldtii*), devil crawfish (*Cambarus diogenes*), and ambiguous crayfish (*Cambarus striatus* and *Orconectes erichsonianus*) (Mirarchi, 2004).

Unique and Sensitive Aquatic Species and Habitat

Correspondence with the Alabama Department of Conservation and Natural Resources (ADCNR) indicate that there are documented occurrences of two impaired caddisfly species, *Nyctiophylax morsei* and *Brachycentrus chelatus*, within one mile of the Citronelle Field and service lines and within 0.25 miles of the proposed pipeline, as well as an impaired amphibian species, the two-toed amphiuma (*Amphiuma means*) (ENTRIX, 2010a; ENTRIX, 2010c; ENTRIX, 2010d; ANHP, 2009). No other sensitive or unique species or habitats were identified within one mile of the Project area.

The injection and characterization well sites, electrical service lines, and pipeline rights-of-way do not cross-critical aquatic habitat for any federally listed threatened or endangered aquatic species. The Mobile River basin is not considered critical habitat for Gulf Sturgeon (USFWS, 2003). Critical habitat for threatened or endangered mussels is found further upstream in the Mobile River basin, but is not found in or downstream of the Mobile-Tensaw-Cedar River basin (O'Neil et al., 2009). In addition, no Essential Fish Habitat (EFH) under the jurisdiction of the National Marine Fisheries Service (NMFS) occurs within or downstream of the proposed pipeline alignment (NOAA, 2009a).

4.6.1.3 Protected Species

The USFWS has identified 13 federally listed endangered, threatened, or candidate animal species as potentially occurring within Mobile County, Alabama (USFWS, 2010; ANHP, 2009). There is also critical habitat located on the coastal islands for the endangered piping plover, but area is not within or near the project boundaries (USFWS, 2010). Based on a natural heritage element occurrence database search, Alabama Natural Heritage Program (ANHP) identified three of these federally-listed species (gopher tortoise, Eastern indigo snake, and red-cockaded woodpecker) as occurring within a search area that encompassed 9 USGS topographic quadrangle maps (approximately 550 square miles or 1,400 square kilometers) centered on the injection well (ANHP, 2009). All species that are federally listed and identified as potentially occurring in Mobile County, Alabama and their management status are included in Table 4.6.1.3.

Table 4.6.1.3. Federally Listed Species Potentially Occurring in the Mobile County, Alabama Vicinity

Species	Identified within General Project Area[a]	Status	
		Federal	Alabama
Amphibians			
Flatwoods Salamander (*Ambystoma cingulatum*)	No	T	SP
Mammals			
West Indian Manatee (*Trichechus manatus*)	No	E	SP
Fish			
Gulf Sturgeon (*Acipenser oxyrinchus desotoi*)	No	T	SP
Reptiles			
Loggerhead Sea Turtle (*Caretta caretta*)	No	T	SP
Green Sea Turtle (*Chelonia mydas*)	No	T	SP
Eastern Indigo Snake (*Drymarchon corais couperi*)[c]	Yes	T	SP
Gopher Tortoise (*Gopherus polyphemus*)	Yes	T	SP
Kemp's Ridley Sea Turtle (*Lepidochelys kempii*)	No	E	SP

Table 4.6.1.3. Federally Listed Species Potentially Occurring in the Mobile County, Alabama Vicinity

Species	Identified within General Project Area[a]	Status	
		Federal	Alabama
Black Pine Snake (*Pituophis melanoleucus lodingi*)	No	C	SP
Alabama Red-Bellied Turtle (*Pseudemys alabamensis*)	No	E	SP
Birds			
Piping Plover (*Charadrius melodus*)	No	T	SP
Least tern (*Sterna antillarum*)	No	E	--
Red-cockaded woodpecker (*Picoides borealis*)	Yes	E	SP

NOTES:
Source: (ANHP, 2009; USFWS, 2010).
[a] Identified by ANHP as being present within a 9-quadrangle topographic map area centered on the Citronelle East Topographic Quadrangle or through USFWS consultation.
[b] E = endangered; T = threatened; C = candidate SP = state protected;
[c] USFWS identified eastern indigo snake as potentially occurring in Mobile County.

The preferred habitats and potential for occurrence of the federally listed threatened and endangered species identified as potentially occurring Mobile County are described below or located in Appendix B. No federally listed species were observed during field assessments of the Project well pads. Further, except for abandoned and inactive gopher tortoise burrows, no other sign of species presence was identified for any of these species within the Project well pad workspaces. Due to the absence of appropriate habitat the effects of the new injection and characterization well construction, pipeline construction, existing well reconditioning, and future maintenance work is not expected to adversely affect locally occurring listed species in Appendix B.

Eastern Indigo Snake (*Drymarchon corais couperi*)
The eastern indigo snake is a large, shiny black snake reaching lengths up to 8 feet (FNAI, 2001a). This species largely occurs in Florida and southern Georgia, although its historic range extended from southern South Carolina to southeastern Mississippi, including the Project area in Mobile County, Alabama. The eastern indigo snake is found in a variety of habitats ranging from xeric, well-drained uplands to wet prairies and other hydric habitats. In the northern part of its range, this species overwinters in gopher tortoise burrows and other subterranean refuges. Eastern indigo snakes require very large, un-fragmented tracts of natural habitat (greater than 5,000 acres) to survive.

Based on reconnaissance, field assessments conducted during the summer of 2009, the Project well pads did not contain appropriate habitat for the eastern indigo snake due to the overly dense vegetative communities, extent of disturbance, and habitat fragmentation within and surrounding the Project well pads.

Gopher Tortoise (*Gopherus polyphemus)*

The gopher tortoise's geographic distribution includes areas from southern South Carolina southward through southern Georgia and Florida and westward through southern Alabama, Mississippi, and extreme southeastern Louisiana (FNAI, 2001b). It is generally found in dry, well-drained upland habitats characterized by a relatively open pine canopy, which allows sufficient sunlight penetration for egg incubation, basking, and growth of grasses, herbs, and other forbs, which largely constitute the gopher tortoise's diet. Gopher tortoises may also be found in disturbed, less suitable habitats such as pastures, power line easements, and roadsides where forage availability is often greater than surrounding habitats. Gopher tortoises excavate deep burrows as refuge from predators, weather, and fire. These burrows also serve as unique and important habitat for over 300 commensal species, including the eastern indigo snake.

No gopher tortoises were observed during reconnaissance field assessments of the Project well pads. During the evaluation of the potential presence of gopher tortoises and/or eastern indigo snakes, a total of one inactive and two-abandoned gopher tortoise burrows were observed in the Project area. One inactive and one abandoned burrow (Photograph 1 of Appendix C) were observed within the previously disturbed and cleared area of well site D9-9 and one abandoned burrow was observed adjacent to the previously disturbed and cleared area of well site D4-14 (Photograph 2 of Appendix C).

The abandoned burrows at well sites D9-9 and D4-14 were in a dilapidated condition and showed no evidence of recent utilization by gopher tortoises. The presence of significant amounts of intact live plant roots, spider webs, and leaf litter near the opening of the burrows was evidence that the two burrows had been abandoned. The mounded skirts around the abandoned burrows formed by burrow excavation were also grown over with vegetation, hard-packed, and free of tracks and recently excavated soils. These signs provided further support that the two burrows were abandoned.

The inactive burrow at well site D9-9 may also be abandoned, but because the burrow did not exhibit obvious signs of abandonment, such as intact plant roots growing across the burrow and significant amounts of leaf litter near the opening of the burrow, the field biologists categorized the burrow as inactive, or potentially occupied. No tracks drag marks, or recently excavated soils were observed near the opening of the burrow. Therefore, the burrow is likely abandoned, but the burrow could possibly still be utilized by juvenile and adult gopher tortoises and numerous commensal species.

Based on vegetation observed during reconnaissance field assessments of the Project well sites conducted during the summer of 2009, the Project well sites do not appear to provide suitable gopher tortoise habitat due to the overly dense vegetative communities, extent of disturbance, and habitat fragmentation within and surrounding the Project well pads. The canopy and understory strata in most of the mixed forest community within the observation area for the Project injection/monitoring area are too dense to allow sufficient sunlight penetration to adequately support the groundcover stratum. As a result, groundcover is sparse and, therefore, does not provide sufficient foraging habitat for gopher tortoises. It is likely that the abandoned

and inactive burrows found within the disturbed well pad areas are present because the groundcover stratum in these areas receives more sunlight than the surrounding mixed forest habitat; however, these disturbed areas are poor gopher tortoise habitat due to sparse forage availability, total lack of canopy, and routine disturbance. In consideration of these factors, it is highly unlikely that the gopher tortoise currently utilize the Project well pads. Field observations along the proposed pipeline and electric service lines have not yet been conducted by Denbury. Gopher tortoise habitat conditions are likely to be similar to those observed within the Project injection and monitoring areas in the Citronelle Field.

Red-cockaded Woodpecker (*Picoides borealis*)

The red-cockaded woodpecker is listed as a federally endangered species in Mobile County, Alabama. In Alabama, a majority of the red-cockaded woodpecker populations are found in Oakmulgee, Talladega, and Conecuh National Forests (ADCNR, 2008). Red-cockaded woodpeckers inhabit mature (greater than 9.1 inches, or 23 cm, DBH) longleaf pine forests and mixed pine upland hardwood forests with little to no hardwood mid-story vegetation (ADCNR, 2008; LDWF, 2005). Long leaf pines are the most commonly preferred tree species, but the red-cockaded woodpecker does use other southern pine species, such as loblolly pines. Longleaf pines that average 80 to 120 years old and loblolly pines that are 70 to 100 years old are the preferred tree ages for red-cockaded woodpeckers (ADCNR, 2008). Typically, red-cockaded woodpeckers do not travel more than 0.5 mile (0.8 kilometer) from their clusters to foraging habitat (NCNHP, 2009). Primary threats to the species include the loss of pine stands due to development, the management of pine forests in short rotation, and fire suppression, which promotes the growth of hardwood mid-story vegetation, which is unsuitable as red-cockaded woodpecker habitat (NatureServe, 2009a).

Informal consultations were initiated with the USFWS and ADCNR regarding the potential occurrences of federal- and/or state-listed endangered and threatened species (plant and animal), candidate species or species proposed for such listing, species of special concern, or critical habitats in the vicinity of the Project (see Appendix D). Table 4.6.1.3 lists the federally listed endangered and threatened animal species that potentially occur in the Mobile County, Alabama. Additionally, the database of ANHP was reviewed for records of known occurrences of any federally listed threatened or endangered species, other species or natural communities of conservation concern, and special features in proximity to the Project facilities.

The ANHP database contained only one record of occurrence for federally and/or state-listed endangered or threatened species in the Project area. The ANHP reported occurrence of the federally endangered gopher tortoise within the Project area. Further, USFWS and/or ANHP identified gopher tortoise, eastern indigo snake, and red-cockaded woodpecker as potentially occurring within the Project vicinity. During field, surveys of the proposed Project well pads, no red-cockaded woodpecker or its habitat were observed.

4.6.2 Effects of SECARB's Proposed Project

As discussed in Section 4.5, some mixed forest habitat may be cleared during well drilling and potentially during pipeline and service line installation. In these areas, trees would be cut from

the drilling workspace and species that depend upon trees for food, refuge, or nesting would be displaced to nearby forested habitat. Some nesting species and tree cavity nesting species may suffer mortality during workspace clearing. Nesting success may be prevented or diminished for one annual breeding cycle for those adult birds that are able to disperse from the construction workspace. These impacts to mixed forest inhabiting species would be minimal due to the minor quantity of clearing required. Further, clearing would be conducted in areas adjacent to previously disturbed areas, which would minimize additional forest habitat fragmentation within the Citronelle Field.

Impacts to herbaceous open land habitat during SECARB's Proposed Project installation would occur within the previously disturbed well pad areas. Mobile species would disperse to adjacent habitat. Small, less mobile species may suffer mortality during workspace clearing and grading, but these impacts would not be significant to the population as a whole. Further, mobile species are expected to re-colonize open land habitats after the completion of Project installation activities, although there may still be some minimal disturbance during the additional year of monitoring and during decommissioning activities. These impacts would be localized and limited to the immediate area of the project site.

After construction, the mixed forest habitat located outside of the permanent right-of-way would be allowed to revert to former habitat type during operations. The early and late succession vegetation stages would provide habitat for a variety of wildlife species during reestablishment of the mixed forest habitat. The open land habitat along the proposed pipeline route would regain pre-construction habitat function in approximately one growing season. Impacts to herbaceous open land habitats would primarily be limited to a loss of habitat during construction and re-vegetation. Denbury would conduct occasional mowing, cutting, and trimming along the permanent pipeline and transmission rights-of-way to maintain an herbaceous vegetation stratum, which would result in additional occasional disturbance of wildlife species. Wildlife would be able to use the right-of-way after restoration of vegetative communities and the impacts of localized loss of any individuals during construction would be rapidly minimized replaced re-colonization of emerging habitats.

Although high concentrations of CO_2 can present risks to humans and some other species, it is highly unlikely that undetected migration of injected CO_2 to the surface would be of sufficient quantity or duration to affect wildlife or habitats in the Project area. According to the Texas Railroad Commission (RRC), Texas and numerous other states have been safely and successfully using CO_2 for EOR for over 35 years. The RRC has permitted over 11,200 CO_2 injection wells, with over 5,400 of those permitted wells currently active. The 50 active CO_2 EOR projects in West Texas represent about 50 percent of total CO_2 flooding activity worldwide. CO_2-driven EOR has grown steadily since 1985 and now accounts for over 15 percent of the average yearly oil production in Texas. Over 35 million tons of CO_2 are injected annually in more than 70 projects in the United States. In most cases, with appropriate site selection, construction, monitoring, and testing, the risks of CO_2 geologic sequestration would be comparable to the risks of current activities such as natural gas storage and EOR (RRC, 2008).

4.6.2.1 Fish and Aquatic Species

Most impacts to aquatic habitat would be limited to sediment or highly turbid runoff entering water-bodies from Project clearing and grading activities. As none is listed as impaired, best management practices would be implemented to ensure that stream integrity is maintained. This may include stream bank stabilization techniques and erosion reduction procedures. Impacts to surface waters would be expected to remain below the threshold of significance. Short-term surface water quality impacts, which would alter aquatic habitat, during construction of the surface facilities, would be negligible. The SECARB Team would implement erosion control measures as necessary, to minimize or avoid storm water impacts to water resources. Therefore, the likelihood of sediment altering aquatic habitat or affecting fish or aquatic species is low.

The SECARB Team proposes to use municipal water sources during well drilling and would not discharge wastewater into local bodies of water. Therefore, no entrainment of aquatic organisms would occur for well drilling water withdrawal and no potentially contaminated or turbid water would be discharged that could affect aquatic habitat or organisms.

Depending on the construction method used, direct impacts to aquatic habitats and species would either be avoided (i.e., through a successful horizontal directional drill (HDD)) or limited to localized areas at the site of, and the area just downstream of, the proposed pipeline open-cut crossings. Removal of vegetation from riparian areas could cause an increase in surface runoff and erosion from the pipeline corridor. Removal of riparian vegetation and loss of associated shading at waterbody crossings could also result in elevated water temperatures.

To contain disturbed soils in upland areas and minimize the potential for sediment loss to wetlands and bodies of water, temporary erosion controls would be installed immediately after initial disturbance of soils and maintained throughout construction. Erosion and sedimentation control devices would be installed in accordance with the Alabama Handbook. Elevated levels of suspended sediments and turbidity would also be limited to short periods during which in stream construction would be completed. The rapid pace of construction, in conjunction with the implementation of erosion control in accordance with the Alabama Handbook and NWP 12 conditions to reduce soil erosion, would adequately minimize the impacts of sedimentation and turbidity on aquatic life.

Introduction of pollutants into bodies of water and aquatic habitats could occur through disturbance of contaminated soils or sediments, accidental spills, and inadvertent releases of drilling fluids during pipeline HDD operations. Such pollutants could affect fishes and other aquatic life through acute or chronic toxicity, and sub-lethal effects could affect reproduction, growth, and recruitment. To protect surface and groundwater resources in construction and support areas from inadvertent releases of fuel and other mechanical fluids, Denbury staff would conduct such operations in accordance with Denbury's existing SPCC Plan. The SPCC Plan describes measures to be implemented by Denbury personnel to prevent and, if necessary, control any inadvertent spill of hazardous materials such as fuels, lubricants and solvents that could affect water quality. Further, Denbury would not use any synthetic or potentially toxic drilling fluid additives during HDD construction activities and Denbury's DFCP would be

implemented to monitor for, contain, and clean up any potential releases of drilling fluid during HDD operations.

Pipeline hydrostatic test water withdrawal and discharge would be completed in accordance with all applicable federal, state, and local permits and regulations. Entrainment of fish and other aquatic organisms could occur during withdrawals of hydrostatic test water. Denbury would prevent or adequately limit entrainment impacts from hydrostatic testing by using screening on water withdrawal pipes to limit entrainment of fishes and they would maintain adequate stream flow rates to protect aquatic life during withdrawals for hydrostatic testing. All pipeline test water would be exposed to only new pipe and no toxic chemicals or additives would be added to the test water. Upon completion of each test, it is anticipated that hydrostatic test water would be discharged to the Mobile River. Hydrostatic test water would be discharge in accordance with requirements stipulated under the NPDES general permit ALG670000 and should not result in a significant effect on aquatic species or habitats.

Although buildup of CO_2 in surface water can affect odor, taste, water hardness, color, or trace element concentrations, it is highly unlikely that undetected migration of injected CO_2 would be of sufficient quantity or duration to alter water chemistry enough to affect water quality or habitats in the project area. According to the RRC, Texas and numerous other states have been safely and successfully using CO_2 for EOR for over 35 years (RRC, 2008).

4.6.2.2 Protected Species

The preferred habitats and potential for occurrence of the federally listed threatened and endangered species identified as potentially occurring Mobile County, as well as ENTRIX's assessment of potential Project effects, are discussed in the Project's Federally Listed Species Descriptions in Appendix B. No federally listed species were observed during field assessments of the Project well pads. Further, except for abandoned and inactive gopher tortoise burrows, no other sign of species presence was identified for any of these species within the Project well pad workspaces. Field reconnaissance surveys of the CO_2 pipeline and electric service lines have not been conducted. If the decision is made to move forward by SECARB with the CO_2 pipeline and electric service lines (independent of the DOE decision to fund or not fund the SECARB's Proposed Project), protected species field assessments would be completed, and appropriate USFWS consultation will be conducted, for these activities prior to the commencement of construction.

While a majority of the non-previously disturbed Project well pad assessment area consists of forested vegetation, the Project well pad assessment area contains substantial mid- and under-story vegetation that would not be suitable red-cockaded woodpecker habitat. Additionally, biologists did not observe red-cockaded woodpeckers, nesting cavity trees, or hear red-cockaded woodpecker vocalizations during field reconnaissance. Therefore, we conclude that construction and operation of the SECARB's Proposed Project well pads would have no effect on the red-cockaded woodpecker or its preferred habitat.

Based on the findings of field reconnaissance at the Project well pads and SSEB's commitments described in their EIV and protected species report to conduct pre-construction gopher tortoise

surveys and to implement any necessary USFWS-recommended mitigation measures resulting from pre-construction surveys, we conclude that construction and operation of the SECARB's Proposed Project would not likely adversely affect the gopher tortoise population in this area.

The forested habitats within the Project well pads and surrounding areas are highly fragmented by dirt roads, utility easements, and other non-Project well pads. In consideration of these factors, and given that no eastern indigo snakes were observed during field reconnaissance, it is highly unlikely that this species currently utilizes the Project area. We conclude that construction and operation of the SECARB's Proposed Project is not likely to adversely affect the eastern indigo snake.

Surveys of all Project workspaces, including the service line and pipeline rights-of-way, would be completed prior to the start of Project installation. Further, work would not commence until all appropriate USFWS clearances are obtained. To ensure that the Project does not result in impacts to gopher tortoise, the SECARB Team proposes to follow avoidance and minimization measures recommended by the USFWS, which may include additional gopher tortoise surveys, gopher tortoise relocation, worker training, and/or the installation of barrier fencing. Based on the lack of species occurrence, habitats, and the adoption of USFWS-proposed mitigation and avoidance measures that would be implemented prior to construction, the Project either would have no effect or would be not likely to adversely affect any federally listed threatened or endangered species.

Because an inactive gopher tortoise burrow was identified within the well pad field assessment area, SSEB would implement several measures to ensure that the SECARB's Proposed Project well pads do not affect any gopher tortoises that may be present within the Project well pads at the time of construction. Forty-five to thirty days prior to the commencement of construction activities, SSEB would employ a qualified biologist to conduct a survey of the areas that would be subject to ground disturbance at the well pads and a 100-foot-wide buffer beyond the boundaries of the planned ground disturbance areas. If a non-abandoned (active or inactive) gopher tortoise burrow were identified during pre-construction surveys, SSEB would consult further with USFWS to implement appropriate mitigation measures to avoid impacts to the species. USFWS-recommended mitigation measures that could be implemented would include gopher tortoise identification training for workers, construction exclusion areas near non-abandoned burrows, and/or gopher tortoise relocation. Appropriate mitigation measures would be determined in consultation with USFWS based on pre-construction field survey results. Further, work would not commence until all appropriate USFWS clearances are obtained. To prevent impacts to gopher tortoise from the Project, the SECARB Team proposes to follow avoidance and minimization measures recommended by the USFWS, which may include additional gopher tortoise surveys, gopher tortoise relocation, worker training, and/or the installation of barrier fencing. Denbury would follow a similar survey and, if necessary, follow similar avoidance and minimization measures recommended by the USFWS for the proposed pipeline and electric service lines.

Any impacts on wildlife from the SECARB's Proposed Project would be limited to a small portion of the population and would not affect the viability of the resource. Full recovery would

occur in a reasonable time, considering the size of the project and the affected species' natural state. Therefore, impacts on wildlife would not be expected to exceed the significance threshold.

4.6.3 Effects of No-Action

Under the No-Action Alternative, the Southeast Regional Carbon Sequestration Partnership Phase III Early Test project would not be implemented. No impacts to wildlife would occur because of this alternative beyond impacts that would occur regardless of SECARB participation.

4.6.4 Cumulative Effects

Wildlife and habitat in the Citronelle Unit have been, and continue to be, subject to disturbance and damage from hunting, timber harvest, traffic, Denbury's commercial oilfield operations, and past oil and gas operations. Habitat disturbance associated with infrastructure as part of the proposed project would be limited, and wildlife displacement and disturbance would be temporary lasting only for the duration of the construction, injection, and monitoring period. Similar impacts could occur to any threatened and endangered species if they are present in the area. A leak of CO_2 to the surface, while unlikely, could have widespread consequences on wildlife and habitat. Cumulative impacts from the proposed project when added to other past, present, and reasonably foreseeable future actions would be limited to a small portion of the wildlife population and would not affect the viability of the resource. Recovery of this resource from any temporary change would occur in a reasonable period and not exceed the impact significance threshold.

4.7 Land Use

4.7.1 Description

The proposed SECARB project would be located in the southeast portion of the Citronelle Field, which is located in an unincorporated portion of Mobile County, Alabama, in the southwest corner of the state. Unincorporated areas of Mobile County do not have zoning restrictions, and the county does not have a comprehensive land-use plan (Patterson, 2000). While residential communities and roads require county permits, other types of construction not requiring septic systems within the unincorporated areas of the county require no county permits (Mobile County, 2009).

Oil field operations at the Citronelle Field have been underway since 1955 and the site contains both active and abandoned wells (ENTRIX, 2010a). The locations of the proposed injection well and site characterization well would be located at existing well pad locations within a 160-acre (64.7 hectare) tract of land in the Citronelle Field that is owned in fee by Denbury Onshore, LLC (Denbury).

The setting of the proposed project area can be characterized as rural. Land uses near the proposed project area are reflective of historic uses and primarily consist of mixed forest and silviculture, which are typically fragmented by cleared rights-of-way, access roads, and rural

residential development. From 1960 to 1996, the population in the unincorporated portion of Mobile County increased 144 percent (Patterson, 2000).

Properties adjacent to the injection and monitoring pads, in which Project wells and electric service lines would be installed, are owned by private citizens, the Board of Commissioners of Mobile County, or held in trusts by Regions Bank (ENTRIX, 2010a). Sensitive land use receptors near the proposed wells are summarized in Table 4.7.1. Although the nearest residential development is located over one mile from the proposed injection well location, some isolated residences are located within one mile of the proposed injection well and pipeline route.

Table 4.7.1. Sensitive Land Use Receptors

Type of Receptor	Name of Receptor	Distance from Well
Hospital	Searcy State Hospital	9.2 miles (14.8 km)
Church	Lambert Grove Church	2.06 miles (3.3 km)
Cemetery	Lambert Cemetery	2.22 miles (3.6 km)
Recreational Area	Boykin WMA Dogwood Park	2.45 miles (3.9 km) 4.45 miles (7.2 km)
Residential Development	Southside Woods Subdivision	1.23 miles (2.0 km)
School	Rosa A. Lott Elementary School	9.95 miles (16.0 km)

Note: all measurements were taken from the location of the proposed injection well.
Source: (USGS, 2007)

The nearest designated recreational land use area is the Frank W. & Rob M. Boykin (Boykin WMA), which is located north of Citronelle Field. Boykin WMA is 18,025 acres (7,294 hectares) in size and allows big game and small game hunting. Dogwood Park, a local park, and Cedar Creek State Park, are located southwest of the Citronelle Field (ENTRIX, 2010a).

4.7.2 Effects of SECARB's Proposed Project

The proposed project would consist of a new injection well and a new characterization well, as well as the use of four previously installed wells that would be retrofitted for monitoring activities. Two shallow groundwater monitoring wells would also be drilled on existing well pads. Additionally, a 12.3 mile (19.8 km) pipeline would be installed from Plant Barry to the injection well, and two electric service lines would be erected within the Citronelle Field.

The drilling of the proposed injection and characterization wells is anticipated to disturb less than 3 acres (1.2 hectares) of land at each new well site. Retrofitting of existing wells for monitoring would require only lands at existing well pads that have previously been cleared of vegetation for commercial Citronelle Field operations. All well drilling activity would occur entirely on land already owned by Denbury. The land use types on this land are either cleared for oil field wells or comprised of forested vegetative communities (ENTRIX, 2010a).

The proposed CO_2 pipeline would have a 95-foot (29 m) wide construction ROW and a 40-foot (12 m) wide permanent ROW. No new access roads would be required for installation or monitoring of the pipeline. New aboveground facilities associated with the Denbury pipeline would include a mainline valve and a new pig launcher and receiver. Temporary land requirements for the Denbury pipeline and aboveground facilities during construction would

total approximately 141.2 acres (57 hectares). Permanent land requirements for the Denbury pipeline and aboveground facilities would total approximately 59.7 acres (24 hectares).

Approximately 42.4 percent of the proposed pipeline facilities would encumber open land during construction, and approximately 47.7 percent of the land would consist of mixed forested. A similar proportion of mixed forest (approximately 46.6 percent) and open lands (approximately 43.3 percent) would be permanently encumbered within the operational ROW and aboveground facility footprints (ENTRIX, 2010a).

Review of aerial imagery indicates that the proposed pipeline would not cross any residential land use between approximate Mile Post (MP) 4.0 and 12.3. However, isolated residential houses are located near the eastern portion of the pipeline alignment near Plant Barry and Highway 43 (ENTRIX, 2010a).

To minimize any impacts to residences, Denbury would consult with landowners regarding the location of residential structures during the easement negotiation process. Any residences within close proximity to the proposed pipeline would be identified during the civil survey of the proposed alignment and Denbury would minimize impacts to identified residential structures (ENTRIX, 2010a).

ROW clearing along the two proposed power line corridors for the delivery of electric power to the injection and characterization sites would be required. Spacing between the poles would be approximately 300 feet (91 m) and selective vegetative clearing for installation and operation would occur within an approximately 30- to 50-foot (9 to 15 m) wide ROW.

Service line installation would occur entirely within the tract of land owned by Denbury. Approximately 40 percent of the ROW would be located on open land and approximately 60 percent of the ROW would be located on mixed forestlands. Impacts to open land uses would be limited to use of the ROW during installation activities and would result in a minor short-term impacts from selective vegetation clearing, pole installation, and stringing to open land uses. Because of selective tree clearing in the ROW, those land uses that contain forested vegetation would be permanently converted to open land uses (ENTRIX, 2010a).

No agricultural land uses would be converted by the proposed project. As there is currently no zoning or land use planning requirements in the unincorporated areas of Mobile County, the proposed project would not influence regional land use planning or zoning. All project activities occurring within the Citronelle Field (e.g. well activity and the installation of new service lines) are considered compatible with surrounding land uses, as the area is a currently operating industrial oil field. However, installation of the proposed CO_2 pipeline at the eastern portion of the pipeline may disturb some residences. This is anticipated to result in minor land use impacts to these residences, which would be less than the significance threshold.

4.7.3 Effects of No-Action

Under the No-Action Alternative, the proposed injection well and all of its supporting infrastructure, including the pipeline and service lines, would not be constructed. Because of no

new construction within the proposed project area, no impacts to land use are expected to occur. Thus, the No-Action Alternative would not result in any impacts to land use.

4.7.4 Cumulative Effects

There are no additional construction or development activities known to be occurring or anticipated to occur in the near future in the immediate vicinity of the proposed project. Regionally, however, the unincorporated areas of Mobile County are experiencing growth and are becoming more developed. As more of the county becomes developed and land demands increase, land use conflicts between industrial, residential, and undeveloped lands may increase. This project contributes minor impacts to cumulative area development.

4.8 Socioeconomic Resources

This section describes the socioeconomic conditions that may be sensitive to or affected by implementation of the project proposed project and addresses any potential impact that may result.

4.8.1 Population

4.8.1.1 Description

SECARB's proposed injection and monitoring site would be located in the southeast portion of the Citronelle Field, in north central Mobile County Alabama. To the northwest of the site, the City of Citronelle, with a 2008 population of 3,738 (Census, 2009a), is the largest population center in the site vicinity. The town of Mount Vernon, population 815, is the only other major concentration of population within a 15-mile (approximately 24 km) radius of the proposed project site (ENTRIX, 2010a). Approximately 20 miles (32 km) to the southeast of the site, residential populations are found in the cities of Saraland, population 12,946; Satsuma, population 5,987; and Creola, population 2,071 (Census, 2009a).

The City of Citronelle is a sparsely populated residential community with a total land area of 24.42 square miles (approximately 63.2 square km) and an estimated 2000 population density of 1,149 persons per square mile (Census, 2000a). The city's population has been relatively stable since 2000, growing by only 2.2 percent to its 2008-estimated size (Census, 2009a). By contrast, the town of Mount Vernon with a smaller land area of 1.89 square miles (approximately 4.9 square km) had a population density of 446.4 persons per square mile in 2000 (Census, 2000a). Mount Vernon's population has also been relatively stable, but has declined by an estimated 3.0 percent from its 2000 level of 844 residents (Census, 2009a).

In 2000, Mobile County's population of 399,843 was highly urbanized, with approximately 80.3 percent of county residents living in urbanized areas or urban clusters (Census, 2000b). In 2000, the county had a population density of 329.5 persons per square mile, which is substantially higher than that for the State of Alabama, which had a density of 91.9 persons per square mile in the same year (ENTRIX, 2010a). Since 2000, the population of the county has grown by approximately 1.0 percent to a 2008 level of 404,012 residents (Census, 2008).

Mobile County supports 178,650 housing units of which, an estimated 86.4 percent were occupied in 2008, with an average household size of 2.64 persons per household. The median age of Mobile County residents in 2008, 36 years, is slightly lower than the 37.3 years for the State of Alabama as a whole. Approximately 26.4 percent of the total population is under the age of 18. Persons aged 65 and over make up 12.3 percent of the population, while children under age five account for 7.3 percent of the population (Census, 2008).

4.8.1.2 Effects of SECARB's Proposed Project

Implementation of the SECARB's Proposed Project would have only a minor, if not negligible, effect on the size and demographic characteristics of the local population. The proposed alternative is in keeping with the current commercial oilfield operations presently ongoing at the site. Any increased labor requirement would be temporary and could be accommodated by the existing labor force of Mobile County. No adverse impact on local populations associated with the project labor requirement would be anticipated.

SECARB's Proposed Project injection and monitoring site is located in an established oilfield setting where commercial oilfield operations familiar to the surrounding communities have been ongoing for many years. The proposed activity is similar in character to ongoing operations at the site and would add only minimally to existing conditions at the site and in the surrounding communities. No additional land outside the existing Citronelle Field is required for the proposed drilling and injection operations. The CO_2 pipeline crosses existing Denbury property and follows existing rights of way for approximately 56 percent of its distance. Private property owners along the rights of way have been contacted and no opposition to the project has been identified. Any associated impact to local setting and character or local populations near the site would be expected to be minimal.

The project injection and monitoring wells would require only a small additional labor force consisting of 12 workers for a period of two months during drilling. During the subsequent operational phase, labor requirements would be limited to one part-time worker for one day per week over the three-year project duration (ENTRIX, 2010a). The construction of the associated pipeline would add a temporary peak requirement for up to 172 workers for a period of one month during construction (ENTRIX, 2010c). Labor requirements for the proposed project could be accommodated by the existing Mobile County workforce and would not be expected to result in any substantial changes in the size or composition of the local population.

4.8.1.3 Effects of No-Action

The No-Action Alternative would mean that DOE funds would not be available to support the proposed drilling, construction, monitoring, and data collection activities on the study site. Current and planned activity associated with carbon capture and separation would be expected to continue at the Plant Barry site. In the absence of the proposed alternative, these operations would not be expected to have a noticeable impact on the setting and character of the surrounding community or the size and composition of the local population.

4.8.1.4 Cumulative Effects

The introduction of the preferred alternative would not be expected to account for any noticeable changes in the size or demographic characteristics of the local population and would not contribute to any substantial changes in local community character and setting. The requirements of the SECARB's Proposed Project are minimal with respect to population and would not be expected to stress local resources. The proposed activity is in character with historic and existing uses of the proposed site and would add only minimally to existing conditions in the study area. Any cumulative effect on local populations would be expected to be minimal to minor.

4.8.2 Employment and Income

4.8.2.1 Description

The economy of Mobile County increasingly reflects the growing diversification of the U.S. Gulf Coast region with emphasis on high-end manufacturing, logistics/distribution, technology, healthcare, finance and education and maritime operations at the Port of Alabama (MACoC, 2010). The leading economic sectors by employment for the Mobile County economy include Educational Services, Health Care and Social assistance followed by Retail Trade and Manufacturing (Census, 2008). Leading employers in the county are shown in Table 4.8.2.1 below.

Table 4.8.2.1. Mobile's Largest Manufacturing and Non-manufacturing Employers

Company	Economic Activity	Total Employment
TS Aerospace Mobile	Aircraft Refurbishing	1,300
Austral USA	Shipbuilding	1,100
Atlantic Marine	Shipbuilding	959
Evonik-Degussa	Chemicals	700
Kimberly-Clark	Paper Products	675
Mobile Co. Public School System	Education	8,100
Infirmary Health System	Healthcare	5,300
University of South Alabama	Education	5,000
Wal-Mart	Retail	2,900
City of Mobile	Government	2,200

Source: (MACoC, 2010)

In 2008, Mobile County's per capita personal income was $30,567 or 91% of the state average and 76% of the national average (BEA, 2010). Median Household income for that year in the county was $40,667 or 77.9 percent of the national median. Employment statistics for February 2010 indicate that the county supported a total labor force of 177,257 workers, with an unemployment rate of 12.0 percent. This represents a decrease of 0.6 percent from the previous month, but is substantially higher than the 9.0 percent rate for the same month in 2009 (BLS, 2010).

4.8.2.2 Effects of SECARB's Proposed Project

Implementation of the SECARB's Proposed Project would be expected to have a generally

beneficial, but temporary effect on the local economy of Mobile County, both in the form of increased employment opportunities for local residents and as a consequence of increased project expenditures for labor, supplies and materials in the local economy during the construction and operations phases of the project.

Well drilling and reconstruction activities, as well as the connected action of constructing the pipeline would be expected to add 17 FTEs (full-time equivalent workers – one person working full time for one year) to the local economy in the form of temporary and part-time employment during the construction and operations phases of the project. In the event that a second injection well is required for the project, additional labor and expenditures would be necessary. As a result, total cost and labor requirements for the project may be slightly higher than would be the case if only one injection well is required. However, any additional labor requirements would not substantially alter the overall economic effects associated with the proposed project.

The SECARB's Proposed Project (injection and monitoring) would be expected to result in a total expenditure of approximately $27 million dollars (ENTRIX, 2010a). Provision of the service line, a connected action, would be part of the routine electric service to the Citronelle field. Alabama Power has the lead responsibility for construction and maintenance of the line, which is estimated to cost approximately $64,000 with an associated labor requirement of 305 person-hours (Hill, 2010a). Current Alabama Power employees or subcontractors stationed in the area would most likely perform all necessary operations associated with the line. As a result, any increased labor requirement would be absorbed into Alabama Power's available workforce and would not be expected to generate any substantial new employment. The preliminary cost estimate for the CO_2 pipeline, a connected action, is $5.7 million.

Project related expenditures and labor requirements represent a potential beneficial impact to the local economy in the form of wages and salaries paid to local workers and income from sales by local commercial entities providing goods and services. However, it is likely that at least a portion of project expenditures might be spent outside the local economy for labor, goods or services not locally available, so that the actual benefit would probably be somewhat less than the total project cost.

The addition of the SECARB's Proposed Project would be expected to result in a generally beneficial, minor change to the conditions of the local economy. The project would not be likely to contribute substantially to overall labor and income growth in the local economy over the longer term. However, it may be expected to provide a short-term stimulus through increased employment and expenditures in the local economy and any associated secondary and induced employment associated with project expenditures in the local area.

4.8.2.3 Effects of No-Action

In the absence of DOE funding, the SECARB Phase III project would likely not proceed. However, a carbon capture and sequestration unit would still be installed at the Plant Barry power plant. No changes in activity in the Citronelle Field area would be anticipated beyond that already planned for ongoing commercial projects. Correspondingly, no change would be expected to occur in the existing condition or uses of the site. Current trends in employment,

production, and commercial activity in the local economy would be unaffected by SECARB Phase III activity and would be expected to continue in their present pattern without any additional direct or indirect beneficial impact to the local economy from project related labor and expenditures. Any potential economic benefit to the larger society and economy that might be derived from the development of this technology would be delayed.

4.8.2.4 Cumulative Effects

The introduction of the SECARB Proposed Project to other planned or reasonably foreseeable actions at the project site or in the surrounding area would be expected to have only a minor incremental effect on the local economy. The proposed activity would not substantially depart from existing activities at the Citronelle Field and would not contribute substantially to any significant adverse change in local employment, labor market conditions, services and resource availability, or local income generation. Some potential benefit is derived from the additional temporary and labor requirement and from additional expenditures in the local economy associated with SECARB's Proposed Project. These benefits are experienced without adverse consequences and would not alter the existing condition or contribute substantially to the cumulative effect of this project in conjunction with other planned or ongoing projects in the Citronelle Field or the surrounding community.

4.8.3 Infrastructure

4.8.3.1 Description

The SECARB Phase III Project injection and monitoring site would be located in the southeast portion of Citronelle Field in the county of Mobile, Alabama. U.S. Highway 45 (Alabama Hwy 17) is the major highway through Citronelle, Alabama. The average annual daily traffic on U.S. Highway 45 is 6,480 vehicles per day (ALDOT, 2008). The primary roads leading to the sites at Citronelle Field as part of the SECARB's Proposed Project from Citronelle, Alabama, are primarily rural, two-lane roads and include Pinecrest Cemetery and Scoutshire Camp Roads. The pipeline would be accessed via U.S. Highway 43 (16,870 vehicle trips per day), Weaver Road, Broad Branch Road, and Lambert Cemetery Road. The nearest railroad is approximately 19 miles to the southeast from the proposed well sites. Several operating and abandoned pipeline and transmission rights-of-way are present within the general project area.

4.8.3.2 Effects of SECARB's Proposed Project

SECARB's Proposed Project would have short-term minor and long-term negligible adverse effects on traffic, road use, and infrastructure. Short-term effects would be primarily due to open cut installation of pipeline segments along the pipeline corridor, workers commutes, and the delivery of equipment and supplies to the well sites, pipeline and electric service lines locations. Long-term effects would be primarily due to monitoring and maintenance activities for all areas associated with SECARB's Proposed Project.

Only existing roadways would be used to access the well areas, and the pipeline and transmission line rights-of-way. The majority of site preparation and installation-related traffic would occur

in the early morning and late evening, outside peak traffic periods. Due to the limited number of workers and temporary nature of the drilling and installation activities, roadways would not experience congestion-related delays.

During pipeline installation, construction across roads, railways, and utility easements would be accomplished in accordance with applicable crossing permits and approval requirements. Roads and rail spurs that would be crossed by the proposed pipeline, the crossing location, techniques proposed to cross roadway, and estimated length of crossing are shown in Table 4.8.3.2. Open-cut installation would be used at twenty-four gravel roads along the pipeline corridor. After which they would be restored to preconstruction conditions. If considerable time would be required for an open-cut installation, provisions would be made for detours and other measures to permit traffic flow during construction. Pipeline installation activities would not interfere with traffic or transportation infrastructure at bore and HDD locations. Existing power line segments would be crossed by methods acceptable to the operator of the individual rights-of-way.

Table 4.8.3.2. Road and Railroad Crossing Locations and Methods

Crossing Feature	Approximate Mile Post(s)	Crossing Method	Bore/HDD Length (feet)
Railroad Track	1.1 1.4	HDD Bore	1300 50
Paved Roads	0.2 0.5 0.6 1.1	Bore Bore Bore HDD	50 50 50 1300
U.S. Highway 43	1.2	HDD	1300
Gravel Road	1.4, 1.7, 1.8, 3.1, 3.3, 3.7, 4.1, 4.3, 4.8, 4.0, 5.2, 5.8, 5.9, 6.1, 6.5, 7.1, 7.2, 7.7, 8.3, 9.3, 9.9, 10.3 , 10.6, 11.0, 11.2, 11.3, 11.6, 11.6, 12.2	Open-cut	N/A
Broad Branch Road	7.1	Bore	100
Lambert Cemetery Road	9.6	Bore	100

Source: (ENTRIX, 2010e)

The electric service lines would be routed to avoid conflicts with existing infrastructure in the Citronelle Field, and there installation would not interfere with existing roadways or infrastructure. While a portion of the D9-9 service line would be located adjacent to an existing pipeline right-of-way, its installation would not interfere with the pipeline's current operation.

4.8.3.3 Effects of No-Action

The No-Action Alternative would have no impacts to infrastructure because no additional equipment would be required for installation of new systems and associated drilling activities. Infrastructure and transportation resources would remain unchanged when compared to existing conditions. As a result, minimal differences exist between SECARB's Proposed Project and No-

Action Alternatives with respect to infrastructure.

4.8.3.4 Cumulative Effects

Cumulative impacts associated with implementation of SECARB's Proposed Project would be negligible. The area and its associated road network has been part of ongoing oil and gas field operation for several decades. There are no planned or reasonably foreseeable actions proposed for the area that may affect local road use or traffic patterns. The introduction of a temporary increase in traffic during construction operations can be easily accommodated by the existing road systems with only minor disruptions. SECARB's Proposed Project would not noticeably affect or disrupt the normal or routine functions of public institutions, roads, electricity, and other public utilities and services in SECARB's Proposed Project area. Continuing operations of the SECARB project following construction would have no additional impact and would not exceed the impact significance threshold.

4.8.4 Parks and Recreation

4.8.4.1 Description

There are no parks or recreational facilities located on or in the area adjacent to the proposed project site. The City of Citronelle contains multiple facilities for use by residents and local visitors. These include:

- The Municipal Park Complex, located four miles west of downtown Citronelle and including a 100 acre lake, RV park, golf course, athletic fields, an amphitheatre, and picnic areas, which is 7.3 miles (11.7 km) west of closest injection well;
- War Memorial Park, located on U. S. Highway 45, and including tennis courts, a senior citizen center, children's play areas and an athletic stadium, which is 2.85 miles (4.6 km) northwest of closest injection well;
- City recreation centers, including the Citronelle Center (2.3 miles (4.0 km) northwest of closest injection well), the Davis Park Meeting Center (2.6 miles (4.2 km) northwest of closest injection well), and Clayton Park (7.7 miles (12.4 km) west of closest injection well) (Citronelle, No date).

Also present in the near vicinity are the Cedar Creek State Park (0.8 miles (1.3 km) south of closest injection well), located to the southwest of the site along County Road 41 and the Boykin State WMA (3.8 miles (6.1 km) north of closest pipeline) to the northeast of the site along County Road 96 near Mount Vernon.

4.8.4.2 Effects of SECARB's Proposed Project

The drilling of additional wells and construction of a pipeline and electric service lines as part of SECARB's Proposed Project would not be expected to have a noticeable effect on the provision and maintenance of recreational resources in the immediate vicinity of the Citronelle Field or in the surrounding communities. The proposed project would only slightly alter the physical characteristics of an already industrial site and there are no facilities, in the immediate vicinity of the Citronelle Field, which might be disturbed by site activities. Parks and other recreational

facilities or nature areas in the surrounding communities are sufficiently removed from the site to experience only minor, if not negligible effects because of the proposed project.

4.8.4.3 Effects of No-Action

Parks and recreational opportunities in the communities surrounding the proposed site have existed along with Citronelle Field commercial oilfield operations for several years. No additional impact would be anticipated from carbon capture and sequestration activities contemplated for the Plant Barry power plant in the absence of the SECARB's Proposed Project.

4.8.4.4 Cumulative Effects

The addition of the proposed SECARB III activity to ongoing commercial operations at the Citronelle Field would have no substantial impact to the use of state and municipal parks and recreational facilities in the Northern Mobile County area. There are no significant facilities in the immediate vicinity of the site, which would be disturbed during drilling, and construction activity associated with the Project. As a result, any cumulative effect contributed by the SECARB III project would be minimal and would not be expected to substantially influence the character, setting, or visitor experience associated with parks or other recreational opportunities in the surrounding communities.

4.8.5 Visual Resources

4.8.5.1 Description

The term "visual resources" is often used interchangeably with "scenic resources" or "aesthetics." The core notion of visual resources or a "view shed" denotes an interaction between a human observer and a landscape being observed. The inherently subjective response of the observant human viewer to the various natural and/or artificial elements of a given landscape and the arrangement and interaction between them is at the heart of visual resources impacts analysis. A related term, visual quality, is what viewers like and dislike about the visual resources, which comprise a particular scene.

Oil field operations at the Citronelle Field have been underway since 1955, and the site contains both active and abandoned wells (ENTRIX, 2010a). This area is characterized by both disturbed and undisturbed open lands and grasslands, mixed forestlands, and forested wetlands. The locations of the proposed wells and electric service lines would be located entirely on a 160-acre (64.7 hectare) tract of land in the Citronelle Field that is owned by Denbury.

4.8.5.2 Effects of SECARB's Proposed Project

The location of the proposed injection and monitoring wells and the electric service lines are within the Citronelle Field and would be in keeping with the industrial nature of nearby oil wells and commercial oilfield operations. Infrastructure and wells located within the Citronelle Field are not anticipated to be visible to any residences located near the Field. No scenic highways, rivers, or trails are located within the view shed of the Citronelle Field (ENTRIX, 2010a).

The proposed CO_2 pipeline would be constructed adjacent to an existing easement for approximately 56 percent of the pipeline route. Construction of the collocated portions of the pipeline is not anticipated to substantially alter or affect existing visual resources. The proposed pipeline would cross-mixed forested areas for a majority of those areas that are not adjacent to existing ROWs. Forest vegetation would act as a buffer to any nearby visually sensitive areas. After pipeline construction is complete, the landscape would be re-contoured to as near pre-construction conditions as possible, and areas outside the permanent pipeline ROW would revert to pre-construction uses and condition (ENTRIX, 2010a).

The portions of the pipeline alignment crossing open lands would return to pre-construction conditions within one to two growing seasons. Forested vegetative communities would take longer to recover to pre-construction conditions, but these forested areas would typically abut other forested areas that would provide natural visual screening (ENTRIX, 2010a).

The proposed pig launcher and other aboveground facilities located near MP 1.1 would be located in a forested area near the bounds of Plant Barry. These aboveground facilities would be surrounded by mixed forest vegetation and no visually sensitive receptors would be located near the facilities. The forest vegetation would provide screening for the pig launcher facilities. The mainline valve (MLV) would be located in forested land that is used for silviculture. No residences or other visually sensitive resources would be in close proximity to the MLV.

Due to the extensive forest vegetation within the Citronelle Field and the existing industrial nature of the area, no impacts to visual resources are anticipated to occur from project activities taking place within the Field. The presence of forest vegetation along the pipeline ROW and around proposed aboveground facilities would help minimize any visual impacts arising from installation of the pipeline outside of the Citronelle Field. Overall impacts from the proposed project on visual resources are anticipated to be negligible.

4.8.5.3 Effects of No-Action

Under the No-Action Alternative, no new construction activities would occur. As a result, no new impacts to visual resources near the Citronelle Field or Plant Barry are expected to occur. That said, under the No-Action Alternative, CO_2 proposed for sequestration would continue to be released into the ambient air. To the extent that this CO_2 incrementally contributes to the formation of any smog in the region, impacts to visual resources from the continued release of the CO_2 could be minor.

4.8.5.4 Cumulative Effects

As there are no additional construction or development activities known to be occurring or anticipated to occur in the near future in the immediate vicinity of the proposed project, the proposed project would not contribute any cumulative impacts to visual resources in the area.

4.8.6 Noise

Noise is defined as any sound that is undesirable because it interferes with communication, is intense enough to damage hearing, or is otherwise intrusive. Human response to noise varies depending on the type and characteristics of the noise distance between the noise source and the receptor, receptor sensitivity, and time of day. Noise is often generated by activities part of everyday life, such as construction or vehicular traffic.

Sound varies by both intensity and frequency. Sound pressure level, described in decibels (dB), is used to quantify sound intensity. The dB is a logarithmic unit that expresses the ratio of a sound pressure level to a standard reference level. Hertz (Hz) are used to quantify sound frequency. The human ear responds differently to different frequencies. A weighing, described in a-weighted decibels (dBA), approximates this frequency response to express accurately the perception of sound by humans. Sounds encountered in daily life and their approximate level in dBA is provided in Table 4.8.6.

Table 4.8.6. Common Sounds and Their Levels

Outdoor	Sound level (dBA)	Indoor
Snowmobile	100	Subway train
Tractor	90	Garbage disposal
Noisy restaurant	85	Blender
Downtown (large city)	80	Ringing telephone
Freeway traffic	70	TV audio
Normal conversation	60	Sewing machine
Rainfall	50	Refrigerator
Quiet residential area	40	Library

Source: (Harris, 1998)

The dBA noise metric describes steady noise levels. Although very few noises are, in fact, constant; therefore, a noise metric, Day-night Sound Level (DNL) has been developed. DNL is defined as the average sound energy in a 24-hour period with a 10-dB penalty added to the nighttime levels (10 P.M. to 7 A.M.). DNL is a useful descriptor for noise because (1) it averages ongoing yet intermittent noise, and (2) it measures total sound energy over a 24-hour period. In addition, Equivalent Sound Level (L_{eq}) is often used to describe the overall noise environment. L_{eq} is the average sound level in dB.

The Noise Control Act of 1972 (Public Law 92-574) directs Federal agencies to comply with applicable Federal, state, interstate, and local noise control regulations. In 1974, the USEPA provided information suggesting that continuous and long-term noise levels in excess of DNL 65 dBA are normally unacceptable for noise-sensitive land uses such as residences, schools, churches, and hospitals. The State of Alabama does not regulate noise at the state level, and Mobile County does not regulate noise at the county level.

4.8.6.1 Description

Existing sources of noise near the pipeline, service lines, and drilling site include local road traffic; high-altitude aircraft over flights, rail traffic, and natural noises such as leaves rustling, and bird vocalizations. The majority of the areas surrounding these locations can be categorized as rural. The noise environment consists of light traffic conditions with very few automobiles and trucks passing. The background sound at the well sites is likely distant traffic noise from U.S. Highway 45 (Alabama Highway 17). Existing noise levels (DNL and L_{eq}) were estimated for the proposed sites and surrounding areas using the techniques specified in the *American National Standard Quantities and Procedures for Description and Measurement of Environmental Sound Part 3: Short-term measurements with an observer present*. Table 4.8.6.1 outlines the closet Noise Sensitive Areas (NSAs), such as residents, to the injection well and the estimated existing noise levels at each location.

Table 4.8.6.1. Estimated Existing Noise Levels at Nearby Noise Sensitive Areas

Closest Noise Sensitive Area			Estimated Existing Sound Levels (dBA)		
Distance	**Type**	**Land Use Category**	**DNL**	**L_{eq} (Daytime)**	**L_{eq} (Nighttime)**
2,050 ft (630 m)	Residence	Very quiet, sparse suburban or rural residential areas	45	43	37
8,870 ft (2,700 m)	Church				

Source: (ANSI, 2003)

4.8.6.2 Effects of SECARB's Proposed Project

Short-term minor adverse effects to the noise environment would be expected with the implementation of the SECARB's Proposed Project. The effects would be primarily due to construction equipment noise during drilling of the injection wells, pipeline installation, and service line installation.

Individual pieces of construction equipment typically generate noise levels of 80 to 90 dBA at a distance of 50 feet. Table 4.8.6.2 presents typical noise levels (dBA at 50 feet) that USEPA has estimated for the main phases of outdoor construction.

Table 4.8.6.2. Noise Levels Associated with Outdoor Construction

Construction Phase	L_{eq} (dBA) at 50 feet from Source
Ground Clearing	84
Excavation, Grading	89
Foundations	78
Structural	85
Finishing	89

Source: (USEPA, 1974)

With multiple items of equipment operating concurrently, noise levels can be relatively high during daytime periods at locations within several hundred feet of active construction and

drilling sites. The zone of relatively high construction noise levels typically extends to distances of 400 to 800 feet (122 – 244 m) from the site of major equipment operations. Locations within 1,000 feet (305 m) would experience appreciable levels of heavy equipment noise. SECARB's Proposed Project would involve drilling operations for the new injection and monitoring wells. Components of the drilling equipment include the drill rig, mud pumps, and diesel generators. The actual drilling equipment would operate twenty-four hours per day, seven days per week, for up to three months. The nearest NSA is 2,050 ft [630 m] of the nearest well location. A DNL of 63 dBA and a L_{eq} of 57 dBA were estimated for the drilling operations at this distance. This level of noise would be clearly audible, but would not likely be highly annoying. These effects would be temporary and less than significant.

The generator and combined diesel driven systems would have the standard exhaust mufflers. Barriers could be installed around the noisy components to diminish the noise; however, would not likely be necessary given the distance to the nearest NSA. Drilling noise would be expected to dominate the soundscape for all on-site personnel. Personnel, and particularly equipment operators, would don adequate personal hearing protection to limit exposure in compliance with Federal health and safety regulations.

Pipeline and Service Line Construction. Construction of the proposed pipeline and service lines could occur over a several month period. The proposed pipeline installation is anticipated to take approximately one month. Individual phases of installation generally would proceed at rates ranging from several hundred feet to one mile per day. Due to the assembly-line method of construction for the pipeline, activities may last four to six weeks in one area on an intermittent basis. These activities typically would be short-term and limited to daylight hours. Construction equipment would be operated on an as-needed basis during those periods and would be maintained to manufacturer's specification to minimize noise impacts. Construction is mainly in a rural largely forested area with few noise receptors near the proposed construction right-of-way. These effects would be less than significant.

Drilling and related construction equipment may operate on a continuous, 12-hour per day basis over short periods of time ranging from one to two weeks in duration at the proposed HDD sites located at approximate MP 1.1. There would not be any residences or noise sensitive areas within approximately 0.2 mile of the HDD entry or exit workspaces. Therefore, the HDD would not likely result in disturbance to any noise sensitive areas. These limited effects would be further masked by the existing noise from Route 43 and the rail corridor between the HDD site and the single residence.

There would be no ongoing stationary sources of noise associated with SECARB's Proposed Project. Therefore, no changes in the noise environment associated with any permanent sources would be expected. SECARB's Proposed Project would increase traffic noise slightly on the surrounding roads from limited operational activities at the well sites, and maintenance activities of the service line and pipeline. Increases would be localized, concentrated predominantly on the main roads near the Citronelle field and would not constitute a perceptible change in the overall noise environment when compared to existing conditions. These effects would be negligible.

4.8.6.3 Effects of No-Action

The No-Action Alternative would have no impacts to noise because no additional site preparation, drilling, or service line installation would occur. Noise levels would remain unchanged when compared to existing conditions.

4.8.6.4 Cumulative Effects

SECARB's Proposed Project would not introduce long-term incremental increases to the noise environment. All noise associated with SECARB's Proposed Project would be in addition to other on-going commercial operations and projects in the in the area. These increases would be relatively small and have a minor cumulative effect on the overall noise environment.

4.8.7 Environmental Justice

Executive Order 12898 "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" (The White House, February 11, 1994), requires that Federal Agencies consider as a part of their action, any disproportionately high and adverse human health or environmental effects to minority and low-income populations. Agencies are required to ensure that these potential effects are identified and addressed.

The Environmental Protection Agency defines environmental justice as "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies." For purposes of assessing environmental justice under NEPA, the CEQ defines a minority population as one in which the percentage of minorities exceeds 50 percent or is substantially higher than the percentage of minorities in the general population or other appropriate unit of geographic analysis (CEQ, 1997).

Consideration of the potential consequences of SECARB's Proposed Project for environmental justice requires three main components:

- A demographic assessment of the affected community to identify the presence of minority or low income populations that may be potentially affected;
- An assessment of all potential impacts identified to determine if any result in significant adverse impact to the affected environment; and
- An integrated assessment to determine whether any disproportionately high and adverse impacts exist for minority and low-income groups present in the study area.

4.8.7.1 Description

In 2000, minority populations constituted 36.9 percent of the total population of Mobile County, or approximately 147,694 individuals. This is a slightly higher minority percentage than represented by the State of Alabama, which had minority populations equal to 28.9 percent of its total population in the same year. Socioeconomically disadvantaged individuals, those living at or below the poverty line, constituted 18.5 percent of Mobile County's population as compared with a 15.1 percent rate for the state as a whole (Census, 2000a). Table 4.8.7.1 below presents

minority and poverty rates for the incorporated communities of Citronelle and Mount Vernon as well as for Mobile County. Alabama State and U.S. percentages are provided for comparison.

Table 4.8.7.1. Populations by Minority Group and Poverty Status

	Citronelle	Mount Vernon	Mobile County	Alabama	U.S.
Population (Calendar year 2000)	3,659	844	399,843	- -	- -
Percent Minority	23.0	54.6	36.9	28.9	24.9
Percent Hispanic	0.8	0.1	1.2	1.7	12.5
Percent below Poverty	15.4	22.8	18.5	16.1	12.4

Source: (Census, 2000a).

Of the two incorporated communities near the proposed project area, the town of Mount Vernon includes a resident minority population equivalent to 54.6 percent of its total population. This is a substantially higher minority percentage than that for either the county or the state populations. For the City of Citronelle, minority populations are roughly comparable to that of the state parentage, but somewhat lower than that for Mobile County.

4.8.7.2 Effects of SECARB's Proposed Project

SECARB's Proposed Project site in the Citronelle Field and the immediately surrounding area are generally sparsely populated. There are no resident populations living immediately adjacent to the site itself. Minority and low income populations are identified in the nearby communities of Citronelle and Mt. Vernon. For the City of Citronelle, these groups represent a smaller percentage of the population than that found for either Mobile County or the State of Alabama. The population of Mount Vernon, though only 844 individuals, does include minority and low income populations in percentages higher than that for the county or state.

However, both direct and indirect population effects associated with the implementation of the SECARB's Proposed Project would be anticipated to be minimal for all populations both in the immediate site area and for the surrounding communities. The Citronelle Field is an existing industrial oilfield located in a sparsely populated area, minimizing the number of individuals potentially affected by actions identified under the alternatives presented here. As a result, there is no expectation that minority or low-income populations would potentially experience any disproportionately high or adverse impact under the SECARB's Proposed Project.

4.8.7.3 Effects of No-Action

In the absence of Federal funding for the SECARB III project, the level of activity associated with the Citronelle Field would be expected to continue with little or no additional adverse impact to the local community or its demographic characteristics, labor force, employment patterns, economic characteristics or infrastructure, services, or resources. The current uses of the site would be expected to continue to be compatible with its existing character as an industrial oilfield. Minority or low income populations may be especially sensitive to changes in potential employment or other sources of income that may be associated with the proposed alternative. However, these beneficial impacts would be small and their absence would not significantly disadvantage these populations. As a result, any potential for adverse impact would

be expected to be minimal for all populations in the area and would not be disproportionately high for minority or low income populations.

4.8.7.4 Cumulative Effects

The proposed activity considered by this assessment would add only minimally to existing conditions in the project area and surrounding communities. Any incremental effect would not be sufficient to constitute a substantial impact and would most likely be experienced evenly across all populations. Therefore, neither minority nor low-income groups within the affected community would be expected to experience disproportionately greater adverse effects than other members of the community.

4.9 Human Health and Safety

4.9.1 Description

Section 4.1 above discusses the potential for local air quality impacts because of SECARB's Proposed Project. Air pollution causes human health problems. Air pollution can cause breathing problems; throat and eye irritation; cancer; birth defects; and damage to immune, neurological, reproductive, and respiratory systems (USEPA, 2010d). National and state ambient air quality standards represent the maximum allowable atmospheric concentrations that may occur and still protect public health and welfare with a reasonable margin of safety. In addition, OSHA regulations specify appropriate protective measures for all employees.

Spills from the construction phase and operation are also a source of possible impacts to human health and safety. Spills can introduce soil contamination and allow exposure pathways to workers and the public. The risks and effects of a spill depend on its composition. A common material used in construction and operation at this site that can be spilled is diesel. Diesel irritates the lungs and is a skin irritant. Enough diesel exposure can cause death or nervous system damage (ATSDR, 2010). Similarly, waste management also is a source of possible human health and safety risks from exposure to contaminants (See Section 4.11).

One potential impact to human health and safety within the project site is CO_2 migration. CO_2 is heavier than ambient air, colorless, and odorless, which makes it an invisible hazard (DOE, 2007a). Since it is denser than ambient air, leaked CO_2 would typically pool in hollows and confined spaces until dispersed by wind or other ventilation methods (DOE, 2007a; IPCC, 2005). CO_2 is not normally considered a toxic gas in the generally accepted sense of the term. It is normally present in the atmosphere at a concentration of approximately 0.03%. However, if individuals are exposed to high concentrations for extended periods of time, there are certain risks and health hazards that warrant attention. CO_2 under pressure or at high concentration levels can cause suffocation and permanent brain injury from lack of air (DOE, 2007a). Headache, impaired vision, labored breathing, and mental confusion also can occur from exposure to CO_2 (IPCC, 2005). The pressure drop from CO_2 leaks from vessels (pipes) creates a cold hazard, which even the vapor can cause frostbite (IPCC, 2005). Generally, the pooling and large, rapid releases of the CO_2 are the situations of concern for human health and safety instead of small gradual leaks due to concentration level differences (IPCC, 2005; DOE, 2007a).

No general CO_2 exposure standards exist yet for the general public (DOE, 2007a). The immediately dangerous to life and health level of exposure for CO_2 is 5% or 40,000 ppm. For up to several hours, exposure to 0.5 to 1.5% CO_2 in the air typically is not harmful for people with normal health. However, people with impaired health (such as cerebral disease), children, and people involved in complex tasks are more susceptible to the effects of CO_2 exposure. CO_2 exposure impedes people's performance of complex tasks by causing labored breathing, headache, and mental confusion. The occupational standard of maximum allowable concentration of CO_2 in air for eight hours of continuous exposure is 0.5%, and for a short period, it is 3.0% (IPCC, 2005).

CO_2 migration in high concentrations can cause human health issues in the water as well as air. If the CO_2 migrates to underground aquifers in high concentrations, groundwater can become contaminated (See Section 4.3). This contamination can occur from the CO_2 causing the mobilization of chemicals (such as metals in the soil) into the aquifers. By following proper installation and monitoring, as established through permitting requirements (such as USEPA's UIC program), the risks to human health from potable water contamination would be reduced to a de minimis level but would still exist from underground injection. Similar to air emissions of CO_2, gradual releases of CO_2 into water sources typically do not cause substantial harm to human health, but rapid releases could (DOE, 2007a).

In the event of a sudden, complete failure of pipe, all the CO_2 in the pipe would be released. The result would be dry ice formation at the break due to the sudden expansion, and release of a large gas cloud as the supercritical fluid is converted to CO_2 gas. While the CO_2 gas is non-toxic and non-explosive, a sudden, large release might displace air for nearby workers at the Citronelle Field, but due to the distance and safety measures in place, it is unlikely to present such a hazard beyond the immediate area of the release.

Between 1994 and 2006, there were 31 CO_2 pipeline accidents reported, and there were no injuries or fatalities from these incidents in the United States (DOE, 2007c). Some historical causes of CO_2 pipeline incidences are relief valve failure (4 failures), weld/gasket/valve packing failure (3 failures), corrosion (2 failures), and outside force (1 failure). The incident rate from 1990 to 2002 for CO_2 pipelines in the United States was 0.0002 $mile^{-1}year^{-1}$ (0.00032 $km^{-1}year^{-1}$) (IPCC, 2005). This rate of failure is comparatively small. For comparison with natural gas pipelines, see Table 4.9.1.

Table 4.9.1. Comparison of Natural Gas Pipelines to CO_2 Pipelines from 1995 to 2005		
Category	**Natural Gas**	**CO_2**
Miles (km) of Pipeline	304,001 (in 2003) (490,000)	3,300 (5,300)
# of Incidents	960	12
Incidents per mile (km) of pipeline	0.0032 (0.0020)	0.0036 (0.0023)
Property Damage per Incident	$484,000	$42,000
Injuries from Incidents	82	0
Fatalities	29	0

Source: (DOE, 2007a).

The constituents of the CO_2 stream is more than 99.9% pure CO_2 with 0.1% water with only de minimis and not needing any special safety considerations. Thus, the CO_2 stream would be well below the pipeline guidelines of 97% CO_2 on a dry basis, total sulfur less than 35 ppm, inert gases less than 0.5%, and water vapor (Hill, 2010b).

All of the workers on the project would be subject to the same types of health risks that are generally associated with their professions (DOE, 2007a). In fact, Denbury currently conducts enhanced oil recovery with CO_2 at multiple locations including the Citronelle field but in another locations and injection zones. Moreover, Denbury's health, safety, and environment policy manual incorporates measures and policies that would apply to this project (SSEB and ENTRIX, 2010). This project would adhere to all regulations regarding the environment and safety (ENTRIX, 2010a).

The most fatalities of any industry in the private sector in 2008 occurred in the construction industry with 404 deaths in 2008 (BLS, 2009a). The construction incident rate of total recordable cases of non-fatal occupational injuries and illnesses in 2008 was 4.7 per 100 full-time workers (BLS, 2009b).

4.9.2 Effects of SECARB's Proposed Project

The SECARB's Proposed Project includes pipe laying; transportation of CO_2; drilling of observation wells; and injection of supercritical CO_2 much of which would occur as connected actions (See Section 2.1). These may present risks to human health and safety. The materials and equipment used for construction and operation would meet applicable industry standards and regulatory requirements. Public notice of the proposed project would be provided and public hearings would be held as required by applicable regulations. Compliance with applicable regulations and industry standards would reduce risks to human health and safety.

The equipment that would be used for the implementation of the SECARB's Proposed Project represents only minimal risks to human health and safety under normal operating conditions (DOE, 2007a). Thus, if BMPs, required maintenance, and applicable regulations are followed, the equipment should pose little impact to human health and safety. Drilling into pressurized formations could release flammable gases like methane. Preventative measures to minimize well

blowouts or venting of dangerous gases should be implemented. Measures to avoid the equipment failure caused by high pressure would be executed (DOE, 2007a).

Since most of the construction and operation activities of the SECARB's Proposed Project are on Denbury property, the increase in traffic from workers and delivery of equipment and materials would be partially limited to onsite, which reduces risk to pedestrians and the general public. Regardless, the SECARB's Proposed Project would still represent an increase in traffic, which increases the potential for accidents. However, this incremental increase in traffic would be very limited and would be a *de minimis* increase to the larger and more frequent movement of materials for Denbury's commercial operations. The traffic impacts would be further reduced due to the approximately 100 construction deliveries occurring outside of normal business hours (early morning and late evening) (ENTRIX, 2010a) (See Section 4.8).

U.S. Highway 45 (Alabama Hwy 17) is the major highway through Citronelle, Alabama (See Section 4.8). Additional travel would not substantially increase the volume of traffic on local roadways as described in Section 4.8.3 and should not impact human health and safety concerns.

Air emissions from the SECARB's Proposed Project are not anticipated to be regionally significant (See Section 4.1). As noted above, the CO_2 used by Denbury does not contain significant concentrations of contaminants. This reduces the risk of additional air pollutants from the contaminants in case of a leak. Following the mitigation measures and BMPs would reduce any impacts to human health from air quality. Further, workers would follow applicable OSHA procedures, which would further reduce the impact to human health. Denbury has performed commercial EOR activities for over a decade without major incident. Therefore, the risks to human health and safety due to air emissions would be expected to be below the impact significance thresholds.

The soils in the area are slightly erodible (See Section 4.2); however, with BMPs in place, water contamination from runoff and spills, which could lead to human health and safety risks, would not be expected to be a major issue (See Section 4.3). BMPs would be followed to minimize storm water pollutants. Wastewater would be collected and disposed of in an existing disposal well in the field. Following proper BMPs and regulations, this would reduce the risk of impacts to human health from wastewater. Therefore, the overall effect of the SECARB's Proposed Project to surface water quality would be expected to be below the significance threshold.

Materials used in the SECARB's Proposed Project that may present a risk to human health and safety would be CO_2 as well as the fuels, lubricants, and solvents from equipment and processes (ENTRIX, 2010a; Hill, 2010b). Thus, if safety procedures and BMPs were followed, spills and leaks from equipment and processes (other than the above-mentioned substances) would be of low concentrations as well as nonhazardous and not toxic. This would represent a low risk to human health and safety (DOE, 2007c). Under normal conditions, hazardous and toxic materials can be used safely when appropriate safety precautions are followed (DOE, 2007a). Thus, the minimal concentrations of VOCs and inert gases (beside the ones mentioned above) in the collected CO_2 as well as any other hazardous and toxic substances should be a minimal risk to human health and safety.

The design of the SECARB Proposed Project's MVA plan is to avoid, detect, and correct any unintended CO_2 emissions. The geological seals of the Project site make CO_2 migration unlikely. Further, the risk of earthquakes and landslides is low (See Section 4.2). However, groundwater monitoring would be conducted to detect migration and initiate corrective action if necessary (See Section 4.3). Such monitoring would allow for early detection and appropriate measures to be initiated in the event of migration. These measures reduce the risk to human health and safety. The maximum surface injection pressure would be balanced with the anticipated fracture pressure for the area. This reduces the possibility of CO_2 migration from fractures (See Section 4.2).

Pipeline inspection and monitoring would reduce the risks of failures and thus to human health. One of the major concerns regarding pipeline safety is water and other contaminants causing corrosion leading to pipe failure (DOE, 2007a). However, the CO_2 would be conditioned to reduce the risk from pipeline failure. As part of its operation, the CO_2 from Plant Barry would be dewatered and have many of the contaminants removed. Pipelines are operated in accordance with regulations and include appropriate shut off systems in case of rupture. All the monitoring for CO_2, that is an integral part of SECARB's Proposed Project, would reduce the risk for CO_2 releases, and the mitigation measures would reduce the consequences of any incidents. The CO_2 would be vented at Plant Barry if pressure increased.

Denbury's health, safety, and environment policy manual would not need to be updated to include SECARB's Proposed Project activities should DOE choose to fund SECARB's Proposed Project as the manual already includes policies and procedures related to CO_2 safety in Denbury's commercial operations. BMPs would be followed. The manual covers appropriate personal protective equipment, employee and supervisor training, and accident investigation and reporting procedures (ENTRIX, 2010a). The workers on the project would be subject to the same types of health risks that are generally associated with their professions. Any further safety equipment needed for the possible hazards would be used such as a respirator or dust mask for someone working with equipment that generates dust. Noise levels for the general public would not expected to be substantially increased, so noise is not expected to affect the public's health (See Section 4.8.6). Following safety protocols would minimize occupational hazards (DOE, 2007a).

A rapid release of CO_2 has a very low probability due to monitoring, proper siting, and BMPs (DOE, 2007a). The risks to human health and safety from a rapid release of CO_2 as a result of activities associated with SECARB's Proposed Project would depend on amount released and conditions (such as wind direction and strength) at the time of the release (DOE, 2007c). A sudden and rapid release of CO_2 from equipment, such as a wellhead being removed, would likely be detected quickly. The processes for containing well blowouts would be employed to stop such a release. Workers onsite would be the primary group affected. If concentrations of CO_2 greater than 7 to 10% in the air were created, it would cause immediate danger to humans. Depending on the amount released and the pressure, the leak could take hours to days to contain, but it could take as little as minutes. However, the leaked CO_2 amount is likely to be minimal compared to the amount injected due to dispersion of CO_2 in the ground away from the injection site (Heinrich et al., 2004; IPCC, 2005). Once the release is over, no lingering effects would occur (Heinrich et al., 2004). Further, the oil and gas industry employs engineering and

administrative controls to manage these types of hazards regularly (IPCC, 2005). In fact, CO_2 injection has occurred safely for over twenty years with oil and gas activities (NETL, 2008b). Moreover, CO_2 comprises the dominant (sometimes more than 90%) of many acid gas injections (H_2S, CO_2, and other constituents). Acid gas injections have occurred for years without causing any substantial harm from known incidents. Operational error rather than mechanical error has been the cause of most acid gas incidents (Heinrich et al., 2004). Thus, adherence to BMPs and following industry standards would be important to prevent incidents. Therefore, while the risk of accidents exists, the risks to human health and safety, with the proper response plans and monitoring, would be below the significance threshold.

The primary human health risk from SECARB's Proposed Project to the general public would be pipeline leaks releasing CO_2, which is described above. There are buffers around the project area of undeveloped, wooded lands. This reduces the impacts to the general public as it allows more time to respond to leaks and space to vent CO_2 before it affects the general public. A local emergency response plan would help reduce the risk of impact to the workers and the general public (DOE, 2007a). Decommissioning of the facility would present the same types of risks associated with operation; but with proper safety procedures, the impact to human health and safety from decommissioning should be minimal.

Overall, the risks would be minimized by having appropriate safety and operating procedures including monitoring and inspections (DOE, 2007a). With the low failure rate of CO_2, proper siting, and safety procedures including monitoring involved, the overall risk to human health and safety would not be expected to exceed the significance threshold.

4.9.3 Effects of No-Action

Under the No-Action Alternative, there would be no construction, operation, or decommissioning of the sequestration test site. Thus, none of the risks listed in the previous section would occur, which would mean no impacts to human health and safety. The exception would be the fact that the SECARB Proposed Project's purpose is to further the research for options in preventing global climate change. Possible deaths from sea levels rising, deaths from increased severity of storms, increase respiratory diseases, and increased deaths from heat are some of the wide variety of potential human health and safety impacts from global climate change (Miller, 2003). However, as many other projects are in operation or being proposed to assist in the reduction of risk from global climate change, not all of the global climate change risks are attributable to the No-Action Alternative. Nevertheless, the No-Action Alternative does represent some risk to human health and safety but not a substantial one. Therefore, implementing the No-Action Alternative would not be expected to exceed the significance threshold.

4.9.4 Cumulative Effects

While other projects are planned (Section 1.3), these projects are of sufficient distance not to contribute to the cumulative impact to human health and safety. Further, the cumulative impacts are further reduced because the CO_2 and constituents would be vented at the nearby Plant Barry without this project and the proposed research project site is located in an active oilfield where

other EOR operations are occurring. All other projects would also follow applicable regulations. The cumulative impacts of existing activities in and around the proposed project site does not represent a substantial risk to human health and safety with existing and proposed mitigation and safety procedures in place, which means the cumulative impacts with implementing SECARB's Proposed Project would not be expected to exceed the significance threshold.

Since the current projects in the area do not pose a substantial risk to human health and safety, the No-Action Alternative does not represent any additional risks to human health and safety. As described in the previous section, the exception is that not implementing the SECARB's Proposed Project (thus, implementing the No-Action Alternative) would have an adverse impact to the progress towards solutions for global climate change. However, since this is a single project of many, the cumulative impacts to human health and safety for the No-Action Alternative would not be expected to exceed the threshold of significance.

4.10 Cultural Resources

Cultural and historic resources are protected by a variety of laws and regulations, including the National Historic Preservation Act, as amended, and the Archaeological Resources Protection Act. Section 106 of the National Historic Preservation Act and implementing regulations (36 CFR 800) outline the procedures to be followed in the documentation, evaluation, and mitigation of impacts to cultural resources. The Section 106 process applies to any federal undertaking that has the potential to affect cultural resources. The Alabama Historical Commission is the SHPO for Alabama (AHC, No date).

4.10.1 Description

The only federally recognized Tribe with land claims in Mobile County, Alabama is the Muscogee (Creek) Nation (NPS, 2008; HUD, 2008). The closest Indian reservation is Mississippi Choctaw Indian Reservation, which is 70 miles (113 kilometers (km)) away to the northwest. Consultation letters to the Tribes and SHPO form were sent (Appendix E and F). The closest site on the National Register of Historic Places (NRHP) is Central Core Historic District, approximately 3 miles (approximately 5 km) to the northwest from the project boundary. However, the closest cemetery is Lambert Cemetery, which is 2.2 miles (3.5 km) to the west (Figure 4.10.1). There are many churches in the area.

A Phase I cultural survey found nothing (R.S. Webb & Associates, 2010). Appropriate surveys would be conducted for the pipeline and the power line extensions.

Regarding the potential for fossils in the area, fossils are formed in sedimentary rock. While some sedimentary rock may be in the project area, this rock would be under the soil layer, which reduces the accessible fossils in the project area (See Section 4.2).

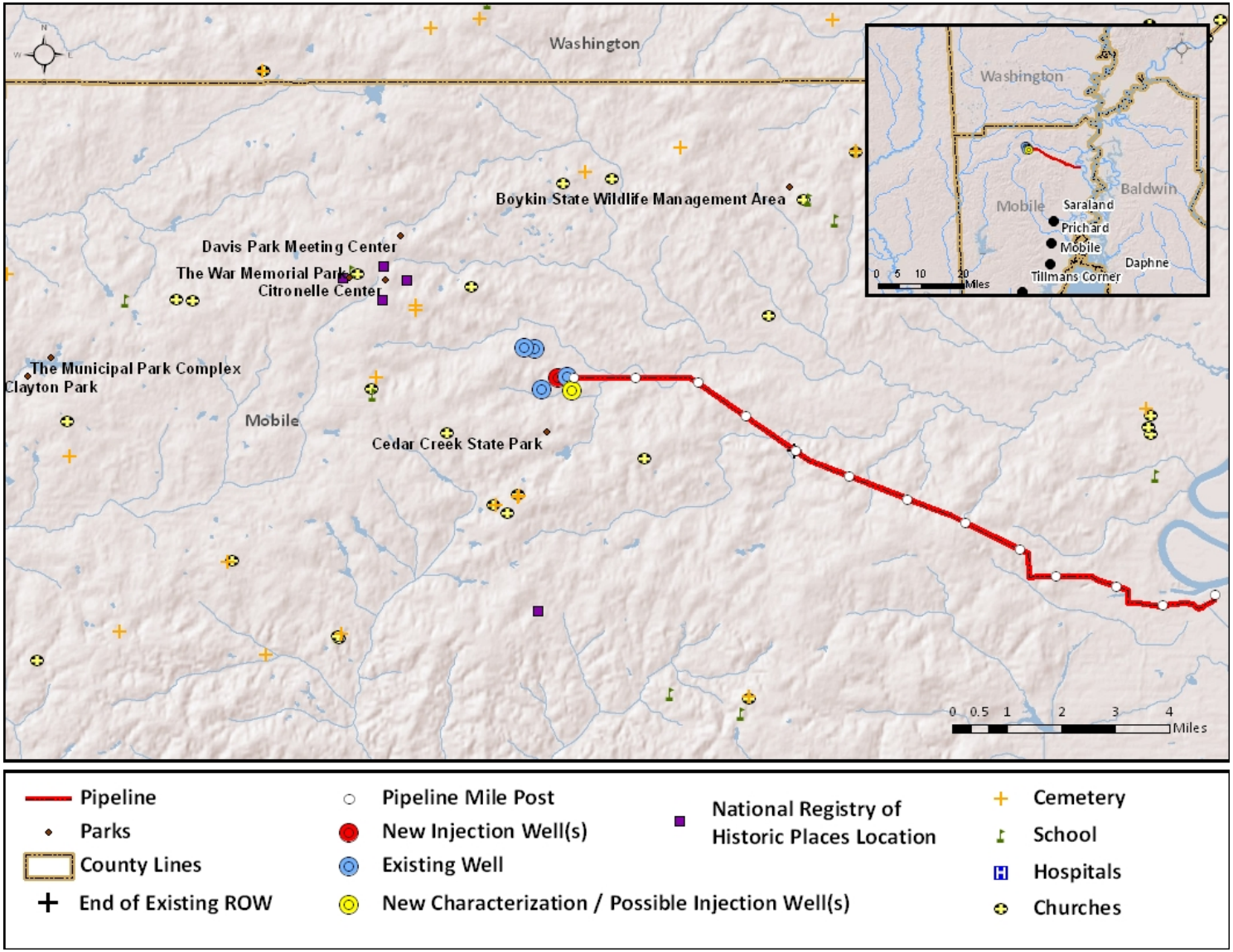


Figure 4.10.1. Cultural Resources in the Project Area

4.10.2 Effects of SECARB's Proposed Project

The potential for impacts to cultural resources would be greatest during the construction phase. Discovery of previously unknown cultural resources can occur during construction activities in historically undisturbed areas. The construction noise and earthmoving activities can also deteriorate the use of the area for Native American activities (DOE, 2007a).

Some construction activities occurring under SECARB's Proposed Project, with the potential to disturb cultural resources, include transporting and utilizing heavy equipment, drilling, and installing pipelines and power lines. These activities can cause an adverse impact to cultural resources by altering drainage patterns, creating fugitive dust, and crushing the resources. Altered drainage patterns and run-off can deteriorate the artifacts or move them. Fugitive dust can cover artifacts. Spills from refueling equipment can also damage cultural resources, which reduce the information potentially gained by the items. Further, construction activities can alter or destroy the context of the cultural resources. Improved access to the area can increase the possibility of illegal collection of properties (DOE, 2007a). Decommissioning would require heavy equipment but would be of a relatively short period relative to the operation and construction phases. Thus, decommissioning would have the same type of possible impacts as described above.

Most of the project area is located in an area that has been previously disturbed. Further, cultural surveys would occur in the pipeline and power line area, and since no cultural resources have been found yet, there would be less of a possibility for discovering cultural resources during SECARB's Proposed Project.

Risks to fossils or paleontological resources would be minimal because of the lack of sedimentary rock at the surface of the project site. Due to the distance to the nearest NRHP site (3 miles or 5 km) as well as the location in an existing oilfield, there should be no substantial impacts to visual resources for any known eligible or existing NRHP sites (See Section 4.8.5). The SHPO has concurred with the project including the connected actions (See Appendix E).

DOE sent consultation letters to Tribes and the Bureau of Indian Affairs' Regional Office to inform them of the project, invite input, and request information of any known sites or issues in the project area. Only the Seminole Tribe of Florida responded to the consultation letter. They had no concerns at this time but requested to be informed if cultural resources were found inadvertently during the project that could have relevance to the Tribe (See Appendix F).

No cemeteries, NRHP sites, or churches are located within the proposed operation or construction area. Thus, the SECARB's Proposed Project should not have any direct impacts to these cultural resources. These sites are in or near an existing developed area, so the impacts of SECARB's Proposed Project should be no greater than what they have experienced in the past and would generally be temporary (See Sections 4.8.5 and 4.8.6).

If cultural resources were discovered during the construction, the construction would be stopped, and the SHPO, any relevant Tribes, or other agencies consulted. If the cultural resources were

found to be historic properties or human remains, then the construction component would need to be relocated elsewhere or other acceptable mitigation performed as per consultation with the SHPO and any relevant Tribes or agencies.

Based on the information above, the impacts from implementing the SECARB's Proposed Project would not be expected to exceed the significance threshold.

4.10.3 Effects of No-Action

Under the No-Action Alternative, SECARB would not conduct the CO_2 test or put the corresponding infrastructure in place. Thus, there would be no construction, operation, or decommissioning activities. Therefore, there would be no impacts to cultural resources due to lack of these activities. On the other hand, as the CO_2 stream, which includes H_2S, would continue to be released into the atmosphere under the No-Action Alternative, this alternative represents a lost opportunity to reduce H_2S that can contribute to acid rain. Acid rain can cause damage to buildings, which means potential harm to cultural resources (Miller, 2003). However, the amounts of H_2S in the CO_2 stream are minimal, so these emissions' contribution to acid rain is negligible. Therefore, the overall impact to cultural resources would be less than the significance threshold.

4.10.4 Cumulative Effects

While some other projects are planned in the general area, these projects are not in the projects immediate area. As impacts to cultural resources are generally local (heavy machinery crushing resources, etc.), SECARB's Proposed Project and the No-Action Alternative both are unlikely to contribute to impacts to cultural resources outside the vicinity of the project area, and those local impacts would not be expected to exceed the threshold of significance. Since no substantial impacts to cultural resources are expected from either alternative, SECARB's Proposed Project and the No-Action Alternative would only represent an incremental addition to the cumulative impacts to cultural resources in the project area or the vicinity of the project area. Therefore, the cumulative impacts would not be expected to exceed the significance threshold.

4.11 Waste Management

4.11.1 Description

The existing commercial facilities at the Citronelle Field are already operating under a current Spill Prevention, Control, & Countermeasure Plan (ES&H, 2009). All solid wastes generated at the facilities are collected and transported by certified handlers and disposed of at permitted facilities.

Hazardous materials are stored at multiple locations within the vicinity of the proposed project site, in accordance to all applicable state and federal regulations. Only staff trained in hazardous materials and waste handling RCRA procedures are allowed to maintain onsite hazardous materials, hazardous wastes, and prepare waste manifests.

4.11.2 Effects of SECARB's Proposed Project

During the proposed project drilling activities, a variety of waste products, including wastewater, municipal waste, drilling mud and cuttings, would be generated. Additionally, a variety of hydrocarbon waste products, such as solvents or lubricating oils and grease would be consumed. It is estimated that 84,000 gallons (2,000 barrels) of well drilling wastewater would be generated; this water would be disposed of at the existing wastewater disposal well in the Citronelle Field. The largest component of drilling waste would be in the form of drilling circulation mud and cuttings. During construction, drilling mud would be contained in a drilling mud retention pit. Typically, these drilling wastes are considered non-hazardous. Approximately 840 cubic feet of drilling mud would be generated. Bentonite drilling mud, which is non-toxic, would be disposed of in-place (ENTRIX, 2010a).

Drilling and well installation activities would require approximately 10,000 gallons of diesel fuel (5 to 10 truckloads). Approximately 40 gallons of cleaning solvents and 13 gallons of waste oil would be generated. All fuel products (petroleum, oils, and lubricants) and solvents required for project construction and installation activities would be stored and maintained in a designated equipment staging area in accordance with the provisions of the existing site SPCC plan. Finally, approximately 1 ton of solid municipal waste would be generated and disposed of at a municipal landfill (ENTRIX, 2010a).

Recycling and/or reuse of discarded materials would occur whenever practical. Non-hazardous construction debris or other solid waste would be disposed of by a contractor at an area landfill. The construction contractor would be responsible for ensuring that the waste material generated is properly disposed of. If portable restrooms were brought on site for employee use during the construction period, they would be provided by a private contractor.

Permanent ROW maintenance, including regular mowing, cutting, and trimming, would result in long-term and permanent impacts to non-herbaceous vegetation resources within the ROW. Vegetation control, on rare occasions, may require herbicide application. The herbicides that would be used would be low in toxicity and biodegradable. Only those herbicides approved by the USEPA would be applied for the uses outlined on the label.

The Plant Barry Unit 5 CO_2 capture technology would be a post-combustion system based upon CO_2 absorption utilizing advanced amines. Amine solutions would be used, stored, and disposed of in accordance with all applicable federal and state regulations (ENTRIX, 2010a).

If the use of the project injection, characterization, or monitoring wells were no longer required by Denbury beyond the project time period, all wells would be abandoned and plugged in accordance with applicable federal and state regulations. In accordance with regulatory requirements, wells would be plugged in a manner that would ensure that these wells would not serve as conduits for future CO_2 movement (ENTRIX, 2010a).

The proposed project would be fully integrated into the existing facility SPCC plan. All solid, liquid, and hazardous wastes generated by the project would be stored and disposed of according to Denbury's current procedures, in full compliance with all applicable federal and state

regulations. Provided all personnel follow applicable guidelines, impacts from storage or handling of waste materials would be negligible. The overall impact of implementing the proposed project on hazardous materials and waste management would be below the threshold of significance.

4.11.3 Effects of No-Action

The wastes associated with drilling, installation, and carbon capture activities for the proposed project would not be generated under the No-Action Alternative. As a result, the No-Action Alternative would have no impact on waste and hazardous materials management.

4.11.4 Cumulative Effects

No additional construction or development activities are known to be occurring or anticipated to occur in the near future in the immediate vicinity of the proposed project. As a result, the proposed project would not contribute any cumulative impacts to waste or hazardous materials management in the area.

5.0 CONSULTATION AND COORDINATION

5.1 Preparation for Development of this Environmental Assessment

A kick-off meeting of the SECARB Phase III program was held on May 14, 2008, at the NETL office in Morgantown, West Virginia, with representatives from NETL, SECARB, and Mangi Environmental Group, to begin the EA process. A site visit was made to the Citronelle, Alabama site on April 14, 2010 by members of the team charged with the development of this EA. Subsequent to that meeting, a review was made of available information necessary for the completion of the EA and data gaps were submitted to NETL.

5.2 Agency Coordination

The Council on Environmental Quality's regulations for implementing NEPA allows federal agencies to invite comment from tribal, state, and local agencies, as well as other federal agencies in the preparation of EAs. The purpose of this coordination is to obtain special expertise with respect to environmental and cultural issues in order to enhance interdisciplinary capabilities, and otherwise ensure successful, effective consultation in decision-making.

5.2.1 U.S. Fish and Wildlife Service

The mission of the USFWS is to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of American people.

See Appendix D for letters sent to and received from agency.

5.2.2 State Historic Preservation Office (SHPO)

The National Historic Preservation Act (NHPA) requires DOE to consult with the SHPO prior to any construction to ensure that no historical properties would be adversely affected by a proposed project. DOE must also afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on the proposed project.

See Appendix E for letters sent to and received from the SHPO.

5.2.3 Bureau of Indian Affairs

The American Indian Religious Freedom Act, 42 USC § 1996, establishes policy to protect and preserve the inherent and Constitutional right of Native Americans to believe, express, and exercise their traditional religions. The law ensures the protection of sacred locations, access of Native Americans to those sacred locations and traditional resources that are integral to the practice of their religions, and establishes requirements that would apply to Native American sacred locations, traditional resources, or traditional religious practices potentially affected by construction and operation of proposed facilities.

See Appendix F for letters sent to and received from the Bureau of Indian Affairs and Tribal Councils.

5.3 Public Involvement

The public comment period on the Draft EA was from September 19 to October 19, 2010. An article informing the public of the availability of the Draft EA at Citronelle Memorial Library in Citronelle ran September 19th to 21st in Mobile's Press Register. DOE received the public comments found in Appendix G.

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8.0 Glossary

A-weighted Decibels – An expression of the relative loudness of sounds in air as perceived by the human ear.

Air Quality – The characteristics of the ambient air (all locations accessible to the general public) as indicated by concentrations of the six air pollutants for which national standards have been established, and by measurement of visibility in mandatory Federal Class I areas.

Ambient – The natural surroundings of a location.

Anthropogenic – Effects, processes or materials are those that are derived from human activities.

Anticline – an arch of stratified rock in which the layers bend downward in opposite directions from the crest

Aquifer – An underground layer of rock and sand that contains water.

Asphyxiation – A condition of severely deficient supply of oxygen to the body that arises from being unable to breathe normally.

Attainment Areas – A zone within which the level of a pollutant is considered to meet United States National Ambient Air Quality Standards.

Best Management Practices – Innovative, dynamic, and improved environmental protection practices applied to oil and natural gas drilling and production to help ensure that energy development is conducted in an environmentally responsible manner.

Brine – Water saturated with or containing large amounts of a salt.

Characterization Well – A well used to define the baseline of the subsurface conditions and existing penetrations within the area of review

Carbon Sequestration – The capture and storage of carbon long-term in an effort to avoid release of that carbon as carbon dioxide in the atmosphere.

CO_2 Flood – If a well has been produced before and has been designated suitable for CO_2 flooding, the first thing to do is to restore the pressure within the reservoir to one suitable for production. This is done by injecting water (with the production well shut off) which will restore pressure within the reservoir to a suitable pressure for CO_2 flooding. Once the reservoir is at this pressure, the next step is to inject the CO_2 into the same injection wells used to restore pressure. The CO_2 gas is forced into the reservoir and is required to come into contact with the oil. This easier movement of oil to the production well. Normally the CO_2 injection is alternated with more water injection and the water acts to sweep the oil towards the production zone.

Contamination – Introduction into water, air, and soil of microorganisms, chemicals, toxic substances, wastes, or wastewater in a concentration that makes the medium unfit for its next intended use.

Cretaceous – Of or belonging to the geologic time, system of rocks, and sedimentary deposits of the third and last period of the Mesozoic Era, characterized by the development of flowering plants and ending with the sudden extinction of the dinosaurs and many other forms of life which occurred 144 to 65 million years ago.

Criteria Pollutants – The Clean Air Act requires USEPA to set standards for six common air pollutants. These commonly found air pollutants (also known as "criteria pollutants") are found all over the United States. They are particle pollution

(often referred to as particulate matter), ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, and lead.

Cultural Resources – Archaeological sites, historical sites (e.g. standing structures), Native-American resources, and paleontological resources.

Cumulative Effects **–** Those effects on the environment that result from the incremental effect of the action when added to past, present and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions.

Day-night Sound Level – The A-weighted equivalent sound level for a 24 hour period with an additional 10 dB imposed on the equivalent sound levels for night time hours of 10 p.m. to 7 am.

Decibel – A unit of measurement that expresses the magnitude of a physical quantity (usually intensity) relative to a specified or implied *reference level*. The decibel is useful for a wide variety of measurements in science (for this application, it is sound).

Decommissioning **–** Formal process for abandoning a well in accordance with applicable laws and regulations.

Diameter at Breast Height – A standard measure of a tree's diameter, about 4 ½ feet above the ground

Directionally Drilled – Wells that are drilled intentionally to a location other than directly beneath the wellhead location.

Ecoregion – Relatively large units of land or water containing a distinct assemblage of natural communities and species, with boundaries that approximate the original extent of natural communities prior to major land-use change.

EIV – (Environmental Information Volume), A written document analyzing the environmental impacts of a Proposed Action, adverse effects of the Proposed Action that cannot be avoided, alternative courses of action, short-term uses of the environment versus the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitment of resources

Endangered Species **–** A species whose numbers are so small that the species is at risk for extinction. A federal list of endangered species can be found in 50 CFR 17.11 (wildlife), 50 CFR 17.12 (plants), and 50 CFR 222.23(a) (marine organisms).

Environmental Justice – The fair treatment and meaningful involvement of all people without regard to race, national origin, or income in the development, implementation, and enforcement of environmental laws, regulations, policies and programs.

Eocene – Of or belonging to the geologic time, rock series, or sedimentary deposits of the second epoch of the Tertiary Period, characterized by warm climates and the rise of most modern mammalian families which occurred 58 to 37 million years ago.

Equivalent Sound Level – The level of a steady-state noise without impulses or tone components that is equivalent to the actual noise emitted over a period of time.

Exotic – A species not historically present in an area also known as non-native species.

Fluvial **–** Anything related to, produced by, or inhabiting a river or stream.

Forage – Grasses, small shrubs and other plant material that can be used as food sources for grazing animals and livestock.

Greenhouse Gas – Greenhouse gases are the gases present in the earth's atmosphere which reduce the loss of heat into space and therefore contribute to global temperatures.

Habitat – A place where particular plants or animals occur or could occur.

Hazardous Waste/Materials – Waste substances which can pose a substantial or potential hazard to human health or the environment when improperly managed.

Hertz – The frequency of sound waves.

Impermeable – Not permitting passage, (such as a fluid) through its substance.

Injection Well – The well that would be used to inject approximately 125,000 tons of CO_2 annually into the Paluxy Formation

Invasive – An exotic species that both invades native communities and impacts those native communities by displacing or replacing native species.

Kilowatt – A measurement of electric power.

Median Age – Is a common measure to describe the ages of a designated population for comparative purposes. The median age divides the population into two equal age groups such that the first group (one-half of the population) is younger than the median value and the second group is older than the median value.

Median Household Income – The median household income is commonly used to provide data about geographic areas and divides households into two equal segments with one-half of all households earning less than the median number and one-half earning more.

Mesozoic – Of, belonging to, or designating the era of geologic time that includes the Triassic, Jurassic, and Cretaceous periods and is characterized by the development of flying reptiles, birds, and flowering plants and by the appearance and extinction of dinosaurs that occurred 230 to 63 million years ago.

Millidarcies – A measurement of permeability.

Miocene – Of or belonging to the geologic time, rock series, or sedimentary deposits of the fourth epoch of the Tertiary Period, characterized by the development of grasses and grazing mammals and occurring about 24 to 5 million years ago.

NAAQS – (National Ambient Air Quality Standards), Standards established by the USEPA that apply for outdoor air throughout the country. Primary standards are designed to protect human health, with an adequate margin of safety, including sensitive populations such as children, the elderly, and individuals suffering from respiratory disease.

Native – A species that historically occurs in an area or one that was not introduced (brought) from another area.

NEPA – (National Environmental Policy Act), Requires all agencies, including Department of Energy, to examine the environmental impacts of their actions, incorporate environmental information, and use public participation in the planning and implementation of all actions. Federal agencies must integrate NEPA with other planning requirements, and prepare appropriate NEPA documents to facilitate better environmental decision making (40 CFR 1500).

New Source Performance Standards – Are pollution control standards issued by the USEPA. The term is used in the Clean Air Act Extension of 1070 to refer to air pollution emission standards, and in the Clean Water Act referring to standards for discharges of industrial wastewater to surface waters.

Nonattainment Areas – The Clean Air Act and Amendments of 1990 define a "nonattainment area" as a locality where air pollution levels persistently exceed national standards or that contributes to ambient air quality in a nearby area that fails to meet standards. Designating an area as nonattainment is a formal rulemaking process,

and USEPA normally takes this action only after air quality standards have been exceeded for several consecutive years.

Palustrine – Non-tidal wetlands.

Particular Matter – Small solid particles and liquid droplets in the sir.

Per Capita Income – A measure of average income obtained by dividing the total aggregate income for a given population by the total number of individuals within that population.

Permeability – Formations that transmit fluids readily, such as sandstones, are described as permeable and tend to have many large, well-connected pores.

Photosynthesis – A process that converts carbon dioxide into organic compounds, especially sugars, using the energy from sunlight.

Pig Launcher – A pig is a mechanical tool used to clean and/or inspect the interior of a pipe. The pig launcher projects the pig into the pipe.

Pliocene – Of or belonging to the geologic time, rock series, or sedimentary deposits of the last epoch of the Tertiary Period, characterized by the appearance of distinctly modern animals which occurred from 13 to 2 million years ago.

Plume – A continuous emission from a point source of contamination that has a starting point and a noticeable pathway.

Population Density – The total population within a geographic entity, such as a state, county or city, divided by the land area of that entity measured in square kilometers or square miles. The result is presented as "persons per square kilometer" or "persons per square mile."

Porosity – The amount of small spaces or voids within a solid material. Porous materials can absorb fluids.

Reduce – To bring down, as in extent, amount, or degree; diminish

Right of Way – An easement or a privilege to pass over the land of another, whereby the holder of the easement acquires only a reasonable and common use of the property

Runoff – The non-infiltrating water entering a stream or other conveyance channel shortly after a rainfall.

Sediment – Particles derived from rock or biological sources that have been transported by water.

Sequestration – A means of mitigating the contribution of fossil fuel emissions to global warming, based on capturing carbon dioxide from large point sources such as fossil fuel power plants, and storing it away from the atmosphere by different means.

Silviculture – The art and science of sustainably growing trees to meet needs

Species – All organisms of a given kind; a group of plants or animals that breed together but are not bred successfully with organisms outside their group.

Stratigraphic – Rock layers and layering.

Supercritical CO_2 **–** Carbon dioxide that is in a fluid state while also being at or above both its critical temperature and pressure.

Threatened Species – A species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Turbidity – A measure of water clarity; a measure of the amount of suspended solids (usually fine clay or silt particles) in water and thus the degree of scattering or absorption of light in the water.

Understory – an underlying layer of vegetation; specifically: the vegetative layer and especially the trees and shrubs between the forest canopy and the ground cover

Viewshed – Subunits of the landscape where the scene is contained by topography, similar to a watershed.

VOCs – (Volatile Organic Compounds), Organic compounds that have high enough vapor pressures under normal conditions to significantly vaporize and enter the atmosphere.

Wetland **–** Area inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

Appendices

Appendix A: Air Emission Calculations

Table A-1. Drilling Emissions

Heavy Equipment Use

Equipment Type	Number of Units	Days on Site	Hours Per Day	Operating Hours
Bore/Drill Rigs	1	90	24	2160
Generator Sets	2	90	24	4320
Other Construction Equipment	2	90	24	4320

Drilling Equipment Emission Factors (lbs/hour)

Equipment	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$
Bore/Drill Rigs	0.5281	1.3416	0.1295	0.0017	0.0591	0.0591
Generator Sets	0.3461	0.6980	0.1075	0.0007	0.0430	0.0430
Other Construction Equipment	0.4504	1.1575	0.1215	0.0013	0.0503	0.0503

Source: (CARB, 2007)

Drilling Equipment Emissions (tons)

Equipment	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$
Bore/Drill Rigs	0.5704	1.4489	0.1399	0.0019	0.0638	0.0638
Generator Sets	0.7476	1.5077	0.2321	0.0015	0.0929	0.0929
Other Construction Equipment	0.9728	2.5002	0.2624	0.0027	0.1087	0.1087
Total Equipment Emissions	**2.2907**	**5.4569**	**0.6345**	**0.0061**	**0.2654**	**0.2654**

Drilling Worker Commutes

Number of Workers	12
Number of Trips	2
Miles Per Trip	60
Days of Drilling	90
Total Miles	129600

Pollutant	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$
Emission Factor (lbs/mile)	0.0105	0.0011	0.0011	0.0000	0.0001	0.0001
Total Emissions (lbs)	1367.08	142.93	139.86	1.39	11.02	6.86
Total Emissions (tons)	**0.6835**	**0.0715**	**0.0699**	**0.0007**	**0.0055**	**0.0034**

Source: (CARB, 2007)

Total Drilling Emissions (tons)

Activity/Source	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$
Heavy Equipment	2.2907	5.4569	0.6345	0.0061	0.2654	0.2654
Worker Commutes	0.6835	0.0715	0.0699	0.0007	0.0055	0.0034
Total Drilling Emissions	**2.9743**	**5.5283**	**0.7044**	**0.0068**	**0.2709**	**0.2688**

Table A-2. Pipeline and Service Line Construction Emissions

Equipment Use

Equipment Type	Number of Units	Days on Site	Hours Per Day	Operating Hours
Graders Composite	1	30	7	210
Excavators Composite	1	30	7	210
Rubber Tired Dozers Composite	2	30	7	420
Off-Highway Trucks Composite	2	30	7	420
Air Compressors	1	30	4	120
Cement & Mortar Mixers	1	30	7	210
Cranes	1	30	7	210
Generator Sets	1	30	7	210
Tractors/Loaders/Backhoes	4	30	7	840

Equipment Emission Factors (lbs/hour)

Equipment	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$
Graders Composite	0.6561	1.6191	0.1936	0.0015	0.0840	0.0840
Excavators Composite	0.5828	1.3249	0.1695	0.0013	0.0727	0.0727
Rubber Tired Dozers Composite	1.5961	3.2672	0.3644	0.0025	0.1409	0.1409
Off-Highway Trucks Composite	0.8499	2.7256	0.2730	0.0027	0.0989	0.0989
Air Compressors	0.3782	0.7980	0.1232	0.0007	0.0563	0.0563
Cement and Mortar Mixers	0.0447	0.0658	0.0113	0.0001	0.0044	0.0044
Cranes	0.6011	1.6100	0.1778	0.0014	0.0715	0.0715
Generator Sets	0.3461	0.6980	0.1075	0.0007	0.0430	0.0430
Tractors/Loaders/Backhoes	0.4063	0.7746	0.1204	0.0008	0.0599	0.0599

Source: (CARB, 2007)

Equipment Emissions (tons)

Equipment	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$
Graders Composite	0.0689	0.1700	0.0203	0.0002	0.0088	0.0088
Excavators Composite	0.0612	0.1391	0.0178	0.0001	0.0076	0.0076
Rubber Tired Dozers Composite	0.3352	0.6861	0.0765	0.0005	0.0296	0.0296
Off-Highway Trucks Composite	0.1785	0.5724	0.0573	0.0006	0.0208	0.0208
Air Compressors	0.0227	0.0479	0.0074	0.0000	0.0034	0.0034
Cranes	0.0631	0.1691	0.0187	0.0001	0.0075	0.0075
Generator Sets	0.0363	0.0733	0.0113	0.0001	0.0045	0.0045
Tractors/Loaders/Backhoes	0.1707	0.3253	0.0506	0.0003	0.0251	0.0251
Total Equipment Emissions	**0.9365**	**2.1832**	**0.2599**	**0.0020**	**0.1074**	**0.1074**

Delivery of Equipment and Supplies

Number of Deliveries	2
Number of Trips	2
Miles Per Trip	60
Days of Construction	90
Total Miles	21600

Pollutant	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$
Emission Factor (lbs/mile)	0.0219	0.0237	0.0030	0.0000	0.0009	0.0007
Total Emissions (lbs)	474.10	512.19	64.64	0.55	18.49	15.97
Total Emissions (tons)	**0.2371**	**0.2561**	**0.0323**	**0.0003**	**0.0092**	**0.0080**

Source: (CARB, 2007)

Table A-2. Pipeline and Service Line Construction Emissions

Worker Commutes

Number of Workers	172
Number of Trips	2
Miles Per Trip	40
Days of Construction	30
Total Miles	412800

Pollutant	**CO**	**NO_x**	**VOC**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**
Emission Factor (lbs/mile)	0.0105	0.0011	0.0011	0.0000	0.0001	0.0001
Total Emissions (lbs)	4354.39	455.27	445.49	4.44	35.11	21.85
Total Emissions (tons)	**2.1772**	**0.2276**	**0.2227**	**0.0022**	**0.0176**	**0.0109**

Source: (CARB, 2007)

Total Emissions (tons)

Activity/Source	**CO**	**NO_x**	**VOC**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**
Construction Equipment	0.9365	2.1832	0.2599	0.0020	0.1074	0.1074
Delivery of Equipment and Supplies	0.2371	0.2561	0.0323	0.0003	0.0092	0.0080
Worker Commutes	2.1772	0.2276	0.2227	0.0022	0.0176	0.0109
Total Emissions	**3.3508**	**2.6669**	**0.5150**	**0.0044**	**0.1342**	**0.1263**

Table A-3. CO_2 Emission Calculations

Drilling and Construction		
Total Fuel	15000	Gallons
Total Fuel	56781	Liters
Emission Factor	2.6304	kg CO_2 per liter
Total Emissions	149356.7	kg
Total Emissions	**165**	**Tons**
Electricity Usage		
Power	72300	kilowatt hour
Emission Factor	0.6510	kg CO_2/kilowatt hour
Total Emissions	47067	kg
Total Emissions	**52**	**Tons**
Worker Commutes		
Number of Workers	5	Workers
Number of Trips	2	Trips
Miles Per Trip	30	Miles
Days of Operation	1098	Days
Total Miles	329400	Miles
Emission Factor	1.1	lbs/mile
Total Emissions	362185.9	lbs
Total Emissions (tons)	**181.1**	**tons**

Source: (CARB, 2007)

Total CO_2 Emissions (tons)	Emissions (tons)
Activity/Source	
Drilling and Construction	165
Electricity Usage	52
Worker Commutes	181
Sequestration	(375,000-547,500)
Total Emissions	**(374,602-547,102)**

Appendix B: Federally Listed Species Descriptions

Flatwoods Salamander (*Ambystoma cingulatum*)

The flatwoods salamander is endemic to a small portion of the Coastal Plain of the southeastern US. Surveys completed since 1990 indicate that 22 populations are known from across the historical range: two in Georgia and the remainder in Florida (none known in Alabama) (NatureServe, 2009b). Limited information specific to the flatwoods salamander exists; however, terrestrial habitat of the complex as a whole is topographically flat or slightly rolling wiregrass-dominated grassland having little to no midstory and an open overstory of widely scattered longleaf pine. Low-growing shrubs, such as saw palmetto (*Serenoa repens*), gallberry (*Ilex glabra*) and blueberries (*Vaccinium spp*.), co-exist with grasses and forbs in the groundcover. Groundcover plant diversity is usually very high. The underlying soil is typically poorly drained sand that becomes seasonally inundated. Post-larval individuals live underground and occupy burrows (NatureServe, 2009b).

West Indian Manatee (*Trichechus manatus*)

The West Indian manatee is a large, herbivorous, aquatic mammal that inhabits coastal waters and rivers (FFWC, 2009). Manatees move between freshwater, brackish, and salt-water environments (USFWS, 2009a). Manatees are rare or extinct in most of their range. This species is found in slow moving rivers, estuaries, saltwater bays, canals, and coastal areas where sea grass flourishes. Manatees have a low metabolic rate and need to be in water 68°F or warmer (MMC, 2009). In summer, manatees are found as far west as Texas and as far north as the Carolinas and Virginia (FFWC, 2009).

Gulf Sturgeon (*Acipenser oxyrinchus desotoi*)

The Gulf sturgeon is an anadromous fish that inhabits coastal rivers from Louisiana to Florida during the warmer months and the Gulf of Mexico and its estuaries and bays in the cooler months (NOAA, 2009b). Sturgeons are primitive fish, characterized by bony plates and a hard, extended snout. Adults range from 1.2 to 2.4 meters (4 to 8 feet) in length and can live about 60 years. Gulf sturgeons are bottom feeders and primarily eat macroinvertebrates. This species forages in the brackish or marine waters of the Gulf of Mexico and its estuaries, not in riverine habitat. Sturgeons migrate into rivers to spawn in the spring. Spawning occurs in areas of clean substrate comprised of rock and rubble.

Loggerhead Sea Turtle (*Caretta caretta*)

The loggerhead sea turtle is large (approximately 0.9 meters [36 inches] in length and 113 kg [250 lbs]) with a brown to reddish-brown carapace and yellow to brown plastron (Wibbels, 2009a). Its distribution is wide, including the Atlantic, Pacific, and Indian Oceans. The loggerhead sea turtle is normally associated with waters along the continental shelf, and found in many coastal and estuarine areas. It is the most abundant sea turtle occurring along the Atlantic and Gulf coasts of the US. This species is also the most abundant sea turtle occurring in the coastal waters and nesting on the beaches of Alabama. In Alabama, loggerhead sea turtles nest

from Florida border to Dauphin Island, with majority nesting between Fort Morgan and Gulf Shores (Wibbels, 2009a).

Green Sea Turtle (*Chelonia mydas*)

The green sea turtle is found in tropical and subtropical oceans throughout the world, including the Atlantic, Pacific, and Indian Oceans (Wibbels, 2009b). This species' habitat is relatively shallow coastal or bay waters, except during migration. Green sea turtles appear to prefer protected bays, lagoons, or shoals with an abundance of algae or marine grass beds. In the continental US, the green sea turtle is found along Atlantic and Gulf Coasts, and occasionally along the Pacific Coast. In the continental US, nesting is primarily done between North Carolina and Florida, with the majority of nesting occurring along the Atlantic Coast of Florida; however, nesting is occasionally done in the northeastern Gulf of Mexico along the Florida Panhandle. In recent years, at least two nests have been recorded in Alabama (Wibbels, 2009b). Although no major feeding areas have been found in Alabama coastal waters, grass beds along the Florida Panhandle do appear to be feeding grounds. This species normally nests on beaches with high-energy wave action, including many islands (Wibbels, 2009b).

Kemp's Ridley Sea Turtle (*Lepidochelys kempii*)

Adult Kemp's ridley sea turtle, considered the smallest marine turtle in the world, weigh an average of 45.4 kg (100 pounds) with a carapace measuring between 61 to 71 cm (24 and 28 inches) in length (NOAA, 2009c). Kemp's ridley sea turtles display one of the most unique synchronized nesting habits in the natural world. Large groups of Kemp's ridley sea turtles gather off a particular nesting beach near Rancho Nuevo, Mexico. Kemp's ridley sea turtles are distributed throughout the Gulf of Mexico and US Atlantic seaboard, from Florida to New England. Occasional nesting has been documented in North Carolina, South Carolina, and the Gulf and Atlantic coasts of Florida.

Black Pine Snake (*Pituophis melanoleucus lodingi*)

The black pine snake is a large (maximum length of approximately 1.9 meters [6.2 feet]) snake with a moderately stout body, short tail, and small head that is only slightly wider than its neck (ENTRIX, 2010a). This species is distributed in the coastal plain from extreme southeastern Louisiana through southern Mississippi to southwestern Alabama. In Alabama, this species has been recorded in Mobile, Clarke, and Washington Counties, and probably occurs in southern Choctaw County. The black pine snake lives in xeric, fire-maintained longleaf pine forests with sandy, well drain soils and typically occurs on hilltops, ridges, and toward the tops of slopes with open canopy, reduced mid-story, and dense herbaceous understory. Riparian areas, hardwood forests, or other closed-canopy conditions are not regularly used.

Alabama Red belly Turtle (*Pseudemys alabamensis*)

The Alabama red belly turtle is approximately 0.3 meters (1 foot) in length, with a distinguishing prominent notch at the tip of the upper jaw, bordered on each side by a tooth-like cusp (Masek, 2009). This is an herbaceous species that feeds on submerged macrophytes. The Alabama red

belly turtle is found in shallow vegetated backwaters of freshwater streams, rivers, bays, and bayous in or adjacent to Mobile Bay. This species seems to prefer habitats with soft bottoms and extensive beds of submerged aquatic macrophytes. Female Alabama red belly turtles leave their aquatic environment and lay their eggs on dry land. The Alabama red belly turtle's range is restricted to the Mobile- Tensaw River Delta in Mobile and Baldwin Counties adjacent to Mobile Bay and this species is rarely found north of Interstate 65. Systematic sampling of major tributaries in coastal Alabama has found this species to be present in major rivers and tributaries of the Mobile Bay, Bayou La Batre, Fowl, Dog, Fish, Magnolia, and Bon Secour Rivers. Specimens have also been recorded from Daphne and Point Clear, Alabama.

Piping Plover (*Charadrius melodus*)

The piping plover is a small, stocky shorebird with sandy-colored plumage on its back and crown and a white underside (USFWS, 2009b). Piping plovers breed in North America in three geographic regions: the Atlantic Coast, the Northern Great Plains, and the Great Lakes. Plovers from all three breeding populations winter along coastal beaches and barrier islands from North Carolina to Texas, the eastern coast of Mexico, and on Caribbean islands. Piping plovers begin arriving on the wintering grounds in early July, with some late nesting birds arriving through October. Wintering plovers feed on exposed wet sand in wash zones, intertidal ocean beach, wrack lines, wash over passes, mud, sand, and algal flats, and shorelines of ephemeral ponds, lagoons, and salt marshes. Plovers use uplands beaches adjacent to foraging areas for roosting and preening.

Least Tern (*Sterna antillarum*)

The least tern is a small shore bird that is found throughout much of the US and migrates as far south as northern South America. It breeds on seacoasts, beaches, bays, estuaries, lagoons, lakes, and rivers. It rests and loafs on sandy beaches, mudflats, and salt-pond dikes (NatureServe, 2009c). Nesting and foraging habitat are near water and include ocean coasts, lagoons, tidal flats, estuaries, beaches, sand dunes, sand bars, and rivers. The least tern usually nests in shallow depressions on level ground on sandy or gravelly beaches and banks of rivers or lakes, typically in areas with sparse or no vegetation; also on dredge spoils; on mainland or on barrier island beaches; and on flat gravel-covered rooftops of buildings (especially in the southeastern US) or other similarly barren artificial sites. Good nesting areas tend to be well beyond the high tide mark, have shell particles, stones, and/or debris for egg camouflage, are out of the way of off-road vehicles and public recreation areas, not subject to unusual predation pressure, and adjacent to plentiful sources of small fishes (NatureServe 2009c). The least tern is migratory and this species breeds along inland river systems in the US and typically winters along the Central American coast and the northern coast of South America (NatureServe, 2009c).

Appendix C: Pictures of Abandoned Gopher Tortoises Burrows

Photo C-1. Abandoned gopher tortoise burrow ear Well D 9-9

Photo C-2. Abandoned gopher tortoise burrow near Well D4-14

Appendix D: Consultation with USFWS

NATIONAL ENERGY TECHNOLOGY LABORATORY
Albany, OR • Morgantown, WV • Pittsburgh, PA

U.S. DEPARTMENT OF ENERGY

June 7, 2010

Bill Pearson, Field Supervisor
United States Fish and Wildlife Service
Daphne Ecological Services Field Office
1208-B Main Street
Daphne, AL 36526

Dear Mr. Pearson:

The Southern States Energy Board (SSEB) manages the Southeast Regional Carbon Sequestration Partnership (SECARB). With the support of the U.S. Department of Energy (DOE) National Energy Technology Laboratory (NETL), SSEB proposes to conduct a large-scale demonstration of the sequestration of carbon dioxide (CO_2) originating from an anthropogenic source, referred to as the "Phase III Anthropogenic Test Characterization Project" (SECARB Phase III Anthropogenic Project or Project). Federal funding would be committed by the NETL for the fieldwork contemplated. The purpose of this letter is to conclude that the Project would not have an adverse affect on protected species.

Project Description

The Project would be located within the Southeast Unit of the Citronelle Oilfield (Citronelle Field) in Mobile County, Alabama, and would consist of the installation of one new injection well and one new characterization well, and the use of four previously installed wells that would be retrofitted for monitoring activities. Two shallow groundwater monitoring wells would also be drilled to a depth of approximately 600 feet. Maps of the proposed project area are located in Appendix A.

The proposed installation and operation of the SECARB Phase III Project facilities field (Figure 2) would include:

- Drilling of one new injection well at an existing pad
- Drilling of one new site characterization well at an existing well pad
- Reconditioning of four existing wells and well pads for project in-zone and above-zone monitoring
- Drilling of two new shallow water wells to monitor groundwater for post-injection changes.

Denbury proposes to construct and operate an approximately 4.5-inch-diameter CO_2 pipeline that would extend from Plant Barry to the Citronelle Field in Mobile County, Alabama (Figure 1 of Appendix A). Specifically, Denbury proposes to construct the following facilities:

3610 Collins Ferry Road, P.O. Box 880, Morgantown, WV 26507

- Approximately 10.9 miles of 4.5-inch-diameter CO_2 pipeline;
- A pig launcher and receiver at Plant Barry and the Citronelle Field, respectively
- A new mainline valve (MLV) located at approximate milepost (MP) 6.2.

The maximum allowable operating pressure (MAOP) of the proposed pipeline would be approximately 2,200 pounds per square inch gauge (psig). All facilities described in this Environmental Information Volume (EIV) would be designed, constructed, tested, operated, and maintained to conform with or exceed the requirements of the US Department of Transportation (DOT) regulations under 49 CFR Part 195, *Transportation of Hazardous Liquids by Pipeline* and other applicable federal and state regulations. In total, the Denbury pipeline and aboveground facilities would permanently encumber approximately 51.6 acres

Connected Actions

There would also be three connected actions, components that are necessary for the proposed project.

CO_2 Source

Alabama Power Company's Plant Barry coal-fired power plant is the host site for a 25 megawatt (MW) CO_2 capture and separation project that would serve as the source of the anthropogenic CO_2 for SECARB's Proposed Project. Plant Barry is located near Bucks, Alabama on a site of approximately 1,000 acres. Alabama Power Company is a subsidiary of Southern Company. Alabama Power, Southern Company, the Electric Power Research Institute (EPRI), and other EPRI members are working with Mitsubishi Heavy Industries (MHI) to design, build, and test the post-combustion CO_2 capture and separation facility. The planned operation start date is in April 2011.

The CO_2 capture unit will be receiving treated stack gas from Plant Barry Unit 5, a 773 MW coal-fired steam generation facility that started commercial operations on October 19, 1971. The total annual CO_2 emissions from Plant Barry Unit 5 in 2009 were 5,329,015 tons. The average annual Unit 5 CO_2 emissions during 1990-2009 were 4,426,569 tons.

Unit 5 is equipped with an electrostatic precipitator (ESP) to remove particulate matter and a selective catalytic reduction (SCR) system to reduce nitrogen oxides (NO_x).

A flue gas desulfurization (FGD) unit was recently added to Unit 5 and placed into operations in January 2010. The new FGD unit is a wet scrubber. Flue gas desulfurization is an important aspect of stack gas clean up that is needed prior to capturing CO_2. Hot stack gas from Unit 5 is routed to an FGD absorption tower where it reacts with a lime-slurry (calcium carbonate) mixture that removes sulfur from the stack gas and creates a liquid stream of calcium sulfite and calcium sulfate. A forced oxidation blower introduces excess air to the absorber tower and converts calcium sulfite to calcium sulfate. Calcium sulfate slurry is removed from the bottom of the absorber tower and sent to a dewatering facility. Stack gas is routed from the FGD absorber tower to a new 660 foot wet scrubber stack.

A slip stream of stack gases will be collected from the duct work between the FGD absorber tower and the new wet scrubber stack. The temperature of the gas stream leaving the FGD absorber tower is 125-130 degrees Fahrenheit (°F), and it has a composition of 10.866 percent (%) CO_2 and 5.7 parts per million (ppm) sulfur dioxide (SO_2).

The Plant Barry Unit 5 CO_2 capture technology will be a post-combustion system that is based upon CO_2 absorption utilizing advanced amines. The technology that is being demonstrated is a technology jointly developed by MHI and Kansai Electric Co., Inc. (Kansai) beginning in 1990.

In an amine-based process, CO_2 from the cooled power plant exhaust gas reacts with an aqueous solution of amine in an absorption tower. Stack gases that are routed to the capture unit are compressed and cooled. Then, the gases go to the absorption tower where the CO_2 binds to the amine solvent chemically. Most of the CO_2 is removed from the exhaust gas and the CO_2-rich solution (i.e. the solution containing the absorbed CO_2) flows to a lean/rich heat exchanger. The hot CO_2-lean solution coming from the stripper column (solvent regeneration) cools itself by giving up its heat to the CO_2-rich solution, which then goes to solvent regeneration. Here the solvent is regenerated by heat as the chemical bonds holding the CO_2 are decomposed thermally. The CO_2 and water vapor leaving the solvent regeneration "stripper" is next cooled and essentially pure CO_2 leaves the separation plant for compression and dehydration. At this point, the CO_2 would be ready for the next step in the process, which is transport to the injection site.

Transport of the CO_2

The CO_2 originating from Alabama Power's Barry Electric Generating Plant (Plant Barry) would be delivered to the injection site via an approximately 10.9-mile long, 4.5-inch diameter pipeline that has been proposed by Denbury Resources, Inc. (Denbury). Denbury proposes a 95-foot wide construction right-of-way (ROW) and a 40-foot wide permanent ROW. Prior to initiating construction-related activities, Denbury would secure ROW easements from landowners whose properties would be crossed by the pipeline route. All owners, managers, tenants, and lessees of lands long the ROW would be notified in advance of construction activities that could affect their property, business, or operations. Approximately 125,000 tons of carbon dioxide (CO_2) would be injected annually into the Paluxy Formation over the course of three years (from 2011 to 2014). Monitoring would occur throughout the injection period and would continue an additional three years after the completion of CO_2 injection activities (through 2017).

The proposed pipeline would be funded, constructed, operated, and maintained by Denbury and would not require federal funding. While the pipeline would not receive DOE funding, the pipeline would be a connected action to the SECARB Phase III Project and will, therefore, need to be included in the EA review.

The majority of the Denbury pipeline construction process would be accomplished using conventional open-cut overland construction techniques for small-diameter pipelines. Conventional open-cut overland installation of pipeline is best represented as a moving assembly line with a construction spread (crew and equipment) proceeding along the construction ROW in a continuous operation. Construction at any single point along the pipeline, from ROW surveying and clearing to backfill and finish grading, will last several weeks. The entire process

would be coordinated so as to limit the time of disturbance to an individual area, thereby minimizing the potential for erosion and the loss of normal use.

No new access roads would be required for installation or monitoring of the pipeline. Denbury proposes to access work areas where existing roads intersect the right-of-way. New aboveground facilities associated with the Denbury pipeline would include a mainline valve and a new pig launcher and receiver.

A trench would be excavated using rotary wheel ditching machines, backhoes, or rippers for installation of the Denbury pipeline. The trench would be excavated to a depth (typically about 4 feet) that would allow space for the pipeline, pipeline bedding, and the minimum amount of top cover required by Department of Transportation (DOT) specifications. Topsoil would be separated in accordance with landowner agreements and any applicable federal, state, and local requirements.

Once installation and backfilling are completed and before the pipeline begins operation, the pipeline would be hydrostatically pressure tested in accordance with DOT safety standards (49 CFR Part 195) to verify its integrity. Hydrostatic testing consists of installing a hydrostatic test cap and manifold, filling the pipeline with water, pressurizing the pipeline to establish its MAOP, and maintaining that test pressure for a specified period of time. Any leaks detected during the test would be repaired and the pipeline would be re-tested.

Following completion of backfilling the trench, all remaining trash, debris, surplus materials, and temporary structures would be removed from the ROW and disposed in accordance with applicable federal, state, and local regulations. All disturbed areas would have topsoil replaced, as applicable, and would be finish graded and restored as closely as possible to preconstruction contours and in accordance with the Alabama Handbook and as negotiated in the individual landowner easements.

A user fee would be paid by DOE/NETL for the CO2 delivered by this pipeline system.

Supply electric power to the injection point

Selective right-of-way clearing along an approximately a 2,600-foot and a 675-foot corridor for the delivery of electric power to the injection site and the characterization well would be required. Additional information on potential environmental impact resulting from such clearing is being prepared by ENTRIX, Inc. as part of a supplemental EIV.

The U.S. Fish and Wildlife Service (USFWS) has identified 14 federally listed endangered, threatened, or candidate species as potentially occurring within Mobile County, Alabama (USFWS, 2010; ANHP, 2009). There is also critical habitat located on the coastal islands for the endangered piping plover, but area is not within or near the project boundaries (USFWS, 2010). Based on a natural heritage element occurrence database search, Alabama Natural Heritage Program (ANHP) identified three of these federally-listed species (gopher tortoise, Eastern indigo snake, and red-cockaded woodpecker) as occurring within a search area that encompassed 9 USGS topographic quadrangle maps (approximately 550 square miles) centered on the Project

area (ANHP 2009). All species that are federally listed and identified as potentially occurring in Mobile County, Alabama and their management status are included in Table 1.

Table 1 Federally- Listed Species Potentially Occurring in the Mobile County, Alabama Vicinity

Species	Identified within General Project Area[a]	Status Federal	Alabama
Vascular Plants			
Louisiana Quillwort (*Isoetes louisianensis*)	No	E	--
Amphibians			
Flatwoods Salamander (*Ambystoma cingulatum*)	No	T	SP
Mammals			
West Indian Manatee (*Trichechus manatus*)	No	E	SP
Fish			
Gulf Sturgeon (*Acipenser oxyrinchus desotoi*)	No	T	SP
Reptiles			
Loggerhead Sea Turtle (*Caretta caretta*)	No	T	SP
Green Sea Turtle (*Chelonia mydas*)	No	T	SP
Eastern Indigo Snake (*Drymarchon couperi*)[c]	Yes	T	SP
Gopher Tortoise (*Gopherus polyphemus*)	Yes	T	SP
Kemp's Ridley Sea Turtle (*Lepidochelys kempii*)	No	E	SP
Black Pine Snake (*Pituophis melanoleucus lodingi*)	No	C	SP
Alabama Red-Bellied Turtle (*Pseudemys alabamensis*)	No	E	SP
Birds			
Piping Plover (*Charadrius melodus*)	No	T	SP
Least tern (*Sterna antillarum*)	No	E	--
Red-cockaded woodpecker (*Picoides borealis*)	Yes	E	SP

NOTES:
Source: ANHP 2009, FWS 2010
[a] Identified by ANHP as being present within a 9-quadrangle topographic map area centered on the Citronelle East Topographic Quadrangle or through FWS consultation.
[b] E = endangered; T = threatened; C = candidate SP = state protected;
[c] FWS identified eastern indigo snake as potentially occurring in Mobile County.

Appendix B contains a description of the preferred habitats of all federally listed species listed for Mobile County, Alabama, except the red-cockaded woodpecker, gopher tortoise, and eastern indigo snake, which are described further below. Neither individuals nor habitats for the species identified in Appendix B were observed during field assessments and ANHP has no record of

their occurrence near the proposed Project area. Based on the lack of habitat and the lack of occurrence records for the proposed Project area, we conclude that the proposed Project will have no effect on the species discussed in Appendix B.

Eastern Indigo Snake (*Drymarchon corais couperi*)
The eastern indigo snake is a large, shiny black snake reaching lengths up to 8 feet (FNAI, 2001a). This species largely occurs in Florida and southern Georgia, although its historic range extended from southern South Carolina to southeastern Mississippi, including the Project area in Mobile County, Alabama. The eastern indigo snake is found in a variety of habitats ranging from xeric, well-drained uplands to wet prairies and other hydric habitats. In the northern part of its range, this species overwinters in gopher tortoise burrows and other subterranean refuges. Eastern indigo snakes require very large, un-fragmented tracts of natural habitat (greater than 5,000 acres) to survive.

Based on reconnaissance, field assessments conducted during the summer of 2009, the Project area did not contain appropriate habitat for the eastern indigo snake due to the overly dense vegetative communities, extent of disturbance, and habitat fragmentation within and surrounding the Project area.

Gopher Tortoise (*Gopherus polyphemus)*
The gopher tortoise's geographic distribution includes areas from southern South Carolina southward through southern Georgia and Florida and westward through southern Alabama, Mississippi, and extreme southeastern Louisiana (FNAI, 2001b). It is generally found in dry, well-drained upland habitats characterized by a relatively open pine canopy, which allows sufficient sunlight penetration for egg incubation, basking, and growth of grasses, herbs, and other forbs that largely constitute the gopher tortoise's diet. Gopher tortoises may also be found in disturbed, less suitable habitats such as pastures, power line easements, and roadsides where forage availability is often greater than surrounding habitats. Gopher tortoises excavate deep burrows as refuge from predators, weather, and fire. These burrows also serve as unique and important habitat for over 300 commensal species, including the eastern indigo snake.

No gopher tortoises were observed during reconnaissance field assessments. During the evaluation of the potential presence of gopher tortoises and/or eastern indigo snakes, a total of one inactive and two abandoned gopher tortoise burrows were observed in the Project area. One inactive and one abandoned burrow were observed within the previously disturbed and cleared area of well site D9-9 (Figure 2 of Appendix A; Photographs 1 of Appendix C) and one abandoned burrow was observed adjacent to the previously disturbed and cleared area of well site D4-14 (Figure 2 of Appendix A; Photograph 2 of Appendix C).

The abandoned burrows at well sites D9-9 and D4-14 were in a dilapidated condition and showed no evidence of recent utilization by gopher tortoises. The presence of significant amounts of intact live plant roots, spider webs, and leaf litter near the opening of the burrows was evidence that the two burrows had been abandoned. The mounded skirts around the abandoned burrows formed by burrow excavation were also grown over with vegetation, hard-packed, and free of tracks and recently excavated soils. These signs provided further support that the two burrows were abandoned.

The inactive burrow at well site D9-9 may also be abandoned, but because the burrow did not exhibit obvious signs of abandonment, such as intact plant roots growing across the burrow and significant amounts of leaf litter near the opening of the burrow, the field biologists categorized the burrow as inactive, or potentially occupied. No tracks, drag marks, or recently excavated soils were observed near the opening of the burrow. Therefore, the burrow is likely abandoned, but the burrow could possibly still be utilized by juvenile and adult gopher tortoises and numerous commensal species.

Based on vegetation observed during reconnaissance field assessments conducted during the summer of 2009, the Project area does not appear to provide suitable gopher tortoise habitat due to the overly dense vegetative communities, extent of disturbance, and habitat fragmentation within and surrounding the Project area. The canopy and understory strata in most of the mixed forest community are too dense to allow sufficient sunlight penetration to adequately support the groundcover stratum. As a result, groundcover is sparse and, therefore, does not provide sufficient foraging habitat for gopher tortoises. It is likely that the abandoned and inactive burrows found within the disturbed areas are present because the groundcover stratum in these areas receives more sunlight than the surrounding mixed forest habitat; however, these disturbed areas are poor gopher tortoise habitat due to sparse forage availability, total lack of canopy, and routine disturbance. In consideration of these factors, it is highly unlikely that the gopher tortoise currently utilize the Project area.

Red-cockaded Woodpecker (*Picoides borealis*)

The red-cockaded woodpecker is listed as a federally endangered species in Mobile County, Alabama. In Alabama, a majority of the red-cockaded woodpecker populations are found in Oakmulgee, Talladega, and Conecuh National Forests (ADCNR 2008). Red-cockaded woodpeckers inhabit mature (greater than 23 centimeter [9.1 inch] diameter at breast height (DBH)) longleaf pine forests and mixed pine upland hardwood forests with little to no hardwood mid-story vegetation (ADCNR, 2008; LDWF, 2005). Long leaf pines are the most commonly preferred tree species, but the red-cockaded woodpecker does use other southern pine species, such as loblolly pines (ADCNR, 2008). Longleaf pines that average 80 to 120 years old and loblolly pines that are 70 to 100 years old are the preferred tree ages for red-cockaded woodpeckers (ADCNR, 2008). Typically, red-cockaded woodpeckers do not travel more than 0.8 kilometer (0.5 mile) from their clusters to foraging habitat (NCNHP, 2009). Primary threats to the species include the loss of pine stands due to development, the management of pine forests in short rotation, and fire suppression, which promotes the growth of hardwood mid-story vegetation, which is unsuitable as red-cockaded woodpecker habitat (NatureServe, 2009a).

Effects of Proposed Action

While a majority of the non-previously disturbed Project assessment area consists of forested vegetation, the Project assessment area contains substantial mid- and under-story vegetation that would not be suitable red-cockaded woodpecker habitat. Additionally, biologists did not observe red-cockaded woodpeckers, nesting cavity trees, or hear red-cockaded woodpecker vocalizations during field reconnaissance. Therefore, we conclude that construction and operation of the proposed Project will have no effect on the red-cockaded woodpecker or its preferred habitat.

Based on the findings of our field reconnaissance and SSEB's commitment to conduct pre-construction surveys and to implement any necessary FWS-recommended mitigation measures resulting from pre-construction surveys, we conclude that construction and operation of the proposed Project is not likely to adversely affect the gopher tortoise.

The forested habitats within the Project area and surrounding areas are highly fragmented by dirt roads, utility easements, and well pads. In consideration of these factors, and given that no eastern indigo snakes were observed during our field reconnaissance, it is highly unlikely that this species currently utilizes the Project area. We conclude that construction and operation of the proposed Project is not likely to adversely affect the eastern indigo snake.

The preferred habitats and potential for occurrence of the federally listed threatened and endangered species identified as potentially occurring Mobile County are described above or located in Appendix B. No federally listed species were observed during field assessments of the Project well pads. Further, except for abandoned and inactive gopher tortoise burrows, no other sign of species presence was identified for any of these species within the Project well pad workspaces. Due to the absence of appropriate habitat the effects of the new injection and characterization well construction, pipeline construction, existing well reconditioning, and future maintenance work is not expected to adversely affect locally occurring listed species.

Conservation Measures

Because an inactive gopher tortoise burrow was identified within the field assessment area, SSEB would implement several measures to ensure that the proposed Project does not impact any gopher tortoises that may be present within the Project area at the time of construction. Forty-five to thirty days prior to the commencement of construction activities, SSEB would employ a qualified biologist to conduct a survey of the areas that would be subject to ground disturbance and a 100-foot-wide buffer beyond the boundaries of the planned ground disturbance areas. If a non-abandoned (active or inactive) gopher tortoise burrow were identified during pre-construction surveys, SSEB would consult further with FWS to implement appropriate mitigation measures to avoid impacts to the species. FWS-recommended mitigation measures that could be implemented would include gopher tortoise identification training for workers, construction exclusion areas near non-abandoned burrows, and/or gopher tortoise relocation. Appropriate mitigation measures would be determined in consultation with FWS based on pre-construction field survey results. Further, work will not commence until all appropriate FWS clearances are obtained. To ensure that the Project does not result in impacts to gopher tortoise, the SECARB Team proposes to follow avoidance and minimization measures recommended by the FWS, which may include additional gopher tortoise surveys, gopher tortoise relocation, worker training, and/or the installation of barrier fencing.

Conclusions

Based on the lack of species occurrence, habitats, and the adoption of FWS-proposed mitigation and avoidance measures that will be implemented prior to construction, the Project either will have no effect or will be not likely to adversely affect any federally-listed threatened or endangered species. No impacts to federally listed species are anticipated in association with

construction and operation of the proposed Project. None of these species were observed during field assessments. Further, except for gopher tortoise, no suitable habitat was identified for any of these species. SSEB proposes to conduct additional gopher tortoise surveys and mitigation measures, if necessary, to minimize impacts to this species. Based on the lack of species occurrence, habitats and/or the FWS-proposed mitigation measures that would be implemented prior to construction, the proposed Project either would have no effect or would be not likely to adversely affect any federally- or state-listed threatened or endangered species.

Please let me know if you have any questions, I can be reached via email (william.gwilliam@netl.doe.gov) or by telephone (304-285-4401). We have provided the references below for your convenience.

Sincerely,

W. J. Gwilliam

William J. Gwilliam

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Attachment

Note: Please Copy All Responses To:
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Glossary

Pig launcher A pig is a mechanical tool used to clean and/or inspect the interior of a pipe

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Appendix A

Project Maps

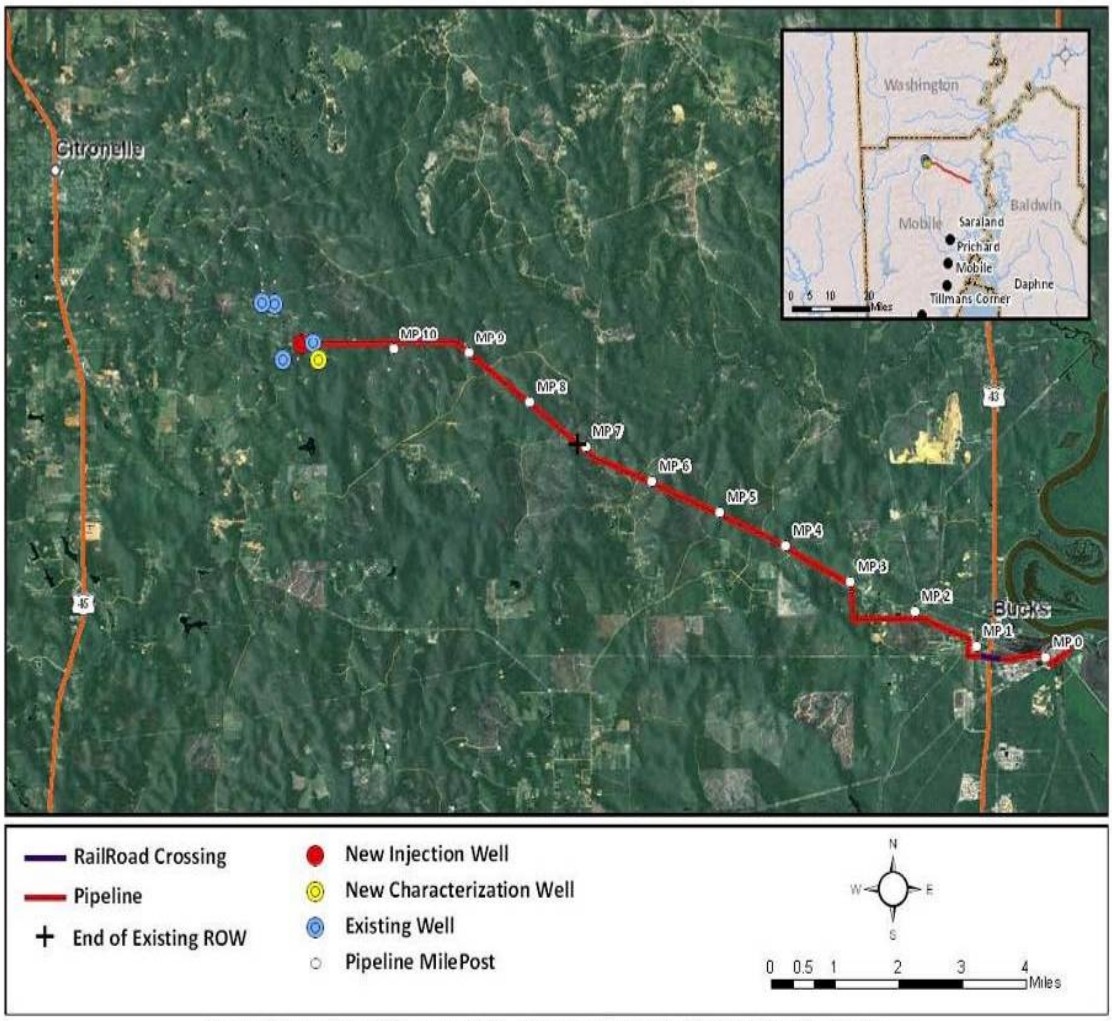

Figure 1: Location of Proposed Pipeline and Wells in Mobile County, Alabama

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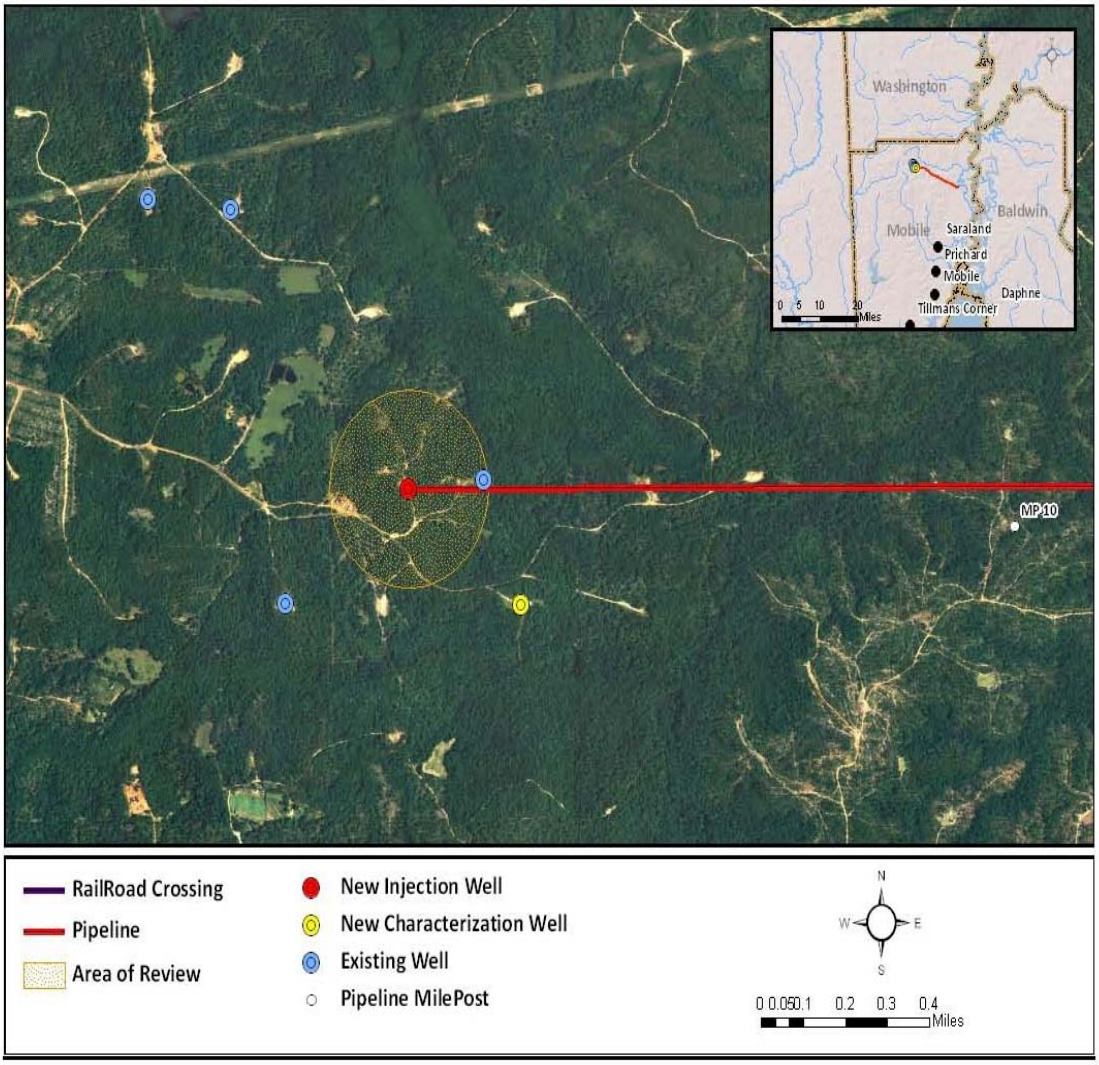

Figure 2: Vicinity Map of Proposed Wells in Mobile County, Alabama

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Appendix B

Federally Listed Species Descriptions

Louisiana Quillwort *(Isoetes louisianensis)*
The Louisiana quillwort is a small, grass-like, seedless aquatic plant closely related to the fern. The leaves of this species can grow up to 40.6 cm (16 inches) long. It occurs predominantly on sandbars of smaller streams. Louisiana quillwort lives in cool, clear creeks and roots in sand and gravel a few inches to a few feet under water (CPC, 2009). This species is known to exist in certain counties in Louisiana and Mississippi. In Alabama, the Louisiana quillwort has been confirmed in Monroe County. Plant samples, possibly of this species, have been retrieved from Conecuh and Escambia Counties, Alabama, but species confirmation is still pending. The Louisiana quillwort, however, has the greatest potential to live and thrive in Mobile and Washington Counties (AFC, 2009).

Flatwoods Salamander (*Ambystoma cingulatum*)
The flatwoods salamander is endemic to a small portion of the Coastal Plain of the southeastern US. Surveys completed since 1990 indicate that 22 populations are known from across the historical range: two in Georgia and the remainder in Florida (none known in Alabama) (NatureServe 2009b). Limited information specific to the flatwoods salamander exists; however, terrestrial habitat of the complex as a whole is topographically flat or slightly rolling wiregrass-dominated grassland having little to no midstory and an open overstory of widely scattered longleaf pine. Low-growing shrubs, such as saw palmetto (*Serenoa repens*), gallberry (*Ilex glabra*) and blueberries (*Vaccinium spp.*), co-exist with grasses and forbs in the groundcover. Groundcover plant diversity is usually very high. The underlying soil is typically poorly drained sand that becomes seasonally inundated. Post-larval individuals live underground and occupy burrows (NatureServe 2009b).

West Indian Manatee (*Trichechus manatus*)
The West Indian manatee is a large, herbivorous, aquatic mammal that inhabits coastal waters and rivers (FFWC 2009). Manatees move between freshwater, brackish, and salt water environments (USFWS 2009b). Manatees are rare or extinct in most of their range. This species is found in slow moving rivers, estuaries, saltwater bays, canals, and coastal areas where sea grass flourishes. Manatees have a low metabolic rate and need to be in water 68 degrees Fahrenheit (F) or warmer (MMC, 2009). In summer, manatees are found as far west as Texas and as far north as the Carolinas and Virginia (FFWC, 2009).

Gulf Sturgeon(*Acipenser oxyrinchus desotoi*)
The Gulf sturgeon is an anadromous fish that inhabits coastal rivers from Louisiana to Florida during the warmer months and the Gulf of Mexico and its estuaries and bays in the cooler months (NOAA 2009a). Sturgeons are primitive fish, characterized by bony plates and a hard, extended snout. Adults range from 1.2 to 2.4 meters (4 to 8 feet) in length and can live about 60 years. Gulf sturgeons are bottom feeders and primarily eat macroinvertebrates. This species forages in the brackish or marine waters of the Gulf of Mexico and its estuaries, not in riverine habitat. Sturgeons migrate into rivers to spawn in the spring. Spawning occurs in areas of clean substrate comprised of rock and rubble.

Loggerhead Sea Turtle (*Caretta caretta*)
The loggerhead sea turtle is large (approximately 0.9 meters [36 inches] in length and 113 kg [250 lbs]) with a brown to reddish-brown carapace and yellow to brown plastron (Wibbels

2009a). Its distribution is wide, including the Atlantic, Pacific, and Indian Oceans. The loggerhead sea turtle is normally associated with waters along the continental shelf, and found in many coastal and estuarine areas. It is the most abundant sea turtle occurring along the Atlantic and Gulf coasts of the US. This species is also the most abundant sea turtle occurring in the coastal waters and nesting on the beaches of Alabama. In Alabama, loggerhead sea turtles nest from Florida border to Dauphin Island, with majority nesting between Fort Morgan and Gulf Shores (Wibbels 2009a).

Green Sea Turtle (*Chelonia mydas*)
The green sea turtle is found in tropical and subtropical oceans throughout the world, including the Atlantic, Pacific, and Indian Oceans (Wibbels, 2009b). This species' habitat is relatively shallow coastal or bay waters, except during migration. Green sea turtles appear to prefer protected bays, lagoons, or shoals with an abundance of algae or marine grass beds. In the continental US, the green sea turtle is found along Atlantic and Gulf Coasts, and occasionally along the Pacific Coast. In the continental US, nesting is primarily done between North Carolina and Florida, with the majority of nesting occurring along the Atlantic Coast of Florida; however, nesting is occasionally done in the northeastern Gulf of Mexico along the Florida Panhandle. In recent years, at least two nests have been recorded in Alabama (Wibbels 2009b). Although no major feeding areas have been found in Alabama coastal waters, grass beds along the Florida Panhandle do appear to be feeding grounds. This species normally nests on beaches with high-energy wave action, including many islands (Wibbels, 2009b).

Kemp's Ridley Sea Turtle (*Lepidochelys kempii*)
Adult Kemp's ridley sea turtle, considered the smallest marine turtle in the world, weigh an average of 45.4 kg (100 pounds) with a carapace measuring between 61 to 71 cm (24 and 28 inches) in length (NOAA 2009b). Kemp's ridley sea turtles display one of the most unique synchronized nesting habits in the natural world. Large groups of Kemp's ridley sea turtles gather off a particular nesting beach near Rancho Nuevo, Mexico. Kemp's ridley sea turtles are distributed throughout the Gulf of Mexico and US Atlantic seaboard, from Florida to New England. Occasional nesting has been documented in North Carolina, South Carolina, and the Gulf and Atlantic coasts of Florida.

Black Pine Snake (*Pituophis melanoleucus lodingi*)
The Black Pine Snake is a large (maximum length of approximately 1.9 meters [6.2 feet]) snake with a moderately stout body, short tail, and small head that is only slightly wider than its neck (Nelson and Bailey 2009). This species is distributed in the coastal plain from extreme southeastern Louisiana through southern Mississippi to southwestern Alabama. In Alabama, this species has been recorded in Mobile, Clarke, and Washington Counties, and probably occurs in southern Choctaw County. The black pine snake lives in xeric, fire-maintained longleaf pine forests with sandy, well drain soils and typically occurs on hilltops, ridges, and toward the tops of slopes with open canopy, reduced mid-story, and dense herbaceous understory. Riparian areas, hardwood forests, or other closed-canopy conditions are not regularly used.

Alabama Redbelly Turtle (*Pseudemys alabamensis*)
The Alabama redbelly turtle is approximately 0.3 meters (1 foot) in length, with a distinguishing prominent notch at the tip of the upper jaw, bordered on each side by a tooth-like cusp (Masek

2009). This is an herbaceous species that feeds on submerged macrophytes. The Alabama redbelly turtle is found in shallow vegetated backwaters of freshwater streams, rivers, bays, and bayous in or adjacent to Mobile Bay. This species seems to prefer habitats with soft bottoms and extensive beds of submerged aquatic macrophytes. Female Alabama redbelly turtles leave their aquatic environment and lay their eggs on dry land. The Alabama redbelly turtle's range is restricted to the Mobile- Tensaw River Delta in Mobile and Baldwin Counties adjacent to Mobile Bay and this species is rarely found north of Interstate 65. Systematic sampling of major tributaries in coastal Alabama has found this species to be present in major rivers and tributaries of the Mobile Bay, Bayou La Batre, Fowl, Dog, Fish, Magnolia, and Bon Secour Rivers. Specimens have also been recorded from Daphne and Point Clear, Alabama.

Piping Plover (*Charadrius melodus*)
The piping plover is a small, stocky shorebird with sandy-colored plumage on its back and crown and a white underside (USFWS 2009a). Piping plovers breed in North America in three geographic regions: the Atlantic Coast, the Northern Great Plains, and the Great Lakes. Plovers from all three breeding populations winter along coastal beaches and barrier islands from North Carolina to Texas, the eastern coast of Mexico, and on Caribbean islands. Piping plovers begin arriving on the wintering grounds in early July, with some late nesting birds arriving through October. Wintering plovers feed on exposed wet sand in wash zones, intertidal ocean beach, wrack lines, wash over passes, mud, sand, and algal flats, and shorelines of ephemeral ponds, lagoons, and salt marshes. Plovers use uplands beaches adjacent to foraging areas for roosting and preening.

Least Tern (*Sterna antillarum*)
The least tern is a small shore bird that is found throughout much of the US and migrates as far south as northern South America. It breeds on seacoasts, beaches, bays, estuaries, lagoons, lakes, and rivers. It rests and loafs on sandy beaches, mudflats, and salt-pond dikes (NatureServe 2009c). Nesting and foraging habitat are near water and include ocean coasts, lagoons, tidal flats, estuaries, beaches, sand dunes, sand bars, and rivers. The least tern usually nests in shallow depressions on level ground on sandy or gravelly beaches and banks of rivers or lakes, typically in areas with sparse or no vegetation; also on dredge spoils; on mainland or on barrier island beaches; and on flat gravel-covered rooftops of buildings (especially in the southeastern US) or other similarly barren artificial sites. Good nesting areas tend to be well beyond the high tide mark, have shell particles, stones, and/or debris for egg camouflage, are out of the way of off-road vehicles and public recreation areas, not subject to unusual predation pressure, and adjacent to plentiful sources of small fishes (NatureServe 2009b). The least tern is migratory and this species breeds along inland river systems in the US and typically winters along the Central American coast and the northern coast of South America (NatureServe 2009c).

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Appendix C

Reference Photographs

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Photo 1: Abandoned gopher tortoise burrow ear Well D 9-9

Photo 2: Abandoned gopher tortoise burrow near Well D4-14

NATIONAL ENERGY TECHNOLOGY LABORATORY
Albany, OR • Morgantown, WV • Pittsburgh, PA

U.S. DEPARTMENT OF ENERGY

July 8, 2010

Bill Pearson, Field Supervisor
United States Fish and Wildlife Service
Daphne Ecological Services Field Office
1208-B Main Street
Daphne, AL 36526

Dear Mr. Pearson:

Due to some clarification with the proponent, I am sending this supplement to our June 7th communication regarding project 2009-I-0784. The change in the project is that up to two injection wells and up to two deep monitoring wells may be drilled on the well pads that are 3 acres. Thus, the total disturbance is expected to be about 1.5 acres per pad or 3 acres total due to the existing clearing in the proposed well locations. Further, the CO_2 to be injected has changed from 125,000 tons per year for three years to 125,000 to 182,500 metric tons per year (or 375,000 to 547,500 total metric tons injected over 3 years). Please see the map below. All other components remain the same.

Please let me know if you have any questions, I can be reached via email (william.gwilliam@netl.doe.gov) or by telephone (304-285-4401).

Sincerely,

W. J. Gwilliam

William J. Gwilliam
NEPA Document Manager

Enclosure

Note: Please Copy All Responses To:
Meghan Morse
Mangi Environmental Group
7915 Jones Branch Drive, Ste. 2300
McLean, VA 22102
(E-mail address: MMorse@mangi.com)

3610 Collins Ferry Road, P.O. Box 880, Morgantown, WV 26507

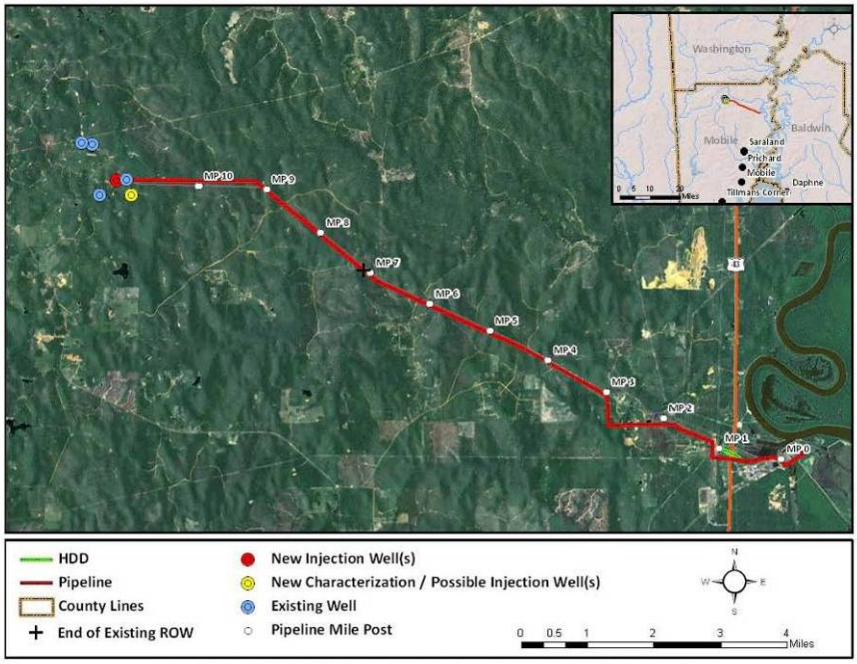

Figure 1: Location of Proposed Pipeline and Wells in Mobile County, Alabama

2

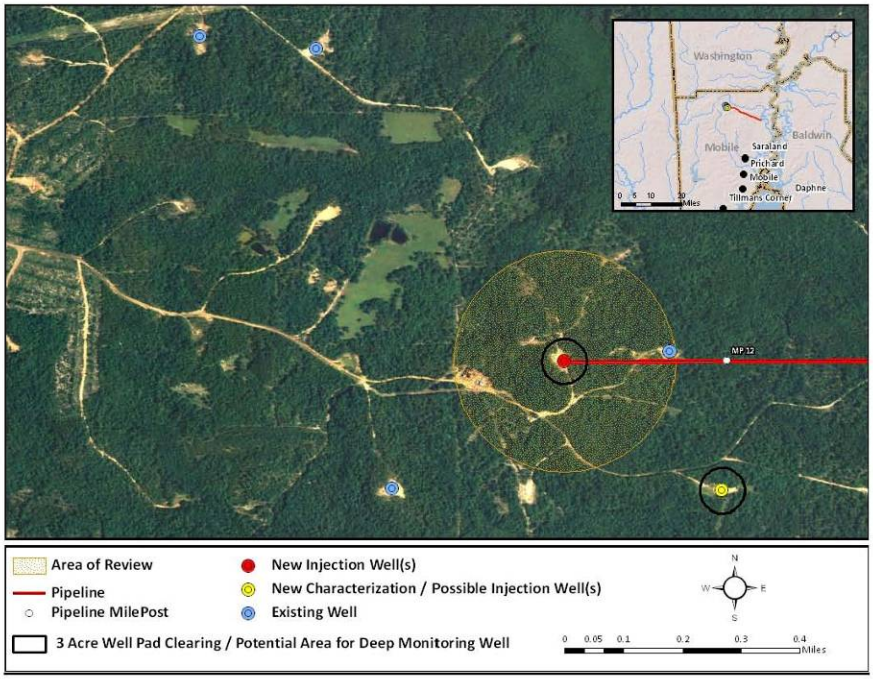

Figure 2: Vicinity Map of Proposed Wells in Mobile County, Alabama

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From: Bruce_Porter@fws.gov
Sent: Wednesday, July 28, 2010 10:01 AM
To: william.gwilliam@netl.doe.gov
Cc: Meghan Morse
Subject: Entrix Storage Demonstration Project, Mobile County, AL

Mr. Gwilliam,

This email is in response to your July 8, 2010 letter in which you submitted changes to the original project description. The species of concern during our initial evaluation of the project was the gopher tortoise (Gopherus polyphemus) and surveys were conducted for this species.
The minor changes that you refer to in your July 8 letter are not cause for us to require new surveys because these pads should have been surveyed during the initial consultation. I can't stress enough the need to fence in these pad sites very soon after they have been cleared because the tortoise will move in causing DOE to reinitiate consultation before work can continue.

If you have questions or require an official letter from our office please don't hesitate to call me at (251) 441-5864 or via email.

Bruce Porter
USFWS ECOLOGICAL SERVICES-Alabama Field Office 1208-B Main Street Daphne, AL 36526

Appendix E: SHPO Consultation

NATIONAL ENERGY TECHNOLOGY LABORATORY
Albany, OR • Morgantown, WV • Pittsburgh, PA

U.S. DEPARTMENT OF ENERGY

June 7, 2010

Amanda Hill
Alabama Historical Commission
ATTN: 106 Reviews
468 S. Perry Street
Montgomery, AL 36130-0900

Dear Ms. Hill:

The Southern States Energy Board (SSEB) manages the Southeast Regional Carbon Sequestration Partnership (SECARB). With the support of the U.S. Department of Energy's (DOE) National Energy Technology Laboratory (NETL), SSEB proposes to conduct a large-scale demonstration of the sequestration of carbon dioxide (CO_2) originating from an anthropogenic source, referred to as the "Phase III Anthropogenic Test Characterization Project" (SECARB Phase III Project or Project). Federal funding would be committed by NETL for the fieldwork contemplated, and the federal action (i.e. DOE's proposed action) is to provide $23,600,878.00 to implement the SSEB proposed project. The Project, as proposed by SSEB, would be located within the Southeast Unit of the Citronelle Oilfield (Citronelle Field) in Mobile County, Alabama (See Vicinity Map).

SSEB's proposed project would inject and closely monitor the flow of 125,000 metric tons of CO_2 per year for three years into the brine bearing Paluxy Formation (See injection map). In order to inject this CO_2, three connected actions exist, which are related activities that are part of an overall effort to implement SSEB's proposed project. First, the CO_2 source for this study would be Southern Company's coal-fired Plant Berry electric generating plant located approximately 12 miles away from the injection point. Secondly, 10.9 miles of 4.5-inch pipeline would need to be installed to transport the CO_2 from Plant Berry to the injection site at the Denbury's Citronelle Field. A user fee would be paid by DOE/NETL for the CO2 delivered by this pipeline system. Lastly, 1,000 feet of electrical right-of-way would be established to provide electrical power to the injection point.

As part of our coordination and consultation responsibilities and to comply with provisions of implementing Section 106 of the National Historic Preservation Act of 1966, we would appreciate receiving any information you may have regarding historic or cultural properties within the project area based on the attached forms we have prepared.

Based on the scope of the proposed project, DOE plans to prepare an Environmental Assessment (EA), in accordance with requirements of the National Environmental Policy Act (NEPA), to analyze, document, and disseminate information on the potential environmental consequences of the proposed project. Information that you provide will be incorporated and appropriately

3610 Collins Ferry Road, P.O. Box 880, Morgantown, WV 26507

addressed in the EA. If your initial review concludes that no historic or cultural properties are present in the project area and that neither historic nor cultural properties would be affected by the proposed action, a written acknowledgement of that conclusion would be appreciated. In any case, the information you provide will be considered in preparing a draft EA, which will be provided to you upon request.

Please let me know if you have any questions, I can be reached via email (william.gwilliam@netl.doe.gov) or by telephone (304-285-4401).

Sincerely,

William J. Gwilliam
NEPA Document Manager

Attachment

Note: Please Copy All Responses To:
Meghan Morse
Mangi Environmental Group
7915 Jones Branch Drive, Ste. 2300
McLean, VA 22102
(E-mail address: MMorse@mangi.com)

Glossary

Pig launcher A pig is a mechanical tool used to clean and/or inspect the interior of a pipe

Literature Cited

(R.S. Webb & Associates, 2009a) R.S. Webb & Associates. 2009a. Letter of Findings: Cultural Resources Literature Review for the SECARB Phase III Tract in Mobile County, Alabama, R.S. Webb & Associates No. 09-198-009 (Appendix B)

(R.S. Webb & Associates, 2009b) R.S. Webb & Associates. 2009b. Letter of Findings: Cultural Resources Literature Review for the 17-Kilometer Gas Transmission Pipeline Corridor in Mobile County, Alabama, R.S. Webb & Associates No. 10-198-014. (Appendix B)

List of Attachments

Appendix A: Project Review Consultation Form
Appendix B: Project Maps
Appendix C: Project Description
Appendix D: Cultural Resources Literature Review

Print Form

ALABAMA HISTORICAL COMMISSION
STATE HISTORIC PRESERVATION OFFICE
SECTION 106 PROJECT REVIEW CONSULTATION FORM

The Alabama State Historic Preservation Office needs to know if your project will affect historic structures or archaeological sites, a requirement under Section 106 of the National Historic Preservation Act of 1966 (as amended). Regulations provide 30 days from receipt for us to respond to your submission. We strive to clear all projects with the information provided, but sometimes additional information is necessary--please refer to the checklist on page 2 of this form to insure all basic information has been provided. For further information, refer to our website: www.preserveala.org and follow the links to regulatory assistance.

Starting project activities before you receive a response from us will delay your project, or could cause you to lose funding.

PROJECT NAME Phase III Anthropogenic Test Characterization Project

FEDERAL AGENCY PROVIDING FUNDS, LICENSE, OR PERMIT Department of Energy

APPLICANT (DOE) National Energy Technology Laboratory (NETL) — TELEPHONE (412) 386-5428

CONTACT PERSON William J. Gwilliam — TELEPHONE (304) 285-4401

CONTACT EMAIL william.gwilliam@netl.doe.gov

ADDRESS FOR RESPONSE National Energy Technology Laboratory
U.S. Department of Energy
P.O. Box 880
Morgantown, WV 26505

PROJECT LOCATION

STREET ADDRESS The Southeast Unit of the Citronelle Oil Field — CITY N/A (unincorporated area)

COUNTY Mobile County, AL — NUMBER OF ACRES IN PROJECT AREA 51.6

USGS TOPOGRAPHIC MAP QUADRANGLE NAME (see map requirements on Page 2) See Appendix D, Cultural Resources Review

SECTION:	TOWNSHIP:	RANGE:	YEAR OF QUAD:

PROJECT DESCRIPTION

Describe the overall project in DETAIL. Be sure to note if there will be any ground disturbing activities or if the project will include the demolition of existing buildings. If the project involves rehabilitation, describe the proposed work in detail. Use additional pages if necessary.

Southern States Energy Board's (SSEB) Proposed Project would inject and closely monitor the flow of 125,000 metric tons of CO2 per year for three years into the brine bearing Paluxy Formation (See injection map). In order to inject this CO2 three connected actions exist which are related activities that are part of an overall effort to implement SSEB's Proposed Project. First, the CO2 source for this study will be the Southern Company's coal-fired Plant Berry electric generating plant located approximately 12 miles away from the injection point. Secondly, 10.9 miles of 4.5 inch pipeline would need to be installed to transport the CO2 from Plant Berry to the injection site at the Denbury's Citronelle Field. Lastly, 1,000 feet of electrical right-of-way would be established to provide electrical power to the injection point.

For more detail, please see Appendix C: Project Description

- 1 -

ARCHAEOLOGY (Ground Disturbing Activities)

Has the ground in the project area been disturbed other than by agriculture (i.e. grading, grubbing, clear cutting, filling, etc.)?

☑Yes ☐No ☐Don't Know ☐N/A

- If yes, please describe in detail. Use additional pages if necessary. Photographs are helpful.

There is an existing right-of-way and existing well pads for the proposed injection wells. Please see Appendix C: Project Description.

Describe the present use and condition of the property. Use additional pages if necessary.

Construction will occur on existing well pads and within an exisiting right-of-way used by the Denbury Power Plant. Please see Appendix C: Project Description.

To your knowledge, has a cultural resource assessment been conducted in the proposed project area?

☑Yes ☐No ☐Don't Know ☐N/A

- If yes, enclose a copy of the archaeologist's report.

STANDING STRUCTURES (Buildings, bridges, etc.)

Are there any standing structures at least 50 years old or older within, near, or adjacent to the project area?

☐Yes ☑No ☐Don't Know ☐N/A

If yes, please provide photographs of all structures. NOTE: See photography requirements on this page.

How will the project impact the structure(s)? (e.g. rehabilitation, relocation, demolition, encroachment, etc.)

Provide a brief history of the building(s), including construction dates and building uses. Use additional pages if necessary.

ADDITIONAL REQUIREMENTS

Map Requirements: Attach a clearly labeled, color copy of the relevant portion of the USGS topographic map indicating the precise location and/or boundaries of the project. Be sure to include the name of the quad sheet from which it came. The location of standing structures at least 50 years old or older must be indicated on the map. *(Go to www.terraserver-usa.com and insert the project's location information. You may enter lat/long or street address, then click "Go". When your results appear, click "Topo Map". When your map appears, click "Print", then print from your browser. Be sure to mark your project area on this map.)*

Photography Requirements: Provide clear photographs (minimum 3" X 5"). Polaroids, photocopies, or faxed photos are not acceptable. Take more photographs, rather than fewer, for quick project review. Photos of all sides of a structure, nearby buildings, and outbuildings to make reviewing easier. All photographs should be labeled and keyed to your map.

CHECKLIST: Did you provide the following information?

☑Detailed description of proposed project	☑Description of present use and condition of the project area
☑Portion of USGS Topographic Map with project area indicated and standing structures identified	☑Photographs of current site conditions & all standing structures
☑Other supporting documents (if necessary to explain the project)	☑For new construction, rehabilitations, etc., attach work plans, drawings, etc.

Return this Form and Attachments to:
Alabama Historical Commission
Attn: Section 106 Review
468 S. Perry Street
Montgomery, Alabama 36130-0900

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Appendix A

Project Maps

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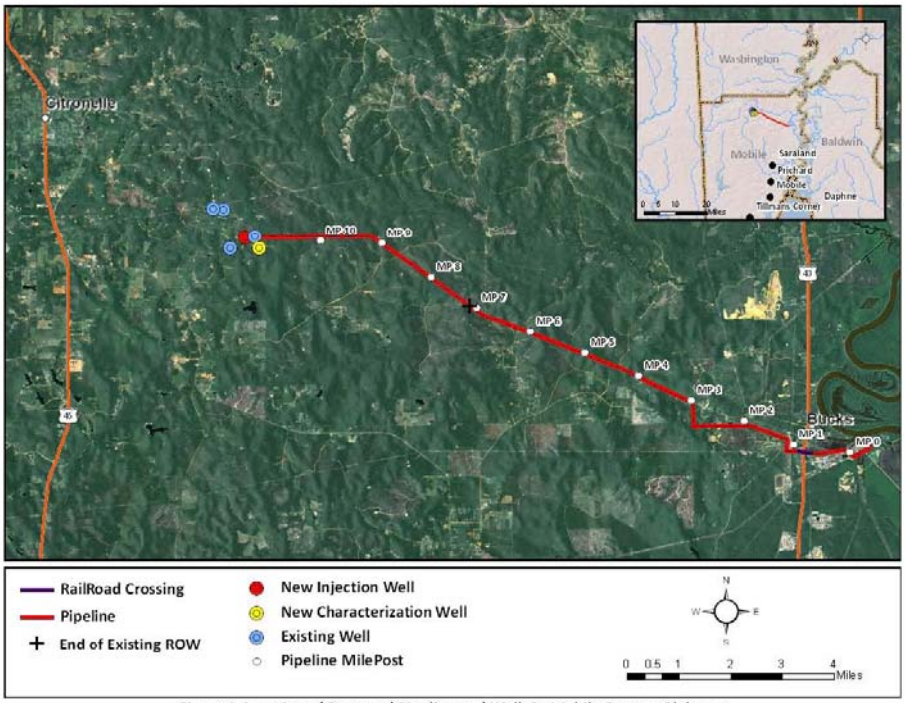

Figure 1: Location of Proposed Pipeline and Wells in Mobile County, Alabama

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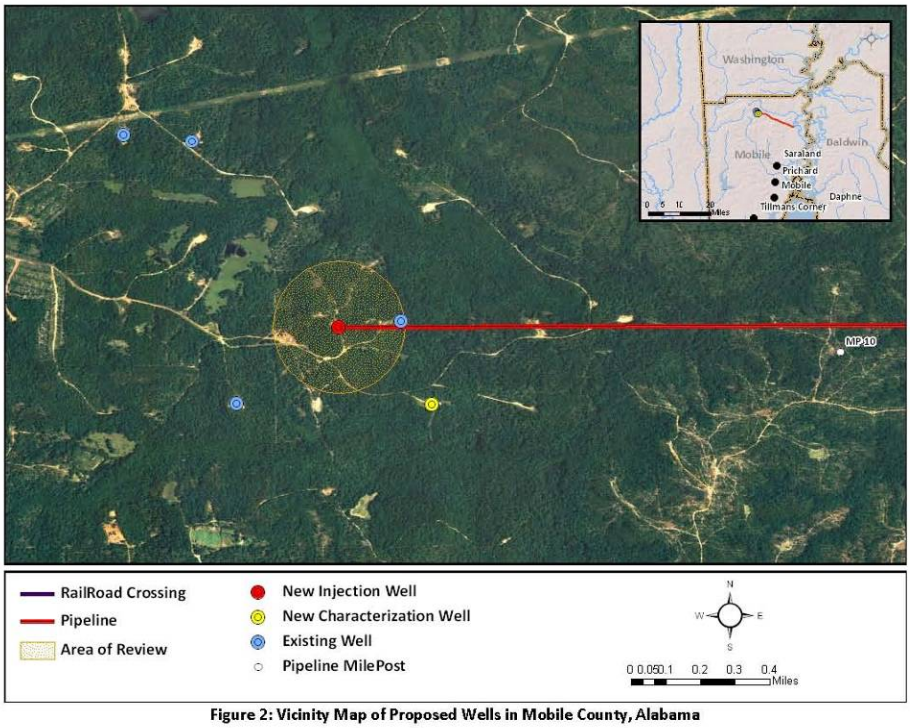

Figure 2: Vicinity Map of Proposed Wells in Mobile County, Alabama

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Appendix B

Project Description

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Project Description

Introduction

The Department of Energy's (DOE or The Department) National Energy Technology Laboratory (NETL) has a mission to implement a research, development, and demonstration program to resolve the environmental, supply, and reliability constraints of producing and using fossil energy sources. One aspect of that mission, the resolution of environmental constraints to producing and using fossil fuels, now requires NETL to review, and where possible, mitigate projected impacts to global climate change caused by the use of fossil fuels. One possible mitigation technique under review is the capture and long-term removal of carbon dioxide (CO_2) from the atmosphere through a process called carbon sequestration. In one of many governmental efforts to address the concerns outlined above, NETL is implementing DOE Carbon Sequestration Program (CSP), which was established in 1997, to evaluate and develop carbon sequestration technologies. The focus of this CSP involves capturing and storing CO_2 emissions prior to release into the atmosphere as well as enhancing natural carbon uptake and storage processes. The principal goal of the CSP is to gain a scientific understanding of carbon sequestration options and to provide cost-effective, environmentally sound technology options that ultimately may lead to a reduction in greenhouse gas intensity and stabilization of atmospheric concentrations of CO_2. One of those options, geologic sequestration, is the placement of CO_2 or other greenhouse gases into subsurface porous and permeable rocks, such as in deep unmineable coal seams, depleted oil and gas reservoirs, or saline (saltwater-filled) formations, in such a way that they remain permanently stored. Impermeable cap rocks and/or geologic structural or stratigraphic traps retain the CO_2 in the formation similar to natural gas storage trapping mechanisms. As a part of this CSP, DOE formed a nationwide network of Regional Carbon Sequestration Partnerships (RCSP) to help determine the best approaches for capturing and permanently storing gases that can contribute to global climate change. The RCSP are a government/industry effort tasked with determining the most suitable technologies, regulations, and infrastructure needs for carbon capture, storage, and sequestration in different areas of the country. This Regional Partnerships' initiative is being implemented in three phases:

- Phase I, Characterization (2003-2005): Characterized opportunities for carbon sequestration, including potential geologic storage formations and trapping mechanisms;
- Phase II, Validation (2005-2009): Small scale field tests are currently under way to verify the injection rates, storage media, and trapping mechanisms; and
- Phase III, Deployment (2008-2017): Conduct large volume carbon storage validation tests.

Southeast Regional Carbon Sequestration Partnership (SECARB) is a member of the RCSP and is comprised of a partnership between Southern States Energy Board (SSEB), the regulatory agencies and geological surveys from the eleven member states (Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Texas, and Virginia), the Electric Power Research Institute, southern utility companies, academic institutions, Native American interests, and the private sector. The SECARB team works with NETL to assess the issues associated with the capture, transport, storage, and use of fossil fuel derived CO_2 emissions.

SECARB is in Phase III of its investigation. During Phases I and II, SECARB commenced the identification of potential capture, transport, and sequestration technologies, developed public involvement and education mechanisms, the characterization of the Southeast US region and its geographic boundaries, and the implementation of potential technologies in field sequestration validation tests. The goal of Phases I and II was to validate carbon sequestration technology and to identify locations that could support future full-scale geologic sequestration projects. As a result of the efforts of Phases I and II, SECARB has determined that numerous thick, regionally extensive, high porosity saline formations with thick shale confining zones exist within the Southeast and that these areas have the potential to effectively contain CO_2 emissions generated in the region.

Phase III of SECARB is a continuation of the work that has been completed under Phases I and II. SECARB Phase III was divided into two tests: the Early Test and the Anthropogenic Test. The Early Test, conducted in Cranfield, Mississippi, demonstrated the feasibility of injecting CO_2 from a natural source into a regionally significant brine-bearing formation and the use of multiple tools to monitor the subsurface movement of the injected CO_2. Data collected during this early phase has been used in the planning and future implementation of the Anthropogenic Test.

The SSEB manages the SECARB. With the support of NETL, SSEB proposes to conduct a large-scale demonstration of the technology to sequester CO_2 originating from an anthropogenic source, referred to as the "Phase III Anthropogenic Test Characterization Project" (SECARB Phase III Anthropogenic Test or Project). Federal funding would be committed by DOE-NETL for the fieldwork contemplated.

The SECARB phased test activities, including those under the Phase III Anthropogenic Test, would continue to study the large-scale demonstration of the safe, long-term injection and storage of CO_2 in formations that are representative of the geology present along the Gulf Coast that could potentially be used to store large quantities of future CO_2 emissions within the Southeastern region.

Purpose and Need

The Department established the RCSP with the **purpose** of assisting in the determination of the best approaches (technologies, regulations, and infrastructure) for capturing and permanently storing gases that contribute to global climate change. This nationwide network of regional partnerships between government and industry interests are now determining the most appropriate and best approaches for carbon capture, storage, and sequestration in different areas of the US. To achieve these goals, the RCSP's studies are being conducted in three phases: characterization (Phase I), validation (Phase II), and development (Phase III). Under the development phase, projects will receive DOE funding to demonstrate the long-term and safe storage of CO_2 in a major geologic formation.

The **need** for the Proposed Action is to assist DOE with its primary goals for Phase III projects, and they include:

- validate deep saline formation capacity estimates;
- use field data to validate geologic reservoir models;
- implement mitigation strategies to reduce potential hazards;
- use advanced monitoring networks to verify the fate of the injected CO_2; and
- demonstrate that CO_2 generated from major point sources can be safely and effectively stored in representative geologic formations for the next 1,000 years.

The Project is needed to further characterize and demonstrate the carbon sequestration potential in the Southeast. The Project will use post-combustion CO_2 captured from an existing coal-fired power plant (Plant Barry) to inject the CO_2 into a regionally significant saline formation. The goals of the SECARB Phase III Project are the following:

- to integrate knowledge gained during the Phase III Early Test;
- to promote the development of the regulatory framework at the state level to continue during the development of the technology;
- to evaluate the differences between the injection of CO_2 that originates from natural sources and CO_2 that is captured from a power plant; and
- to commence integration of carbon capture and sequestration technologies and geological sequestration.

The overall goal of the three phases is to provide the foundation for the commercialization of carbon capture and storage technology. Funding of this Project would help DOE in meeting its goals of advancement and development of feasible carbon capture and storage technology to ultimately reduce greenhouse gas emissions.

Proposed Action

DOE's proposed action is whether to provide SECARB with a grant of $23,600.878.00 to allow for the advancement of the Phase III goals of RCSP.

SECARB's Proposed Project

The Project, as proposed by SSEB, would be located within the Southeast Unit of the Citronelle Oilfield (Citronelle Field) in Mobile County, Alabama (see Figure 1 above).

This oilfield unit is ideally suited for the study because no CO_2 enhanced oil recovery (EOR) floods have occurred locally and it has exceptional geologic containment strata. Additionally, the study participants have the resources and expertise necessary to manage this type of injection and related down-hole technology. The proposed action, which would enable SECARB to monitor, verify and account for injected CO_2, would consist of the installation of a new injection well and a new characterization well and the use of four previously installed wells that would be retrofitted for monitoring activities (see Figure 2 above). Two shallow (600 foot) groundwater monitoring wells will also be drilled on existing well pads.

The injection well would be utilized to inject approximately 125,000 tons of CO_2 annually into the saline water section of the Paluxy Formation over the course of three years (from 2011 to 2014). Baseline characterization of the subsurface conditions and the existing penetrations

within the area of review would be conducted as part of the required Underground Injection Control (UIC) permitting process prior to injection. Monitoring would occur throughout the injection period and would continue an additional three years after the completion of CO_2 injection activities (through 2017). Throughout the injection and monitoring periods, the SECARB Team would implement its monitoring, verification, and accounting (MVA) program. The basic goals of the MVA program would be to monitor CO_2 movement and pressure after injection, detect leakage, and ensure well integrity.

Project Location

The injection well and site characterization well that would be drilled would be located at existing well pad locations in a 160-acre tract that is owned in fee by Denbury Onshore, LLC (Denbury). Additional Project monitoring wells would use existing oil field wells retrofitted with monitoring equipment to meet the needs of the Project. The retrofitted monitoring wells would be located in the Citronelle Southeast Unit and Main Unit. Currently, there are no zoning or land use planning requirements in the unincorporated areas of Mobile County.

Project infrastructure would be located within the operational area of the Citronelle Field and Project activities will be integrated with current oil field operations. No lands outside of the Citronelle Field would be required. Installation of the injection well (D9-7) and site characterization well (D9-9) would require minor clearing of lands around the existing well pads. Modifications of existing well infrastructure for the Project monitoring wells (D9-11, D9-8, D4-14, and D4-13) would not require clearing beyond the existing cleared well pad footprint. While the exact location of the 1,000-foot-long transmission line has not yet been determined by the SECARB Team, it is anticipated that the transmission line will be located adjacent to existing rights-of-way in the Citronelle Field to minimize clearing and habitat disturbance.

The Area of Review (AOR) is the area around an injection well that is determined, in accordance with provisions under 40 CFR 146.6, to be the zone where the CO_2 or formation fluid may migrate into the underground sources of drinking water (USDW) due to pressure. CO_2 movement modeling completed in support of Underground Injection Control (UIC) permitting indicates that the AOR would be confined to a 1,000-foot-radius around the injection site.

Connected Actions

The purpose of this Environmental Assessment (EA) is to analyze the potential environmental impacts of the SECARB's proposed project (i.e. the injection of CO_2 from a man-made source into a sealed geologic formation) to assist DOE in its decision-making regarding whether or not to provide funding for the Project (proposed action). In preparing this EA, DOE is required by NEPA to also look for, and if found, analyze the potential environmental impacts of any connected actions. What this means is that if there are related actions that may pose environmental impact and are a part of an overall effort to implement the proposed action, these connected actions must also be analyzed in the EA. In the case of SECARB's Project being analyzed, there are three connected actions that will also be analyzed: the capture of the CO_2 at its source, which is an existing brown site, the transport of the CO_2 to the injection point, and

clearing of a right-of-way to supply electric power to the injection and characterization wells. No federal funds would be used in any of the three connected actions.

CO_2 Source

Alabama Power Company's Plant Barry coal-fired power plant is the host site for a 25 megawatt (MW) CO_2 capture and separation project that would serve as the source of the anthropogenic CO_2 for SECARB's proposed project. Plant Barry is located near Bucks, Alabama on a site of approximately 1,000 acres. Alabama Power Company is a subsidiary of Southern Company. Alabama Power, Southern Company, the Electric Power Research Institute (EPRI), and other EPRI members are working with Mitsubishi Heavy Industries (MHI) to design, build, and test the post-combustion CO_2 capture and separation facility. The planned operation start date is in April 2011.

The CO_2 capture unit will be receiving treated stack gas from Plant Barry Unit 5, a 773 MW coal-fired steam generation facility that started commercial operations on October 19, 1971. The total annual CO_2 emissions from Plant Barry Unit 5 in 2009 were 5,329,015 tons. The average annual Unit 5 CO_2 emissions during 1990-2009 were 4,426,569 tons.

Unit 5 is equipped with an electrostatic precipitator (ESP) to remove particulate matter and a selective catalytic reduction (SCR) system to reduce nitrogen oxides (NO_x).

A flue gas desulfurization (FGD) unit was recently added to Unit 5 and placed into operations in January 2010. The new FGD unit is a wet scrubber. Flue gas desulfurization is an important aspect of stack gas clean up that is needed prior to capturing CO_2. Hot stack gas from Unit 5 is routed to an FGD absorption tower where it reacts with a lime-slurry (calcium carbonate) mixture that removes sulfur from the stack gas and creates a liquid stream of calcium sulfite and calcium sulfate. A forced oxidation blower introduces excess air to the absorber tower and converts calcium sulfite to calcium sulfate. Calcium sulfate slurry is removed from the bottom of the absorber tower and sent to a dewatering facility. Stack gas is routed from the FGD absorber tower to a new 660 foot wet scrubber stack.

A slip stream of stack gases will be collected from the duct work between the FGD absorber tower and the new wet scrubber stack. The temperature of the gas stream leaving the FGD absorber tower is 125-130 degrees Fahrenheit (°F), and it has a composition of 10.866 percent (%) CO_2 and 5.7 parts per million (ppm) sulfur dioxide (SO_2).

The Plant Barry Unit 5 CO_2 capture technology will be a post-combustion system that is based upon CO_2 absorption utilizing advanced amines. The technology that is being demonstrated is a technology jointly developed by MHI and Kansai Electric Co., Inc. (Kansai) beginning in 1990.

In an amine-based process, CO_2 from the cooled power plant exhaust gas reacts with an aqueous solution of amine in an absorption tower. Stack gases that are routed to the capture unit are compressed and cooled. Then, the gases go to the absorption tower where the CO_2 binds to the amine solvent chemically. Most of the CO_2 is removed from the exhaust gas and the CO_2-rich solution (i.e. the solution containing the absorbed CO_2) flows to a lean/rich heat exchanger. The hot CO_2-lean solution coming from the stripper column (solvent regeneration) cools itself by

giving up its heat to the CO_2-rich solution, which then goes to solvent regeneration. Here the solvent is regenerated by heat as the chemical bonds holding the CO_2 are decomposed thermally. The CO_2 and water vapor leaving the solvent regeneration "stripper" is next cooled and essentially pure CO_2 leaves the separation plant for compression and dehydration. At this point, the CO_2 is ready for the next step in the process, which is transport to the injection site.

Transport of the CO_2

The CO_2 originating from Alabama Power's Barry Electric Generating Plant (Plant Barry) would be delivered to the injection site via an approximately 10.9-mile long, 4.5-inch diameter pipeline that has been proposed by Denbury Resources, Inc. (Denbury). Denbury proposes a 95-foot wide construction right-of-way (ROW) and a 40-foot wide permanent ROW. The proposed pipeline would be funded, constructed, operated, and maintained by Denbury and would not require federal funding. While the pipeline would not receive DOE funding, the pipeline would be a connected action to the SECARB Phase III Project and will, therefore, need to be included in the EA review.

Prior to initiating construction-related activities, Denbury would secure ROW easements from landowners whose properties would be crossed by the pipeline route. All owners, managers, tenants, and lessees of lands long the ROW would be notified in advance of construction activities that could affect their property, business, or operations.

The majority of the Denbury pipeline construction process would be accomplished using conventional open-cut overland construction techniques for small-diameter pipelines. Conventional open-cut overland installation of pipeline is best represented as a moving assembly line with a construction spread (crew and equipment) proceeding along the construction ROW in a continuous operation. Construction at any single point along the pipeline, from ROW surveying and clearing to backfill and finish grading, will last several weeks. The entire process would be coordinated so as to limit the time of disturbance to an individual area, thereby minimizing the potential for erosion and the loss of normal use.

No new access roads would be required for installation or monitoring of the pipeline. Denbury proposes to access work areas where existing roads intersect the right-of-way. New above ground facilities associated with the Denbury pipeline would include a mainline valve and a new pig launcher and receiver.

A trench would be excavated using rotary wheel ditching machines, backhoes, or rippers for installation of the Denbury pipeline. The trench would be excavated to a depth (typically about 4 feet) that would allow space for the pipeline, pipeline bedding, and the minimum amount of top cover required by Department of Transportation (DOT) specifications. Topsoil would be separated in accordance with landowner agreements and any applicable federal, state, and local requirements.

Once installation and backfilling are completed and before the pipeline begins operation, the pipeline would be hydrostatically pressure tested in accordance with DOT safety standards (49 CFR Part 195) to verify its integrity. Hydrostatic testing consists of installing a hydrostatic test

cap and manifold, filling the pipeline with water, pressurizing the pipeline to establish its Maximum Operating Pressure (MAOP), and maintaining that test pressure for a specified period of time. Any leaks detected during the test would be repaired and the pipeline would be re-tested.

Following completion of backfilling the trench, all remaining trash, debris, surplus materials, and temporary structures would be removed from the ROW and disposed in accordance with applicable federal, state, and local regulations. All disturbed areas would have topsoil replaced, as applicable, and would be finish graded and restored as closely as possible to preconstruction contours and in accordance with the Alabama Handbook and as negotiated in the individual landowner easements.

Supply electric power to the injection point

Selective right-of-way clearing along an approximately a 2,600-foot and a 675-foot corridor for the delivery of electric power to the injection site and the characterization well would be required. Additional information on potential environmental impact resulting from such clearing is being prepared by ENTRIX, Inc. as part of a supplemental Environmental Information Volume (EIV).

Appendix C

Cultural Resources Literature Review and Survey Report

PHASE I CULTURAL RESOURCES SURVEY

OF SIX WELL SITES

SECARB TRACT

MOBILE COUNTY, ALABAMA

May 3, 2010

R.S. WEBB & ASSOCIATES
2800 Holly Springs Parkway, Suite 200
P.O. Drawer 1319
Holly Springs, Georgia 30142

Cultural resources survey of a 25% sample of a 593 acre development tract, Forsyth County, Georgia.

Archaeological data recovery at a development site on Skidaway Island, Chatham County, Georgia.

Archaeological survey of a portion of the Atlanta Historical Society Grounds, Fulton County, Georgia.

Cultural resources survey of a 130 acre residential/commercial development tract, Cobb County, Georgia.

Cultural resources survey of a 45 acre residential development tract, Gwinnett County, Georgia.

Cultural resources survey of a 1,000 acre residential/recreational development tract, Pickens County, Georgia.

Cultural resources survey of a 750 acre development tract for the proposed Atlanta Area National Cemetery, Cherokee County, Georgia.

Archeological testing of Sites 38JA232, 38JA233, and 38JA235, Cypress Harbour Subdivision, Jasper County, South Carolina.

Utilities

Archeological Data Recovery at a multi-component site in Fulton County, Georgia, prior to a sewer line installation.

Archeological survey of a five mile long, 185 feet wide, transmission line corridor, Jefferson County, Wisconsin.

Cultural resources survey of a sewer line corridor, Rabun County, Georgia.

Nine cultural resources surveys of transmission line corridors and/or substation sites for Oglethorpe Power Corporation, Carroll, Dawson, Elbert, Grady, Hancock, Lumpkin, Spalding, Washington, and Worth Counties, Georgia.

SELECTED ZOOARCHAEOLOGICAL STUDIES

Analysis of faunal remains from the Thornton Site, Jackson County, Illinois.

Analysis of faunal remains from House 4, Cahokia Mounds Site, St. Clair and Madison Counties, Illinois.

Analysis of faunal remains from Phase III Mitigation at the Galum Creek Site, Perry Co., Illinois.
Analysis of faunal remains from the Lightfoot Site, Perry County, Illinois.

Analysis of faunal remains from the New Massilon Site, Wayne County, Illinois.

Analysis of faunal remains from the Fitzgibbons Site, Gallatin County, Illinois.

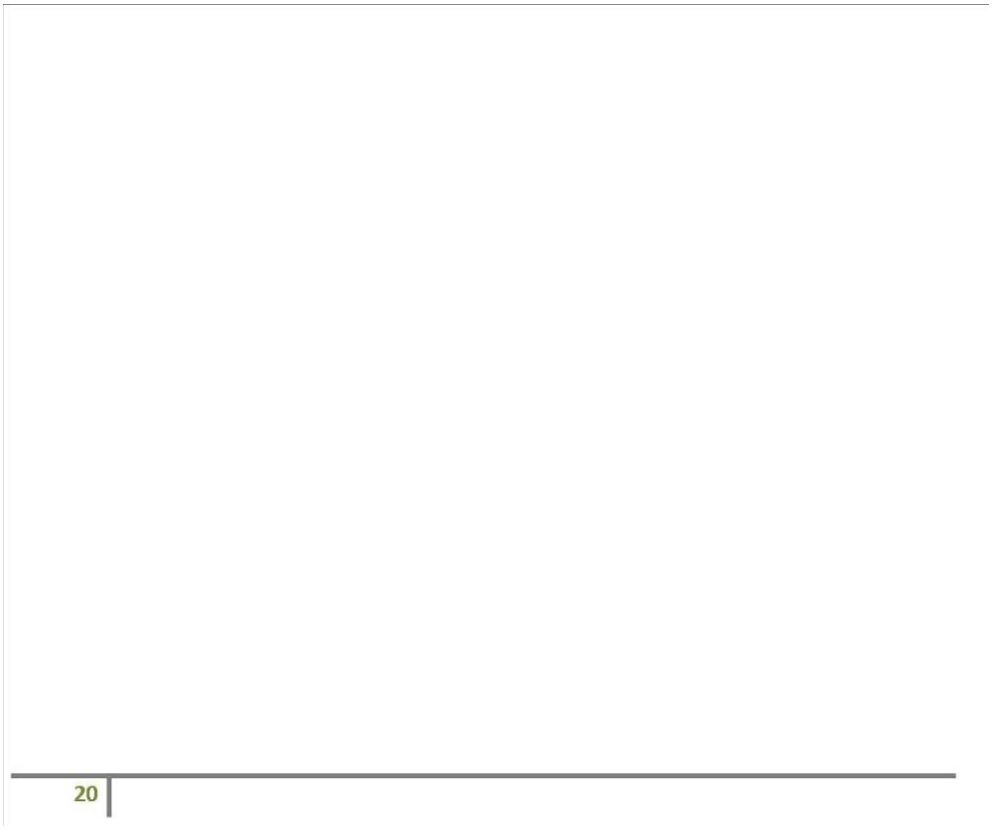
Analysis of faunal remains from the Kruse Bluffbase #3 Site, Monroe County, Illinois.

Analysis of faunal remains from the Bonnie Creek Site, Perry County, Illinois.

Analysis of faunal remains from archeological site testing at a pool raise project at Lake Red Rock, Iowa.

Analysis of freshwater mussels from the Boulder and Texas Sites, Clinton County, Illinois.

Analysis of freshwater mussels from the Great Salt Springs Site, Gallatin Co., Illinois.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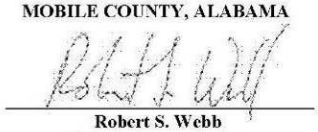
PHASE I CULTURAL RESOURCES SURVEY

OF SIX WELL SITES

SECARB TRACT

MOBILE COUNTY, ALABAMA



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R.S. Webb & Associates Project No. 09-198-010

May 3, 2010


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MANAGEMENT SUMMARY

Background

R.S. Webb & Associates conducted a Phase I cultural resources survey of six well sites within the 404-ha (1,000-acre) SECARB Project area located approximately 2.0 km east-southeast of Citronelle, Alabama. The survey was conducted to locate and delineate cultural resources within the six well sites and to assess cultural resource significance based on National Register of Historic Places (NRHP) eligibility criteria [36 CFR Part 60.4(a-d)].

Two of the well sites are abandoned (D9-7 and D9-9); each covers approximately 1.6 hectares (ha) (4-acres). Drilling of one new injection well is proposed at well D9-7. At well D9-9, one new site characterization well is proposed. In addition, four existing wells/well pads were visited during the current field survey; reconditioning is proposed for each of these wells (D9-11, D9-8, D4-14, and D4-13).

The literature review for the 404 ha SECARB Project area was conducted during July 22 through 29, 2009 (Webb 2009). The Phase I field survey was performed from April 13 though 15, 2010. The project was performed in compliance with Section 106 of the National Historic Preservation Act of 1966 as amended, and followed the guidelines presented in the Alabama Historical Commission's (AHC) *Policy for Archaeological Survey and Testing in Alabama* (adopted May 13, 1996, revised October 1, 2002).

Methodology

Literature Review: At the Alabama Archeological Site File in Moundville, the official archeological site files and maps were examined, along with a review of the pertinent site forms and manuscripts. At the AHC in Montgomery, pertinent Mobile County compliance document files, official maps, and NRHP/study list files were reviewed, as well as the Alabama Register of Landmarks and Heritage (ARLH) and the Mobile County historic structures survey files. Historic maps, historic photographs, and relevant documents were examined at the Alabama Department of Archives and History in Montgomery.

Phase I Cultural Resources Field Survey: The Project Archeologist performed an intensive archeological survey of the proposed injection well and the site characterization well sites. The Archeologist also evaluated the current condition of the four existing wells scheduled for reconditioning. Surface inspection and screened shovel testing techniques were used to search for archeological resources. Exposed surfaces within each study tract were inspected for artifacts and surface features. Subsurface techniques included the excavation of 30-by-30-centimeter (cm) screened shovel tests to sterile subsoil or to 100 cm below surface. Shovel test soils were screened through 0.64-cm hardware cloth to enhance artifact recovery. The shovel test profiles were inspected and soils data recorded. The injection and site characterization well sites were surveyed on transects spaced 30-m apart, with shovel tests excavated at 30-m intervals. Areas with standing water or slope greater than 20 percent were visually inspected, but not subject to subsurface testing. The four wells/pads to be reconditioned were found to exhibit significant ground disturbance and were evaluated by the excavation of two to three shovel tests and surface inspection of exposed areas.

Based on the nature of the proposed undertaking, the project Area of Potential Effects (APE) was set at 30 m beyond the boundary of each of the six study tracts. A visual scan was conducted of the APE to search for historic structures, landscapes, and other historic resources; none were observed.

Results

Literature Search: No properties listed on the NRHP or the ARLH are located within a 1.6 km radius of the 404-ha SECARB Project area. No previous cultural resources investigations have been performed within the same radius of this tract. Data from the Alabama Archeological Site File indicates there are no archeological sites located within or near the 404-ha SECARB site; nor are recorded cemeteries known to be present within the SECARB site. Two state-recognized historic structures (Structure Nos. 7585 and 7586) are located within 1.4 km of the SECARB tract.

No historic structures/features, archeological sites, or isolated finds were recorded during the field survey.

Management Recommendations

Based on the negative findings of the current survey, it does not appear that the proposed work at the six well sites will adversely affect cultural resources eligible or potentially eligible for the NRHP. For this reason, no additional cultural resources work is recommended for this undertaking.

1.0 INTRODUCTION

1.1 Project Purpose

R.S. Webb & Associates (RSWA) conducted a Phase I cultural resources survey of two abandoned well sites and four existing well sites within the 404-hectare (ha) [1,000-acre (ac)] SECARB Project area near Citronelle, Alabama. The purpose of the study was to determine if cultural resources (i.e., archeological sites, historic structures, and/or other areas of human activity that are more than 50 years old) are present within the project Area of Potential Effects (APE), and to assess resource significance based on the National Register of Historic Places (NRHP) criteria of evaluation [36 CFR Part 60.4].

1.2 Regulatory Information

This project requires federal oversight by the Department of Energy (DOE) and therefore must comply with the requirements stipulated under the DOE National Environmental Policy Act (NEPA) Implementing Procedures (10 Code of Federal Regulations [CFR] Part 1021), the National Historic Preservation Act (NHPA), and 36 CFR Part 800 (protection of historic properties).

1.3 Location and Description of the Project and Project Area of Potential Effects

The project area is located approximately 2.0 kilometers (km) east-southeast of Citronelle (Township 1N, Range 2W, Sections 4 and 9) in northern Mobile County, Alabama (Figure 1.1). The six study sites are within the Citronelle Oil Field on the U.S. Geologic Survey (USGS) 7.5 minute Citronelle East, Alabama topographic quadrangle (1982). The proposed installation and operation of the SECARB Project facilities within the Citronelle Oil Field will include:

- drilling one new injection well at an existing well pad (D9-7);
- drilling one new site characterization well at an existing well pad (D9-9); and
- reconditioning of four existing wells and well pads (D9-11, D9-8, D4-14, and D4-13) for project monitoring.

Drilling of the injection and characterization wells would encumber approximately 0.5 ha (1.2 ac) of land at each site. Land requirements for the drilling of new project wells would total approximately 0.9 ha (2.3 ac), which would include the expansion of existing well pads and the creation of temporary work areas. Each of these areas would be retained for use after well drilling is complete. Two 1.6-ha (4.0-acre) areas, one centered on the well pad at D9-7 and the other centered on the well pad at D9-9, were subjected to a full cultural resources field survey. These areas are larger than the actual disturbance footprints to allow flexibility when planning workspaces to minimize impacts to potentially sensitive resources. Retrofitting of existing wells (D4-13, D4-14, D9-8, and D9-11) for monitoring would require only lands at existing well

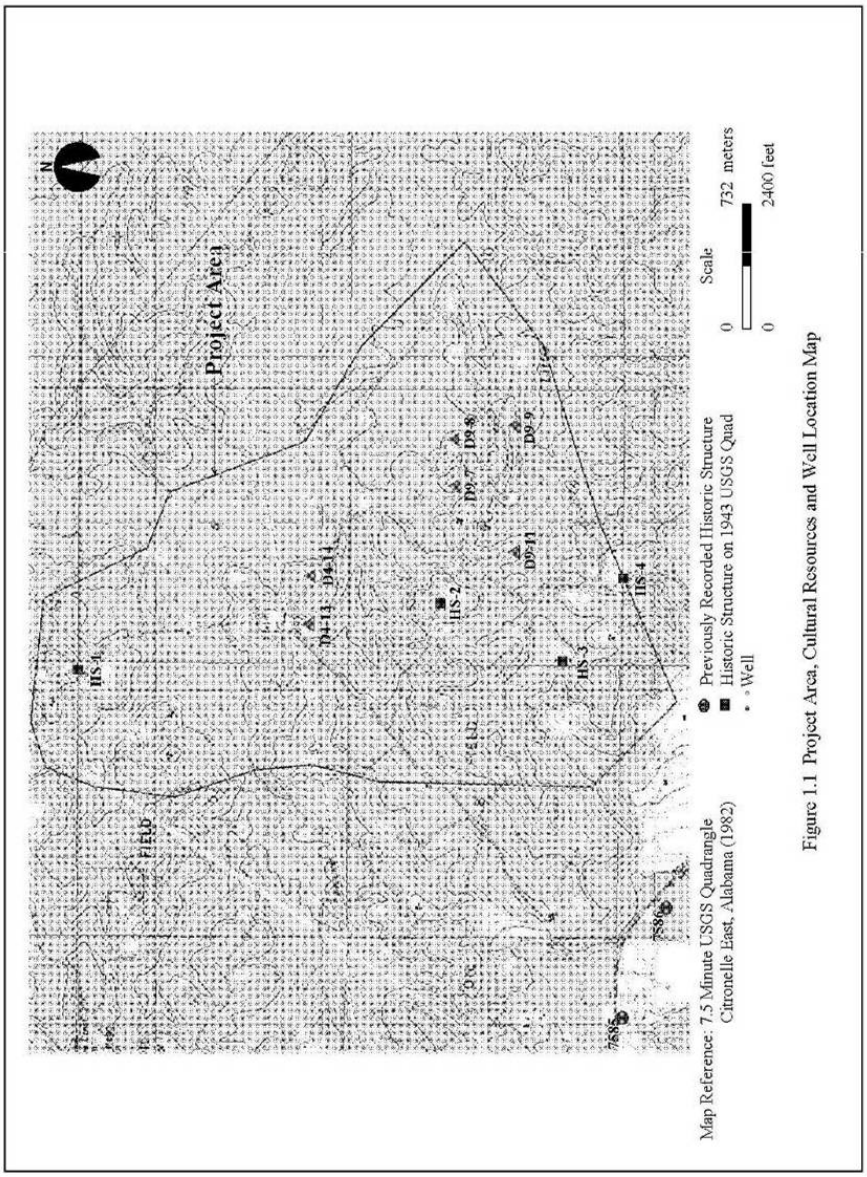

Figure 1.1 Project Area, Cultural Resources and Well Location Map

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pads that have previously been cleared of vegetation for Citronelle Oil Field operations. These sites were also surveyed for cultural resources; however, the level of intensity was limited due to the confinement of ground disturbances to previously cleared/disturbed areas.

Given the nature of the proposed undertaking, the project's Area of Potential Effects (APE) was set at 30 m beyond the boundary of each of the six study tracts. A visual scan was conducted of the APE to search for historic structures, landscapes, and other historic resources.

1.4 Scope-of-Work/Research Design

Mr. Steve Webb served as Principal Investigator for this project and supervised the various project tasks. A literature and records search for the 1,000-acre SECARB Project area was performed by Mr. Ken Styer (Senior Archeologist) during the period of July 22 through 29, 2009. Mr. Jonathan Bloom (Senior Archeologist) conducted the fieldwork from April 13 through 15, 2010, and authored the report. Ms. Jan Parrish-Jordan prepared the graphics, and Mr. Webb and Ms. Susan Wells edited the report; Ms. Wells produced the report. The resumes of Mr. Webb and Mr. Bloom are included in Appendix C.

The Phase I cultural resources survey was performed following guidance provided in the Alabama Historical Commission's (AHC) *Policy for Archaeological Survey and Testing in Alabama* (adopted May 13, 1996, revised October 1, 2002). The literature and records search was conducted at the AHC, the Alabama Department of Archives and History (ADAH), and the Office of Archaeological Research (OAR). Field survey techniques were employed at a level typically considered adequate for detecting archeological resources and historic architecture in the upper East Gulf Coastal Plain. The Project Archeologist (Mr. Bloom) used systematic screened shovel testing at 30-m intervals, systematic surface inspection techniques, and scanned the landscape adjacent to the project area to search for standing historic architecture/structures. At the R.S. Webb & Associates office in Holly Springs, Georgia, field data were transcribed and methodological approaches, findings, conclusions, and recommendations were compiled for presentation in this report.

2.0 LITERATURE AND RECORDS RESEARCH

2.1 Literature and Records Search Results

A literature and records search was conducted for the entire 404-ha SECARB Project area (Figure 2.1). This tract contains the six well sites investigated during the current study.

Previous Cultural Resources Studies: No previous cultural resources investigations have been performed within a 1.6 km (1.0-mile) radius of the current undertaking property.

National Register of Historic Places: The files at the AHC revealed that no NRHP-listed properties are located within 1.6 km of the project area.

Alabama Register of Landmarks and Heritage: No properties listed on the ARLH are within a 1.6-km radius of the study tract.

Recorded Archeological Resources: A site file search was conducted by the staff at the Alabama Archeological Site File. Review of official maps and files revealed that no recorded archeological sites are located within or near the project area. The closest site, 1MB139, is approximately 1.6 km west of the project area. Based on site form data, 1MB139, may be a 20th century isolated artifact find (i.e., one piece of ironstone) rather than an archeological site. As part of the file search, Site File personnel provided a base line assessment of the study tract based on data at this facility. That assessment is attached (Appendix B) and states that there are varying probabilities for different types of archeological sites (i.e., prehistoric, historic Native American, and historic Euro/African American) being present within the project area. The assessment suggests a moderate to high probability for prehistoric sites and a low to moderate probability for historic Native American and historic Euro/African American sites.

Cemeteries: No recorded cemeteries are known to be within the 404-ha SECARB Project area. No cemetery symbols were noted on the historic maps reviewed during the current study. Though no cemeteries are known to be present, there is always the possibility of unrecorded or unmarked cemeteries being present within a tract as large as the current project area.

Mobile County Historic Structures Survey: Historic structure files at the AHC revealed that there are two recorded historic structures (Structure Nos. 7585 and 7586) within 1.6 km of the project area (Figures 1.1 and 2.1). Structure No. 7585 is located approximately 1,390 m southwest of the project area and is a two story, traditional vernacular structure south of Celeste Road. This structure, built in 1939, was recommended ineligible for the NRHP. Structure No. 7586, built in 1949, is on the southwest side of Celeste Road

Figure 2.1 Aerial Photograph (Virtual Earth) Showing Locations of Historic Structures on 1943 Quad Map

approximately 840 m southwest of the project area; it is a one and a half story traditional vernacular structure and was recommended ineligible for the NRHP.

Historic Structures or Features on Historic Maps and Aerial Photographs: A number of historic maps were examined during this investigation including: the 1895 Alabama Township/Section map; 1911 U.S. Department of Agriculture Soil Map; 1943 Citronelle 15-minute USGS quadrangle; and Highway Maps from 1937, 1955, 1962, 1966, 1982, and 2000.

The 1943 quad map is the earliest map showing roads and structures within the project area; four structures were within the project area at that time (HS-1, HS-2, HS-3, and HS-4, Figures 1.1, 2.1 and 2.2). The 1943 road system exhibits the rudiments of the modern transportation network as shown on the 1982 7.5-minute quad (Figure 1.1). None of the 1943 roads appear on state highway maps until 1966, suggesting that these roads may not have been county- or state-maintained until the 1960s. Between the 1960s and 1982, when the Citronelle East USGS quad was issued, this road system was extended to access oil wells. A variety of structures were built along the primary roads during this period. The primary importance of this observation is that there is a reasonable probability that structures and/or industrial features (e.g., oil wells and associated facilities) within and near the project area were constructed within the last 50 years.

No historic aerial photography was available for the project area at the State Archives. Reviewing post-2005 Google Earth aerial photography (Figure 2.2), an "old house" vegetation signature is present at the location of HS-4. No such signatures could be discerned at the locations of HS-1, HS-2, or HS-3.

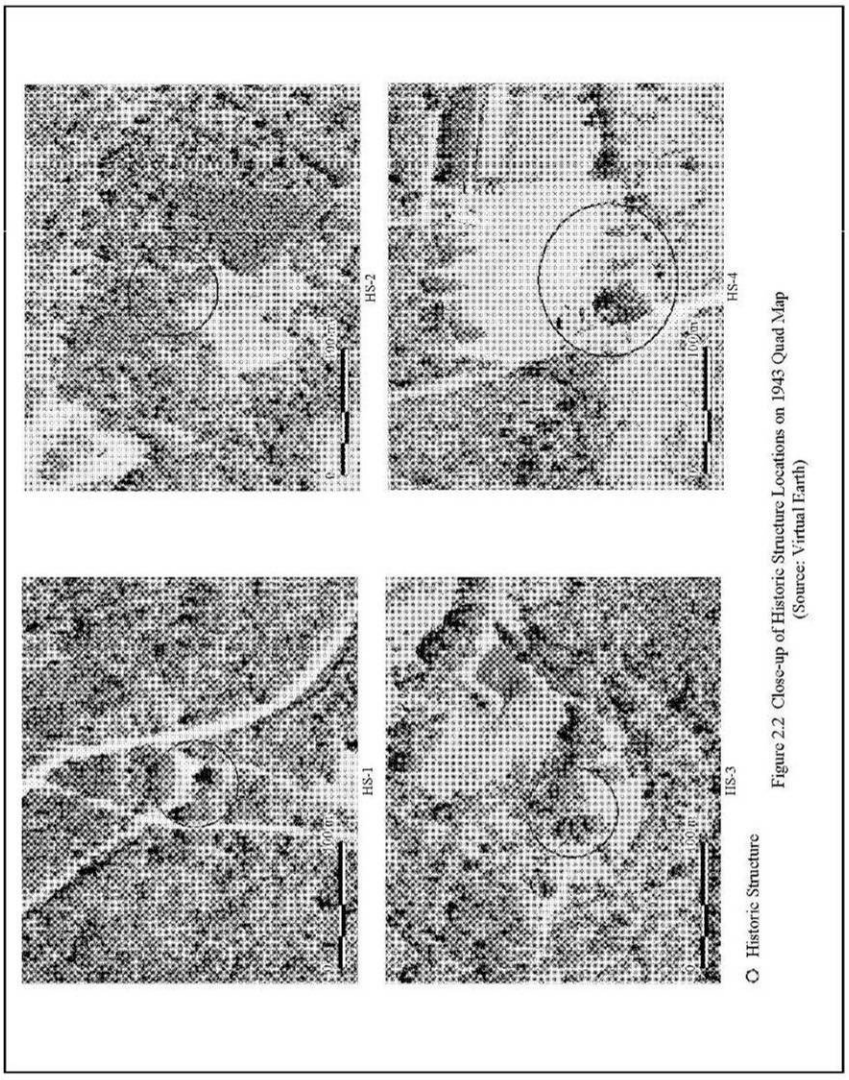

Figure 2.2 Close-up of Historic Structure Locations on 1943 Quad Map
(Source: Virtual Earth)

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3.0 FIELD METHODOLOGY

3.1 Field Personnel

Mr. Jonathan Bloom was the Field Director for this survey; he has more than 15 years of experience conducting archeological survey, testing, and data recovery projects in the Southeast, and an additional ten years of experience in the Midwest and Northeastern United States.

3.2 Physical Nature of the Project Area

The current undertaking includes six well pad sites. These well pads are on low sand ridges supported by a sandy clay or clay subsoil. They overlook the floodplains of Little Creek to the south and one of it's tributaries to the northeast and northwest. The cleared well pads are partially grassed over. Vegetation adjacent to the pads includes longleaf pine, magnolia, oaks, cedar, and occasionally American river cane; there was often a dense undergrowth of privet-like brush and vines. None of the trees observed appear to be greater than approximately 40 years old, indicating that this property was clear of vegetation during the middle 20th century.

3.3 Survey Techniques

Transect and Shovel Test Intervals: At well pads D9-7 and D9-9, shovel tests were excavated at 30-m intervals along transects (four transects at D9-7 and six transects at D9-9) spaced 30-m apart; as a result, 18 shovel tests were excavated at D9-7 and 16 shovel tests were excavated at D9-9. To evaluate Well Pads D9-8, D9-11, and D4-13, two shovel tests were excavated at each site; similarly, three shovel tests were excavated at D4-14. Shovel test locations plotted on USGS quad maps and aerial photographs are provided in Section 4.0.

Subsurface Testing: Subsurface techniques included the excavation of 30-by-30-centimeter (cm) screened shovel tests to 100 cm or sterile subsoil. These tests were excavated at 30-m intervals, avoiding slope greater than 20 percent and standing water. Shovel test transects and shovel test locations were marked on project maps. Shovel test soils were screened through 0.64-cm hardware cloth to facilitate artifact recovery. Each profile was cleaned and examined; soil texture, color, and depth of deposits were then recorded.

Surface Inspections: Exposed surfaces within each well site were inspected for artifacts and surface features. Typically, only the cleared well pads provided surface visibility.

Landscape Scanning: Visual scanning of the landscapes surrounding the study areas was important in determining the potential presence of historic structures or archeological sites with surface indications. The

Project Archeologist looked for vegetation patterns, surface artifacts, pits and/or stone/brick arrangements indicative of house sites, dumps, liquor stills, cemeteries, Civil War features, and similar sites with surface indications.

Viewshed: The viewshed at each well was photographed. No historic structures, landscapes, or other historic resources were observed, so no methodological discussion of historic resources recordation is warranted.

4.0 FIELD SURVEY RESULTS

4.1 Archeological Field Survey

A total of 43 shovel tests were excavated at the six well sites included in the current study. The soil descriptions for each shovel test are presented in Appendix A. The surveys of well pads D9-7 and D9-9 are discussed first, followed by the evaluations of well pads D9-8, D9-11, D4-13, and D-4-14.

4.1.1 Well Pad D9-7

Well pad D9-7 is located on a ridge spur in the southeastern part of the SECARB tract (Figure 1.1). Eighteen shovel tests were excavated at this well pad (Figures 4.1 and 4.2; Appendix A). Six shovel tests (T-1/2, T-2/3, T-3/2, T-3/3, T-3/4, and T-4/3) were excavated within or on the edge of disturbed areas and contained compacted mixed clays and sandy clay fill from well pad construction; these conditions precluded hand excavation deeper than 20 to 30 cm in most cases. Three shovel tests (T-1/3, T-1/4, and T-1/5) were excavated on the side-slope west of the well pad and encountered hydric soils at depths varying from 6 to 20 cm; hydric soils indicate recurring saturation or former wetland conditions. Hydric soils at these locations were characterized by gray to dark gray loamy sand with and without mineral staining, or dark gray fine sandy silty clay. Shovel Tests T-2/1, T-2/2 , T-2/5, and T-3/5 showed minimal disturbances, and terminated in the yellowish-red clay or sandy clay subsoil that was detected at depths varying from 28 to 60 cm. T-2/1 may have sampled the least disturbed location; this shovel test profile displayed 0 to 28 cm of grayish-brown sandy loam, over 20 cm yellowish-brown loamy sand, over 32 cm yellowish-brown clayey sand that graded into a light yellowish-red sandy clay. The remaining shovel tests showed various levels of disturbance. For example, Shovel Test T-4/2 exposed 0 to 12 cm of very dark brown silty loam, over 38 cm of mixed brown and yellowish-brown loamy sand, over 10 cm of compact yellowish-red and gray sandy clay. No historic structures/features, archeological sites, or isolated artifact finds were detected in the 1.6 ha tract centered on well pad D9-7.

4.1.2 Well Pad D9-9

Well pad D9-9 is located on a ridge in the southeastern part of the SECARB tract (Figure 1.1). Seventeen shovel tests were excavated at D9-9 (Figures 4.3 and 4.4; Appendix A). Two shovel tests (T-1/2 and 1/3) excavated in the previously disturbed part of the study tract encountered very compact, mixed sandy clays from well pad construction that precluded hand excavation deeper than 10 cm. Five shovel tests (T-1/5, 2/4, 2/5, 3/3, and 3/4) on the ridge overlooking the well pad sampled undisturbed soils with 15 cm of dark brown sandy loam over 85 cm of yellowish-brown to strong brown loamy sand. Soil profiles were variable along the south ridge slope, but the yellowish-red sandy clay subsoil was typically encountered no deeper than 35 cm. One shovel test (T-5/4) on this slope was anomalous, revealing 0 to 18 cm gray sandy loam, over 22 cm

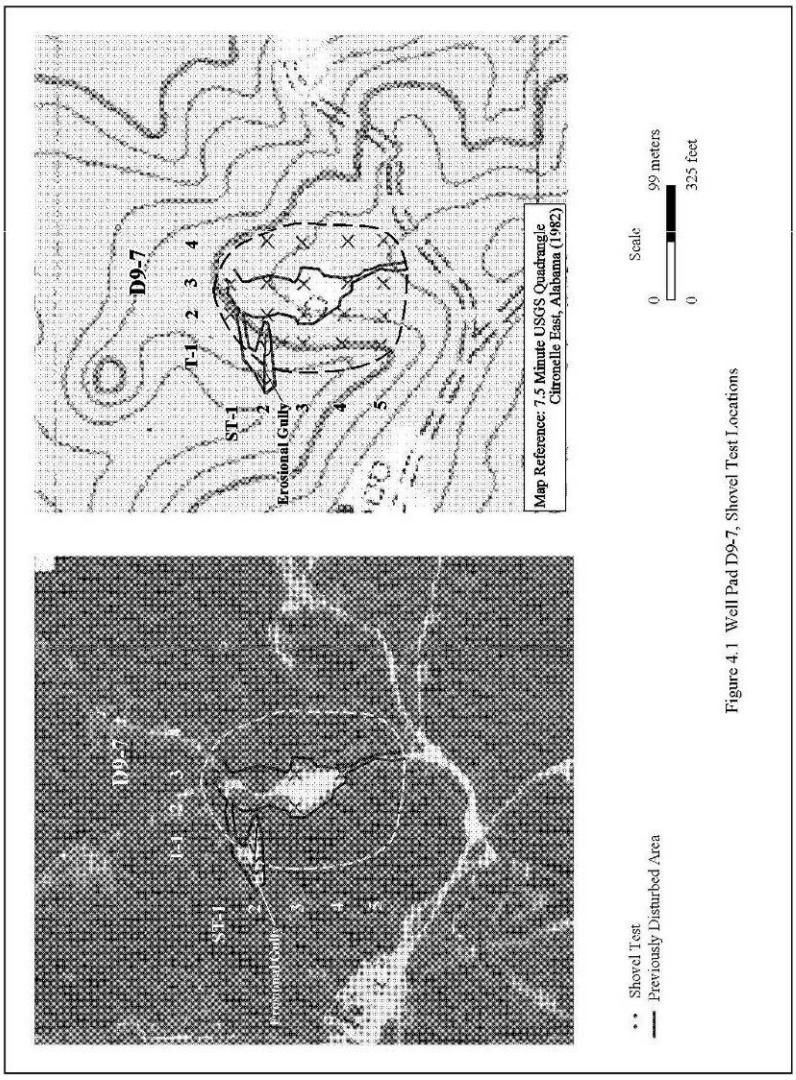
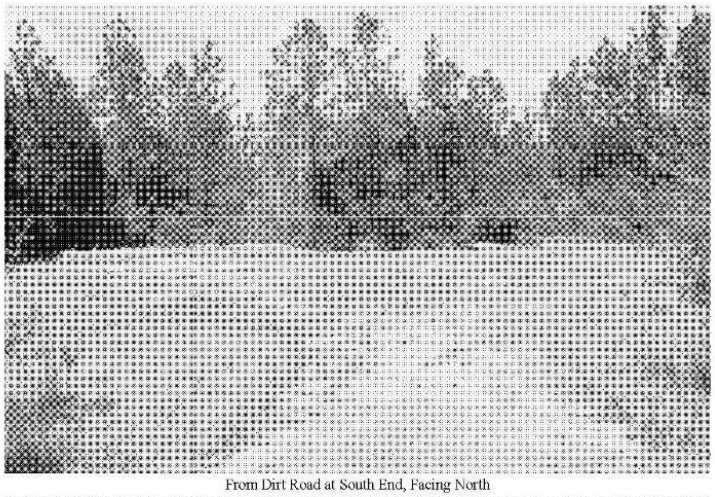
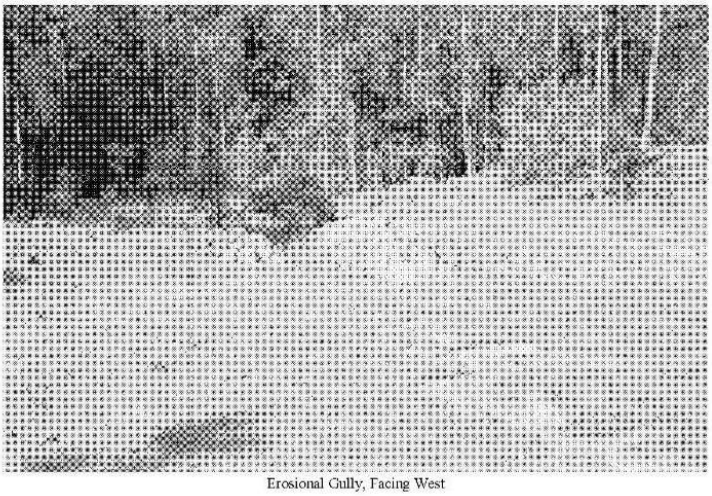


Figure 4.1 Well Pad D9-7, Shovel Test Locations



From Dirt Road at South End, Facing North



Erosional Gully, Facing West

Figure 4.2 Selected Views of D9-7

12

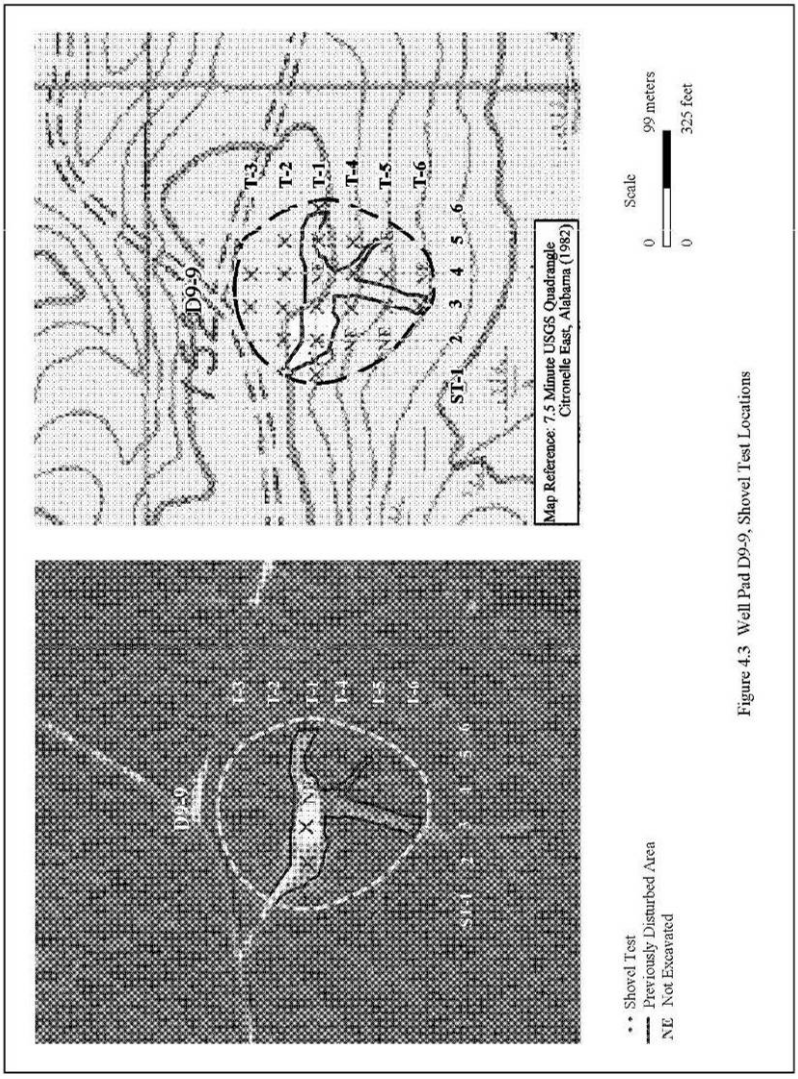
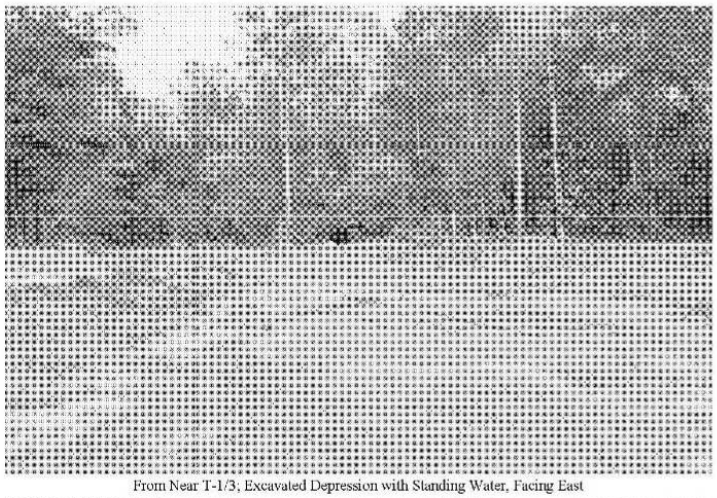
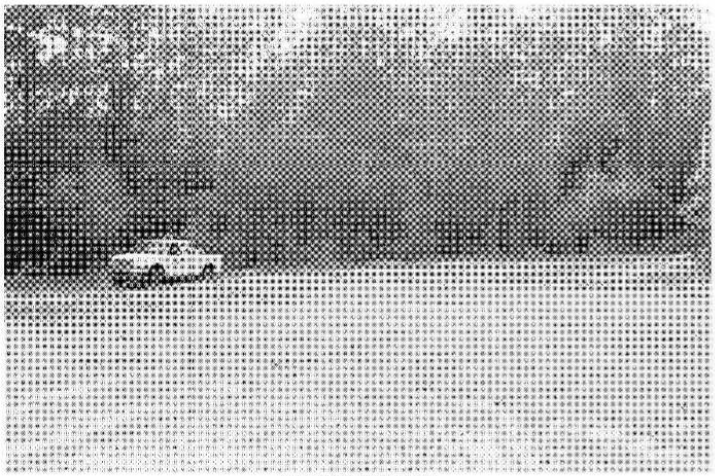


Figure 4.3 Well Pad D9-9, Shovel Test Locations



From Near T-1/3; Excavated Depression with Standing Water, Facing East



From T-1/3, Facing West

Figure 4.4 Selected Views of D9-9

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yellowish-brown loamy sand, over 60 cm of light yellowish-brown loamy sand. No historic structures/ features, archeological sites, or isolated artifact finds were detected in the 1.6-ha tract centered on well pad D9-9.

4.1.3 Well Pad D9-8

Well pad D9-8 is located on a level slope base abutting the Little Creek swamp in the southeastern part of the SECARB tract (Figure 1.1). Two shovel tests were used to evaluate well pad D9-8 (Figures 4.5 and 4.6; Appendix A). Both shovel tests encountered compact fill deposits. Shovel test T-1/1 was excavated 15 m west of the well and encountered 20 cm of mixed loamy sands over very compact grayish-brown sandy clay that limited hand excavation to a depth of 28 cm. Shovel test T1/2 was located 15 m east of the well and encountered 60 cm of mixed fill deposits including strong brown loamy sand, dark brown sandy loam, gray clay, and yellowish-red sandy clay, that became increasingly more compact with depth. Well pad D9-8 has been graded and filled with sediments suitable to support drilling machinery; no cultural resources were recorded or observed at well pad D9-8.

4.1.4 Well Pad D9-11

Well pad D9-11 is located on a ridge spur in the south central portion of the SECARB tract (Figure 1.1). Two shovel tests were excavated to evaluated this well pad (Figures 4.7 and 4.8; Appendix A). Shovel Test T-1/1 was placed 15 m west of the well, and about 10 m east of the steep slope approaching the swamp; 20 cm of very compact yellowish-red sandy clays were encountered. Shovel Test T-1/2 was 15 m east of the well, at the south edge of a wooded island within the well pad area. The soil profile revealed 20 cm of compacted yellowish-brown, yellowish-red, and strong brown loamy sands and clay loams, over 10 cm of very compact light gray, very dark grayish-brown, and strong brown sandy clays. The clays in these two shovel tests were too compact for hand excavation. This pad has been graded and filled with sediments suitable to support drilling machinery; no cultural resources were located at well pad D9-11.

4.1.5 Well Pad D4-13

Well pad D4-13 is located on a fairly prominent ridge end in the central part of the SECARB tract (Figure 1.1). Two shovel tests were excavated at D4-13 (Figures 4.9 and 4.10; Appendix A). Shovel test T-1/1 was excavated 30 m east of the well, and exposed 8 cm of yellowish-red clay, over 4 cm of dark brown loamy sand, over 13 cm of banded light yellowish-brown and yellowish-brown loamy sands, over 3 cm of very compact light gray and yellowish-red sandy clays. Shovel Test T-2/1 was placed 30 m south of the well and revealed 15 cm of yellowish-red sandy clay, over 10 cm of pale yellow loamy sand, over 20 cm of compact yellowish-red sandy clay. The area at the north end of the well pad has been cut and graded where the access

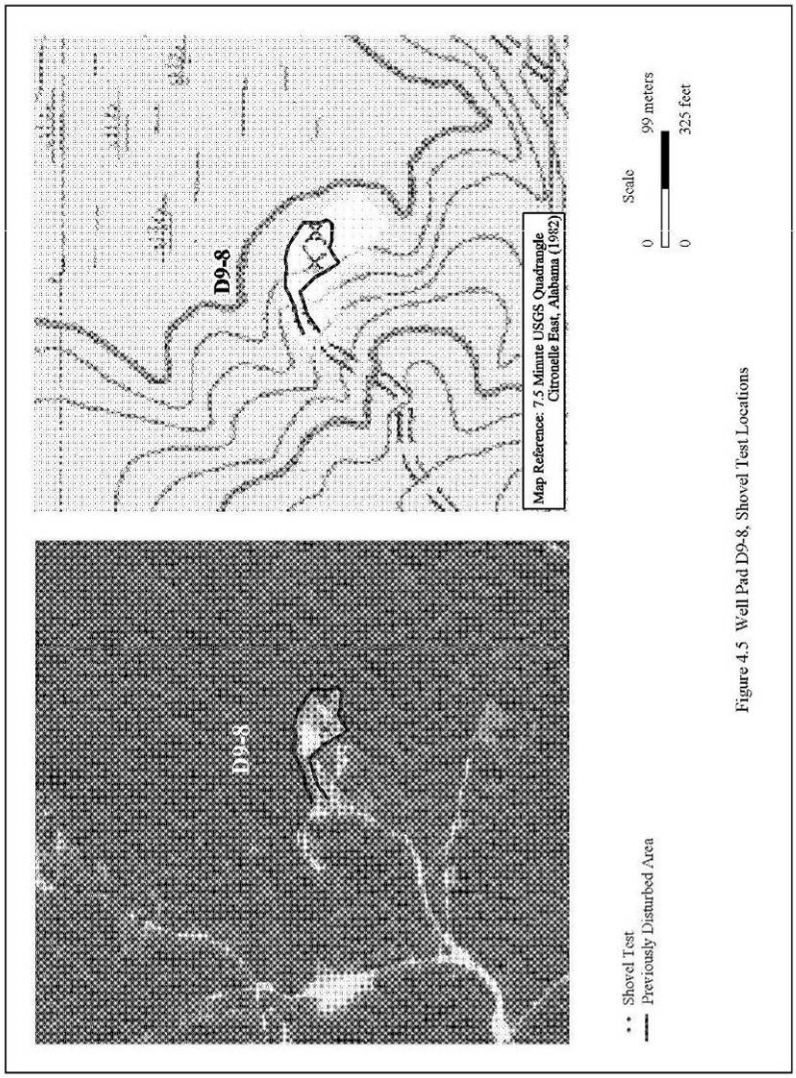
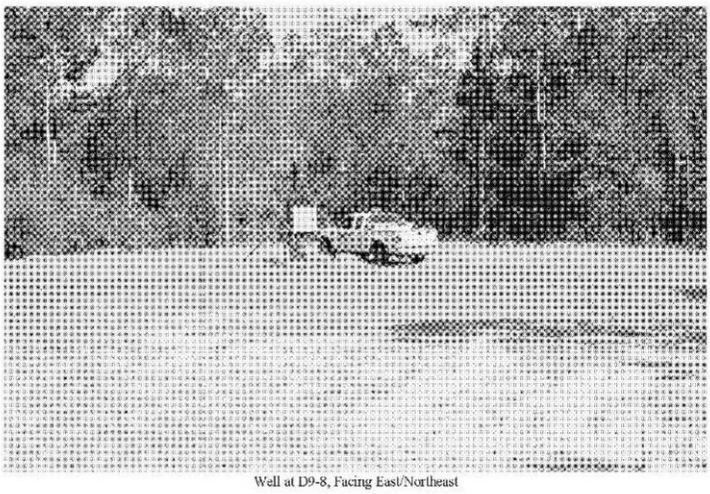


Figure 4.5 Well Pad D9-8, Shovel Test Locations



Well at D9-8, Facing East/Northeast

Figure 4.6 Selected View of D9-8

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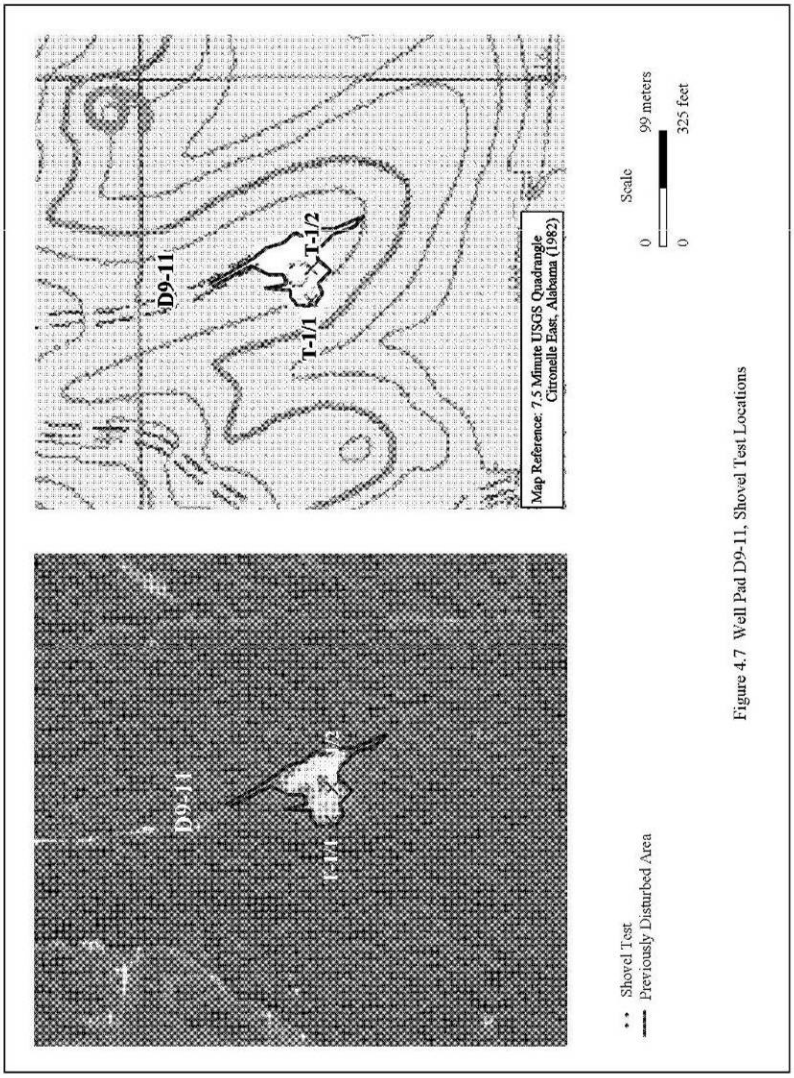
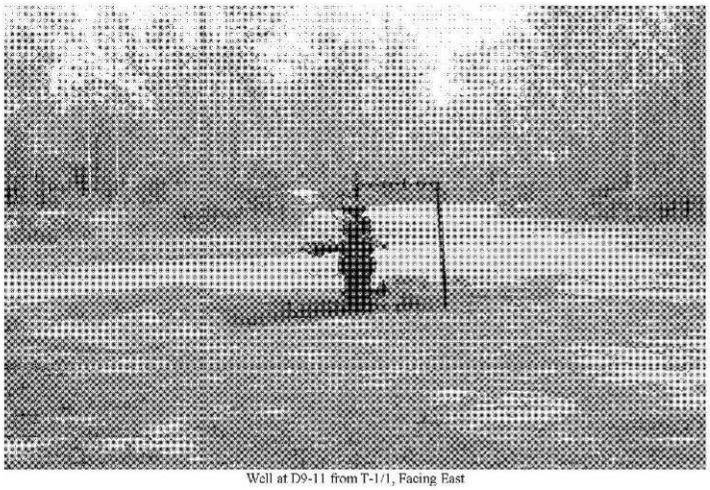


Figure 4.7 Well Pad D9-11, Shovel Test Locations



Well at D9-11 from T-1/1, Facing East

Figure 4.8 View of D9-11

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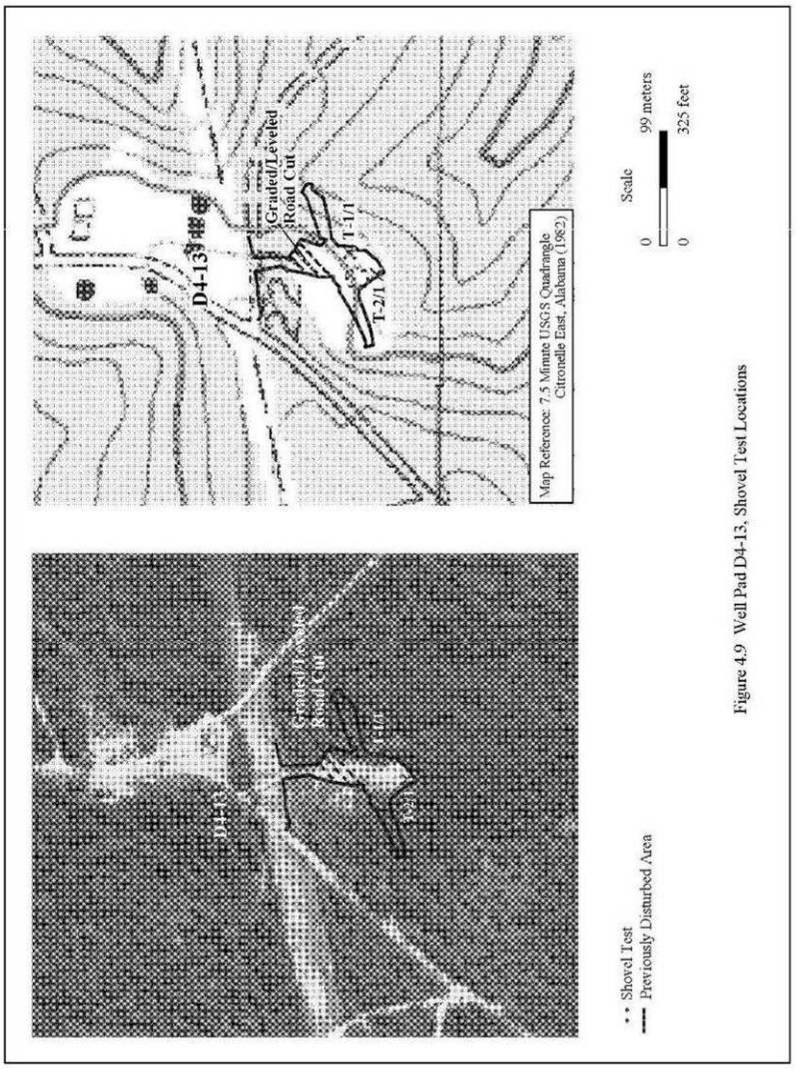
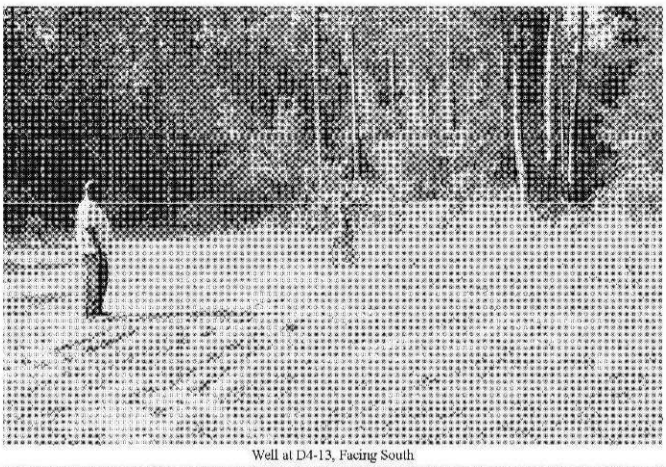
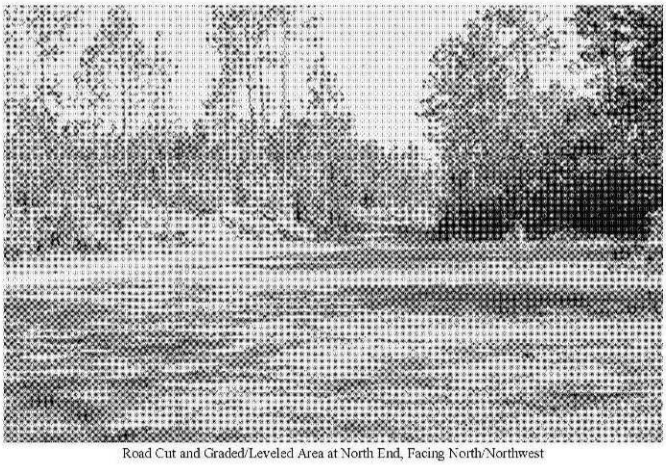


Figure 4.9 Well Pad D4-13, Shovel Test Locations



Well at D4-13, Facing South



Road Cut and Graded/Leveled Area at North End, Facing North/Northwest

Figure 4.10 Views of D4-13

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road enters the work area (Figure 4.10). This pad has been graded and filled to accommodate drilling machinery; no cultural resources were located at well pad D4-13.

4.1.6 Well Pad D4-14

Well pad D4-14 is situated on a ridge spur in the central portion of the SECARB tract (Figure 1.1). Three shovel tests were used to evaluate D4-14 (Figures 4.11 and 4.12; Appendix A). Shovel Test T-1/1 was 30 m west of the well and 4 m northeast of the stacked concrete pads (Figure 4.12). The soil profile consisted of 0 to 12 cm yellowish-brown sandy loam, over 10 cm of light grayish-brown loamy sand, over 13 cm of dark brown loamy sand, over 20 cm of yellowish-brown loamy sand, over 10 cm of yellowish-red sandy clay. The upper 35 cm of deposits appear to be layers of fill. Shovel Test T-2/1 was placed 15 m south of the well; the soil profile revealed 0 to 12 cm of dark yellowish-brown loamy sand, over 58 cm of yellowish-brown loamy sand with some yellowish-red mottling and dark gray root disturbances, over at least 30 cm of dark gray loamy sand. Shovel Test T-2/2 was placed 15 m north of the well, and sampled heavily stratified deposits: 0-10 cm of very dark brown silty loam, over 15 cm of dark yellowish-brown loamy sand with red clay inclusions, over 10 cm of banded brown and grayish-brown loamy sand, over 5 cm of yellowish-red loamy sand, over 8 cm of light gray and grayish-brown loamy sand, over 52 cm of light yellowish-brown loamy sand. The upper 48 cm appear to be layers of fill. Well Pad D4-14 revealed episodes of loamy sand fill deposition for well pad construction, but lacked the clay component noted at the other five well pads. No cultural resources were detected at Well Pad D4-14.

4.2 Historic Resources Survey and Viewshed Analysis

4.2.1 Historic Resources Survey

No historic resources (i.e., standing architecture, other structures or above-ground features that are 50 or more years old) were observed during the current field survey

4.2.2 Viewshed Analysis

The viewsheds for each well pad are shown in Figures 2.1, 4.1, 4.3, 4.5, 4.7, 4.9, and 4.11 (Google Earth aerial photography). The proposed well site undertakings will have no adverse effect on historic resources because no such resources are present within the project APE.

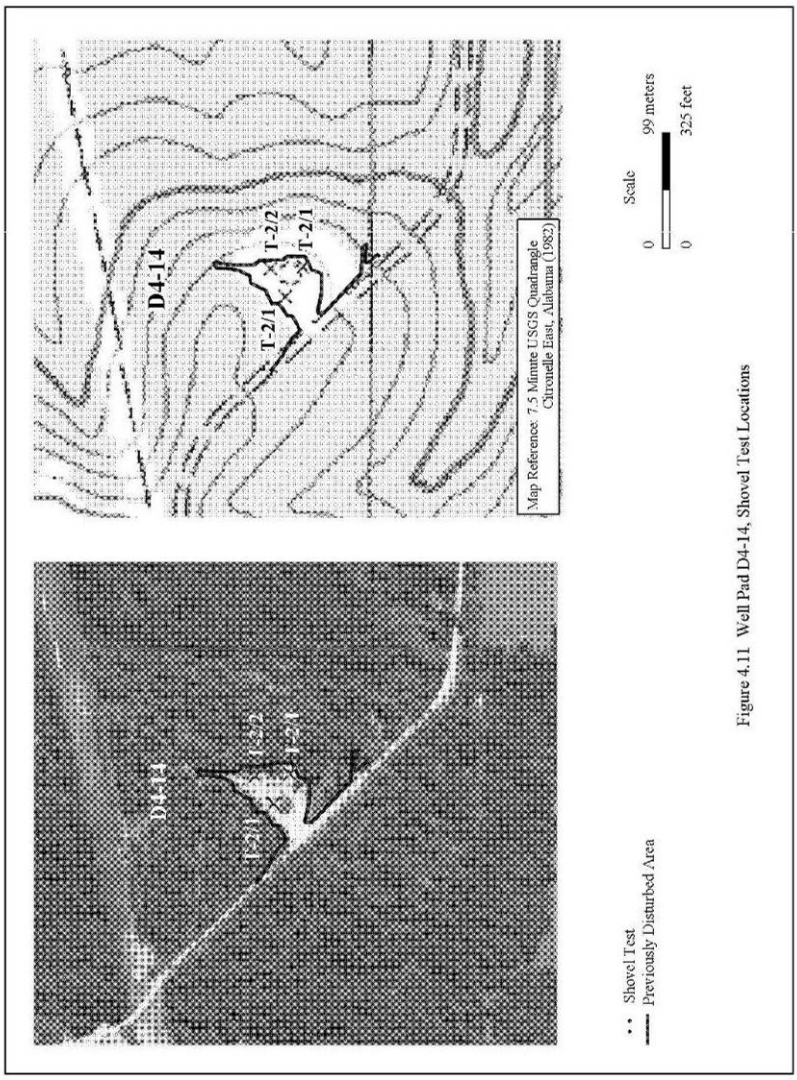
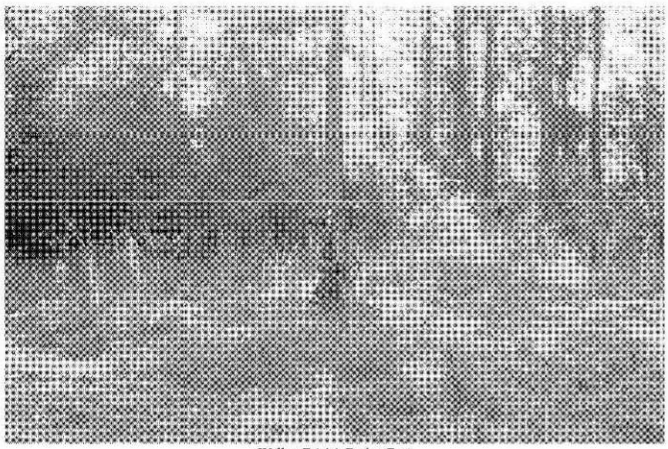
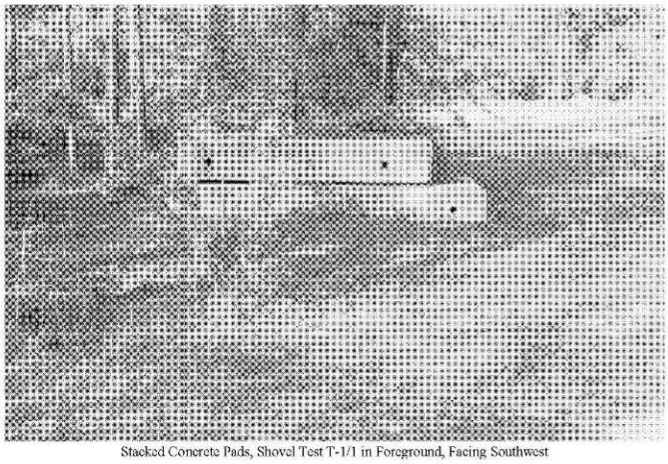


Figure 4.11 Well Pad D4-14, Shovel Test Locations



Well at D4-14, Facing East



Stacked Concrete Pads, Shovel Test T-1/1 in Foreground, Facing Southwest

Figure 4.12 Selected Views of D4-14

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5.0 SUMMARY AND RECOMMENDATIONS

5.1 Summary

A cultural resources survey was completed for six well pads (D9-7, D9-9, D9-8, D9-11, D4-13, and D4-14) in the Citronelle Oil Field. The literature and records search found no recorded archeological sites or historic structures on or adjacent to the six study sites. The field survey found that the study tracts are largely disturbed by grading and filling for well pad construction, logging activities, and associated erosion. No historic structures/features, archeological sites, or isolated artifact finds were recorded during this survey.

5.2 Recommendations

Based on the negative findings of the current survey, it does not appear that work proposed at the six well sites will adversely affect cultural resources eligible or potentially eligible for the NRHP. For this reason, no additional cultural resources work is recommended for this undertaking.

BIBLIOGRAPHY

Webb, R.S.
2009 Letter of Findings: Cultural Resources Literature Review, SECARB Phase III Tract, Mobile County, Alabama. Letter report on file at R.S. Webb & Associates, Holly Springs, GA.

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APPENDIX A - SHOVEL TEST SOIL DATA

A-1

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Appendix A - Shovel Test Soil Data

Well No.	Transect/ Shovel Test	Soil Descriptions
D-4-13	T-1/1	0-8 cm yellowish-red clay, 8-12 cm dark brown loamy sand, 12 to 25 cm banded light yellowish-brown and yellowish-brown loamy sands, 25 to 28 cm very compact light gray and yellowish-red sandy clay fill.
	T-2/1	0-15 cm yellowish-red sandy clay, 15-25 cm pale yellow loamy sand, 25-45 cm compact yellowish-red sandy clay (possibly all fill).
D-4-14	T-1/1	0-12 cm yellowish-brown sandy loam, 12-22 cm light grayish-brown loamy sand, 22-35 cm dark brown loamy sand (fill), 35-55 cm yellowish-brown loamy sand, 55-65 cm yellowish red sandy clay.
	T-2/1	0-12 cm dark yellowish-brown loamy sand, 12-70 cm yellowish-brown loamy sand
		with some yellowish-red mottling and dark gray bioturbation.
	T-2/2	0-10 cm very dark brown silty loam, 10-25 cm dark yellowish-brown loamy sand with red clay inclusions, 25-35 cm banded brown and grayish-brown loamy sands, 35-40 48-100 cm light yellowish-brown loamy sand.
		red clay inclusions, 25-35 cm banded brown and grayish-brown loamy sands, 35-40
D-9-7	T-1/1	Not Excavated - outside of project boundary as provided.
	T-1/2	0-16 cm light brown and light reddish-brown silt with fragments of ferrous sandstone, 16-26 cm compact gray and yellowish-red clays.
	T-1/3	0-6 cm mixed gray and yellowish-red clays, 6-30 cm gray loamy sand with yellowish-red mineral staining (hydric).
	T-1/4	0-12 cm brown sandy clay loam, 12-40 cm very dark gray fine sandy silty clay (hydric).
	T-1/5	0-20 cm mixed brown sandy silty clay, 20-40 cm dark gray loamy wet sand (hydric).
	T-2/1	0-28 cm dark grayish-brown sandy loam, 28-48 cm yellowish-brown loamy sand, 48-80 cm yellowish-brown clayey sand grading to light yellowish-red sandy clay.
	T-2/2	0-6 cm mixed brown and gray sand and clay fill, 6-16 cm very dark brown sandy loam, 16-28 cm dark yellowish-brown loamy sand, 28-36 cm yellowish-red clay.
	T-2/3	0-6 cm brown sandy loam, 6-50 cm mixed light gray and yellowish-red clay fill that is more compact at 50 cm.
	T-2/4	0-8 cm brown sandy clay loam, 8-18 cm compact yellowish-red and gray clay fill.
	T-2/5	0-22 cm mixed sandy clay fill, 22-60 cm yellowish-brown sand mottled with dark brown loamy sand (bioturbation), 60-65 cm yellowish-red clay.
	T-3/1	0-15 cm brown sandy loam, 15-28 cm reddish-yellow sandy clay.
	T-3/2	0-30 cm compact brown and yellowish-red sandy clay loam and clay fill.
	T-3/3	0-10 cm yellowish-brown loamy sand, 10-20 cm very compact very dark brown and
		reddish-brown sandy clay fill.
	T-3/4	0-30 cm compact mixed brown, yellowish-red, and gray sand and sandy clay.
	T-3/5	0-12 cm brown sandy loam, 12-30 cm yellowish-brown loamy sand, 30-40 cm yellowish-red clayey sand.
	T-4/1	Not Excavated - outside of project boundary as provided.
	T-4/2	0-12 cm very dark brown silty loam, 12-50 cm mixed brown and yellowish-brown loamy sand, 50-60 cm compact yellowish-red and gray sandy clay fill.
	T-4/3	0-20 cm compact mixed yellowish-red and gray clay fill.
	T-4/4	0-70 cm mixed yellowish-brown and yellowish-red loamy sand (possibly all fill).
	T-4/5	0-7 cm yellowish-brown and grayish-brown sandy loam, 7-22 cm heavily mixed light yellowish-brown and grayish-brown loamy clay sand, 22-32 cm light yellowish-red sandy clay.
D-9-8	T-1/1	0-20 cm mixed yellowish-brown, gray, and yellowish-red loamy sands;
		20-28 cm very compact grayish-brown sandy clay.
	T-1/2	0-60 cm mixed strong brown loamy sand, dark brown sandy loam, gray clay, and yellowish-red sandy clay.
D-9-9	T-1/1	0-8 cm dark brown sandy loam, 8-28 cm yellowish-red loamy sand, 28-72 cm yellowish-brown loamy sand, 72-76 cm very dark brown loamy sand, 76-100 cm
	T-1/2	0-10 cm very compact mixed yellowish-brown, yellowish-red, and brownish-red sandy clay fill.
		sandy clay fill.

Well No.	Transect/ Shovel Test	Soil Descriptions
	T-1/3	0-10 cm very compact mixed yellowish-brown, yellowish-red, and brownish-red sandy clay fill.
	T-1/4	Not Excavated - In excavated depression with standing water.
	T-1/5	0-15 cm dark brown sandy loam, 15-100 cm yellowish-brown loamy sand.
	T-1/6	0-15 cm dark brown sandy loam, 15-100 cm strong brown loamy sand.
	T-2/1	Not Excavated - outside of project boundary as provided.
	T2/2	0-30 cm yellowish-red loamy sand, 30-35 cm very compact yellowish-red loamy sand and sandy clay fill.
	T-2/3	0-70 cm yellowish-brown loamy sand; became very compact at 70 cm.
	T-2/4	0-15 cm dark brown sandy loam, 15-100 cm strong brown loamy sand.
	T-2/5	0-16 cm dark brown sandy loam, 16-100 cm strong brown loamy sand.
	T-2/6	Not Excavated - outside of project boundary as provided.
	T-3/1	Not Excavated - outside of project boundary as provided.
	T-3/2	Not Excavated - outside of project boundary as provided.
	T-3/3	0-15 cm dark brown sandy loam, 15-100 cm dark yellowish-brown loamy sand.
	T-3/4	0-15 cm dark brown sandy loam, 15-100 cm strong brown loamy sand.
	T-3/5	Not Excavated - outside of project boundary as provided.
	T-3/6	Not Excavated - outside of project boundary as provided.
	T-4/1	Not Excavated - outside of project boundary as provided.
	T-4/2	Not Excavated - slope
	T-4/3	0-5 cm brown sandy loam, 5-15 cm yellowish-red sandy clay (heavily eroded slope).
	T-4/4	0-10 cm gray sandy loam, 10-25 cm yellowish-brown loamy sand, 25-40 cm yellowish-red sandy clay.
	T-4/5	0-10 cm dark brown sandy loam, 10-55 cm yellowish-brown loamy sand, 55-60 cm yellowish-red sandy clay
	T-4/6	Not Excavated - outside of project boundary as provided.
	T-5/1	Not Excavated - outside of project boundary as provided.
	T-5/2	Not Excavated - Slope
	T-5/3	0-35 cm yellowish-brown loamy sand, 35-40 cm yellowish-red sandy clay.
	T-5/4	0-18 cm gray sandy loam, 18-40 cm yellowish-brown loamy sand, 40-100 cm light yellowish-brown loamy sand.
	T-5/5	Not Excavated - Slope
	T-5/6	Not Excavated - outside of project boundary as provided.
	T-6/1	Not Excavated - outside of project boundary as provided.
	T-6/2	Not Excavated - outside of project boundary as provided.
	T-6/3	0-15 cm dark brown sandy loam, 15-35 cm yellowish-brown loamy sand, 35-40 cm yellowish-brown sandy clay.
	T-6/4	Not Excavated - slope
	T-6/5	Not Excavated - outside of project boundary as provided.
	T-6/6	Not Excavated - outside of project boundary as provided.
D-9-8	T-1/1	0-20 cm mixed yellowish-brown, yellowish-red, and gray loamy sands, 20-28 cm
		very compact grayish-brown sandy clay fill.
	T-1/2	0-60 cm mixed strong brown loamy sand, dark brown sandy loam, and gray clay,
		and yellowish-red sandy clay fill.
D-9-11	T/1/1	0-20 cm very compact yellowish-red sandy clay fill.
	T-/1/2	0-20 cm compact yellowish-brown, yellowish-red, and strong brown loamy sand and clay loam, 20-30 cm very compact light gray, strong brown, and very dark brown sandy clay fill.

APPENDIX B - ARCHAEOLOGICAL BASE LINE ASSESSMENT REPORT

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ARCHAEOLOGICAL BASE LINE ASSESSMENT REPORT

Client Name: R. S. Webb & Associates
P.O. Box 1519
Holly Springs, GA. 30142

Project Name: SECARB Phase III Project, Mobile County, Alabama

Legal Designation: Sections 3, 4, 5, 8, 9, 10, 16, and 17 of T1N, R2W; Sections 32 and 33 of T2N, R2W

Exhibit Reference: Citronelle East, Alabama USGS 7.5' topographic quadrangle

Assessment Procedure:

National Register of Historic Places Review
No National Register properties are listed in or near the proposed SECARB Phase III Project survey area.

Alabama Tapestry of Historic Places Review
No properties eligible for the Alabama Tapestry are listed in or near the proposed SECARB Phase III Project survey area.

Alabama Archaeological Site Files Review
No sites have been recorded within the survey tract. Only one site has been previously recorded within one mile of the SECARB Phase III Project survey area. The site form for Site 1Mb139 is included. However, based on the information provided in the form, the site appears to actually be an isolated find with a large amount of trash associated with it.

Historical Atlas of Alabama, Volume 2, Cemetery Locations by County
A search of this atlas yielded no cemeteries located in your proposed development. This does not rule out the possibility of undocumented cemeteries, however.

Other Source Review
The Mobile County Soil Survey map for the project tract and the surrounding area from 1911 was examined. No structures are present in the parcel in question.

A copy of the Citronelle East quadrangle is included to show recorded archaeological sites near the proposed development. The 1982 Citronelle East quadrangle shows numerous structures located within the property and several oil wells inside the project boundaries.

Copies of the 1937, 1955, and 1966 Mobile County Highway maps for the proposed area are included. Also, the relevant portion of the 1895 Township and Section map of Mobile County is enclosed. No structures are shown within the proposed survey tract on any of the included maps.

A search of previously performed survey areas indicated that no surveys have been performed in or near the proposed survey tract. No report of the survey for the previously recorded locale, Site 1Mb139, is on file.

Professional Assessment of Project Area

Significant Cultural Resource Probability Estimate
Historic: High _____ Medium __X__ Low __X__
Prehistoric: High __X__ Medium __X__ Low _____

Recommendations:

None of the project area has been previously surveyed and no archaeological sites have recorded in this survey area. The area has a high to medium prospect for locating aboriginal site due to Little Creek flowing through the survey area. Several drainages intersect the creek and a portion of the survey tract appears to be located in swampland and landforms suitable for habitation are likely adjacent to Little Creek and the ridge tops and ridge slopes located inside the project boundaries. There is a low to medium probability of a historic home place located within the tract. Of interest is a C.C.C. Camp depicted on the 1937 Mobile County Highway Map in Section 8 of T1N, R2W. The area indicated as the C.C.C. Camp was likely dismantled but artifacts, structures, or features associated with the camp are still possible in the area. Other historic sites are possible on the ridge tops as well. The survey parcel has been disturbed from pipelines and the numerous roads associated with the oil well pads. It is the recommendation of this office that the proposed SECARB Phase III Project near Citronelle, Mobile County, Alabama has a moderate to high potential for aboriginal archaeological sites and a low to medium probability for historic nonaboriginal archaeological sites. A survey by a professional archaeologist is recommended for the proposed development.

7/22/09
Date

Signature, Robert Clouse

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APPENDIX C - RESUMES OF THE PRINCIPAL INVESTIGATOR AND FIELD DIRECTOR

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ROBERT S. WEBB

President
Senior Principal Archeologist

EDUCATION: M.A., Anthropology, University of Tennessee
B.A., Anthropology, University of Tennessee

PROFESSIONAL MEMBERSHIPS: Southeastern Archeological Conference, Georgia Council of Professional Archeologists, The Society for Georgia Archaeology, Society for American Archaeology, Tennessee Council for Professional Archaeology, Archaeological Society of South Carolina

CAREER SUMMARY

Mr. Webb has over 30 years of professional experience in cultural resource management studies. He is the president and principal archeologist of the firm. Mr. Webb has expertise in cultural resources identification, evaluation, data recovery and other areas of resource management. He is also a trained physical anthropologist and bio-statistician. Mr. Webb served as senior archeologist and cultural resources assessment department manager at Law Environmental, Inc. from 1990 through 1993. He owned a cultural resources management firm from 1985 until joining Law Environmental, Inc. in 1990. Mr. Webb established R.S. Webb & Associates in January 1994.

SELECTED PROJECTS

Unless otherwise noted, Mr. Webb served as principal investigator on the selected projects below.

Reservoir Projects

Cultural resources survey, Carroll County raw water supply reservoir, Carroll County, Georgia (748 acres)

Cultural resources survey, testing and data recovery, Walton County raw water supply reservoir system, Walton County, Georgia (1,600 acres)

Cultural resources survey, testing and data recovery, City of Canton raw water supply reservoir system, Cherokee County, Georgia (350 acres)

Cultural resources survey and testing, Tired Creek recreational reservoir, Grady County, Georgia (1,500 acres)

Cultural resources survey and testing, South Fulton County raw water supply reservoir system, Fulton County, Georgia (625 acres)

Cultural resources survey and testing, Richland Creek raw water supply reservoir, Paulding County, Georgia (500 acres)

Cultural resources reconnaissance surveys, Glades Reservoir alternatives analysis, Hall County, Georgia

Cultural resources survey, Lake Chastain water supply reservoir, Gilmer County, Georgia (40 acres)

Cultural resources survey, testing and data recovery, Blue Creek reservoir, White County, Georgia (100 acres)

Cultural resources reconnaissance surveys, Tallapoosa Basin, West Georgia Regional reservoir alternatives analysis, Haralson County, Georgia

Cultural resources survey, City of Newnan reservoir improvements, Coweta County, Georgia (160 acres)

Cultural resources survey and testing, Bear Creek raw water supply reservoir system, Newton County, Georgia (1,500 acres)

Cultural resources survey and testing, Henry County raw water supply reservoir system, Henry and Butts Counties, Georgia (1,650 acres)

Cultural resources survey, testing and data recovery, City of Griffin raw water supply reservoir system, Pike County, Georgia (450 acres)

Cultural resources survey, Henry County raw water supply reservoir system, Henry and Spalding Counties, Georgia (1,000 acres)

Cultural resources survey, testing and data recovery, Lake MacIntosh raw water supply reservoir system, Fayette and Coweta Counties, Georgia (650 acres)

Data recovery at nine prehistoric sites, Henry County raw water supply reservoir system, Henry and Spalding Counties, Georgia

Cultural resources survey, Horton Creek raw water reservoir and dam site, Fayette County, Georgia (800 acres)

Cultural resources survey, Town Creek raw water supply reservoir and dam site, Jones County, Georgia (750 acres)

Testing at a Historic Creek village and a late 19th/early 20th century cemetery, Town Creek raw water supply reservoir, Jones County, Georgia

Cultural resources survey and testing, Cornish Creek raw water supply reservoir and dam site, Newton County, Georgia (1,000 acres)

Data recovery at three prehistoric sites, Cornish Creek raw water reservoir and dam site, Newton County, Georgia

Cultural resources survey, testing, and data recovery, Yellow Creek raw water supply reservoir and dam site, Cherokee County, Georgia (330 acres)

Data recovery at an Archaic and Woodland period camp/quarry site, Pates Creek raw water supply reservoir, Henry County, Georgia

Cultural resources survey, Shoal Creek raw water supply reservoir and dam site, Clayton County, Georgia (450 acres)

Cultural resources survey, Ellijay-Gilmer raw water supply reservoir and dam site, Gilmer County, Georgia (300 acres)

Cultural resources survey, Hudson River raw water supply reservoir and dam site, Banks County, Georgia (570 acres)

Cultural resources survey, Rush Creek raw water supply reservoir and dam site, Meriwether County, Georgia (80 acres)

Cultural resources survey and testing, Hazel Creek raw water supply reservoir and dam site, Habersham County, Georgia (350 acres)

Robert S. Webb
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Cultural resources literature and records search, water supply reservoir alternatives study, Lamar County, Alabama

Airports

Cultural resources survey, selected airport site, Lumpkin County, Georgia (150 acres)

Cultural resources survey, selected airport site, Upson County, Georgia (220 acres)

Cultural resources survey and testing, Cartersville Airport strip extension project, Bartow County, Georgia (60 acres)

Cultural resources survey, Gwinnett County airport strip replacement project, Lawrenceville, Georgia (250 acres)

Cultural resources survey, Tom B. David Airport strip extension project, Calhoun, Georgia (110 acres)

Development Projects

Cultural resources survey and testing Wateree industrial development site, Richland County, South Carolina (300 acres)

Cultural resources survey and testing Burt Creek development site, Dawson County, Georgia (969 acres)

Cultural resources survey and testing Corinth development site, Coweta County, Georgia (800 acres)

Cultural resources survey and testing, Spring Tract development site, Spaulding County, Georgia (1,820 acres)

Cultural resources survey, testing, and data recovery, River Club development site, Gwinnett County, Georgia (750 acres)

Cultural resources survey, timber stands, Sumter National Forest, Oconee County, South Carolina (1,146 acres)

Cultural resources survey, testing, and data recovery, Rivermoore development site, Gwinnett County, Georgia (700 acres)

Cultural resources survey and testing, Cypress Harbour development site, Jasper County, South Carolina (90 acres)

Cultural resources survey, Perigrine Point development tract, Beaufort County, South Carolina (6 acres)

Phase II testing at 38BK1002, Crowfield Plantation, Berkeley County, South Carolina

Cultural resources survey and testing, Silver Creek development site, Forsyth County, Georgia (700 acres)

Cultural resources survey, Trenton industrial development site, Edgefield County, South Carolina (470 acres)

Cultural resources survey, Kingswood South development site, Fulton County, Georgia (83 acres)

Cultural resources survey, Matrix Parcel 15 development site, Greenville County, South Carolina (50 acres)

Cultural resources survey, Abbotts Bridge Road development site, Fulton County, Georgia (20 acres)

Cultural resources survey and testing, Lugoff industrial development site, Kershaw County, South Carolina (250 acres)

Archival research and archeological testing, St James Hotel renovation and expansion project, Selma, Alabama (Project Manager)

Cultural resources survey and evaluative testing, Harbor View development site, Cherokee County, Georgia (1,400 acres)

Evaluative testing at two historic house sites, Sugarloaf Farm, Gwinnett County, Georgia

Cultural resources survey and data recovery, Ballantyne golf course community, Mecklenburg County, North Carolina (750 acres)

Archival research, archeological monitoring and archeological data recovery, Atlanta Federal Center (Richs Department Store site), Atlanta, Georgia

Cultural resources survey, (confidential) golf course community, Beaufort County, South Carolina (90 acres)

Cultural resources survey and testing, I-20 mall site, Dekalb and Rockdale Counties, Georgia (1,250 acres)

Cultural resources survey, Columbia County community center, Columbia County, Georgia (50 acres)

Cultural resources survey, Columbia County public school site, Columbia County, Georgia (70 acres)

Cultural resources survey and testing, BMW automobile manufacturing plant site, Spartanburg County, South Carolina (1,500 acres)

Cultural resources reconnaissance surveys, alternative Mercedes-Benz automobile manufacturing plant sites, Alamance County, North Carolina and Berkeley County, South Carolina (2,500 acres)

Cultural resources reconnaissance survey, five Resolution Trust properties, Columbia, South Carolina (15 acres)

Cultural resources reconnaissance survey, American-Italian Pasta Company, Columbia, South Carolina (250 acres)

Cultural resources reconnaissance survey, Bona Allen development project, Buford, Georgia (320 acres)

Cultural resources survey, Union Camp facility, Prattville, Alabama (50 acres)

Cultural resources survey and testing, Technology Parkway development, Floyd County, Georgia (800 acres)

Cultural resources survey and testing, Publix Distribution Center development, Gwinnett County, Georgia (150 acres)

Cultural resources survey, International Paper Facility, Corinth, New York (50 acres)

Cultural resources literature/records review, industrial development site, Texas City, Texas

Cultural resources survey, Sawmill Place development site alternatives study, Columbus, Ohio

Cultural resources reconnaissance survey, Elbow Road development project, Chesapeake, Virginia (150 acres)

Cultural resources survey, Interrose industrial development site, Georgetown County, South Carolina (400 acres)

Cultural resources survey and testing, American Okenite industrial development site, Orangeburg County, South Carolina (250 acres)

Cultural resources survey and testing, Chapel Hill golf course, Douglas County, Georgia (150 acres)

Archeological testing at Crowfield Plantation for Westvaco Development Corporation, Summerville, South Carolina

Cultural resources survey and testing, Vereen Memorial Gardens, Horry County, South Carolina (120 acres)

Cultural resources survey, Tiger Creek stream channelization project, Fort Benning, Georgia (4 acres)

Cultural resources survey, Moccasin Creek lake site, Union County, Georgia (60 acres)

Cultural resources reconnaissance survey, Plantation Centre site, Bibb County, Georgia (90 acres)

Highways

Cultural resources survey, Annistown Road improvements corridor, Gwinnett County, Georgia

Evaluative testing at Site 9GW347, Annistown Road improvements corridor, Gwinnett County, Georgia

Data recovery at a prehistoric quartz quarry site and 19th century farmstead site, Ronald Reagan Parkway, Gwinnett County, Georgia

Cultural resources survey, Old Madison Pike road-widening project, Huntsville, Alabama

Cultural resources survey, Four Mile Post road-improvement project, Huntsville, Alabama

Cultural resources survey, Kentucky Highway 15 road-widening project, Hazard, Kentucky

Cultural resources literature and records search, Valdosta by-pass alternatives study, Valdosta, Georgia

Historic Cemetery Delineations and Relocations

Archival research, delineation, and relocation of the Hudson-Wood Cemetery, City of Atlanta, Georgia

Archival research, delineation, and relocation of the Harrison-Addington-Mallard Cemetery, Jackson County, Georgia

Delineation and relocation of the Martin Family Cemetery, Dekalb County, Georgia

Delineation and relocation of two historic cemeteries, Allendale County, South Carolina

Archival research and delineation of the Farmer Street Cemetery, Newnan, Georgia

Archival research and delineation of the Brooks Family Cemetery, Pickens County, Georgia

Archival research and delineation of the Alexander Family Cemetery, Mecklenburg County, North Carolina

Archival research and delineation at Bethel Baptist Church Cemetery, Cobb County, Georgia

Archival research and delineation of an abandoned cemetery, Anderson County, South Carolina

Archival research and delineation of the Franklin-Hamilton Cemetery, Cobb County, Georgia

Archival research and delineation of the Strickland Cemetery, Forsyth County, Georgia

Archival research and delineation of the Hiram Road Cemetery, Cobb County, Georgia

Archival research and delineation of the Harmony Cemetery, Gwinnett County, Georgia

Archival research and delineation of Thompson Cemetery, Fulton County, Georgia

Archival research and delineation of the McCurdy-Rawlins-Boring Cemetery, Gwinnett County, Georgia

Archival research and delineation of the Barham Cemetery, Henry County, Georgia

Archival research and delineation of the Adams-Adkins Cemetery, Henry County, Georgia

Archival research and delineation of the Woodward-Puch Cemetery, Henry County, Georgia

Archival research and delineation of the Grice Cemetery, Henry County, Georgia

Archival research and delineation of an abandoned 19th century cemetery, Madison County, Alabama

Archival research and delineation of a late 18th century cemetery, Spartanburg, South Carolina

Archival research and delineation of the Lost Mountain Baptist Church Cemetery, Cobb County, Georgia

Archival research and delineation of the Shiloh Church Cemetery, Cobb County, Georgia

Archival research and delineation of the Turner-Sewell Cemetery, Cobb County, Georgia

Archival research and delineation of the Matthew Strickland Gravesite, Gwinnett County, Georgia

Archival research and delineation of the Morris Cemetery and Sarah Webb Gravesite, Fulton County, Georgia

Archival research and delineation of the Moon Cemetery, Cobb County, Georgia

Archival research, delineation and relocation of the Miles Cemetery, Jackson County, Florida

Archival research, delineation and relocation of two 19th century cemeteries, Spartanburg County, South Carolina.

Archival research, delineation and relocation of the Freshwater Resort Cemetery, Calhoun Falls, South Carolina

Archival research, delineation and relocation of the Harris and McClure Cemeteries, Cabarrus County, North Carolina

Archival research, delineation and relocation of the Smithfield Cemetery, Cabarrus County, North Carolina

Archival research, delineation and relocation of the Rock Creek Cemetery, Guilford County, North Carolina

National Priority List Hazardous Waste Sites

Cultural resources survey (Phase 1a), Fort Dix sanitary landfill site, Fort Dix, New Jersey, (126 acres)

Cultural resources survey (Phase 2b), Fort Dix sanitary landfill site, Fort Dix, New Jersey, (1 acre)

Cultural resources literature review, dry cleaning facility, Fort Riley, Kansas

Cultural resources literature and records search, selected sites, Griffiss Air Force Base, New York

Radioactive Waste Facilities (Proposed Locations)

Cultural resources survey and testing, proposed North Carolina Low-Level Radioactive waste disposal facility site, Wake and Chatham Counties, North Carolina (850 acres)

Cultural resources survey and testing, proposed North Carolina Low-Level Radioactive waste disposal facility site, Richmond County, North Carolina (2,000 acres)

State of Georgia

Cultural resources survey and testing, Richard B. Russell State Park golf course, Elbert County, Georgia (430 acres)

Cultural resources survey, Gordonia State Park golf course, Tattnall County, Georgia (90 acres)

Various public outreach site visits for the Georgia Council of American Indian Concerns

More than 20 cultural resources surveys conducted for State agencies under the Georgia Environmental Policy Act

Solid Waste Landfill Sites

Data recovery, solid waste landfill site, Banks County, Georgia

Cultural resources survey, solid waste landfill site, Catawba County, North Carolina (350 acres)

Cultural resources survey, two solid waste landfill sites, Chickasaw County, Mississippi (700 acres)

Cultural resources survey, Superior Sanitation solid waste landfill site, Chatham County, Georgia (742 acres)

Cultural resources survey, BFI regional solid waste landfill site, Lawrence County, Alabama (500 acres)

Cultural resources reconnaissance survey, proposed solid waste landfill site, Forsyth County, Georgia (650 acres)

Cultural resources survey and testing, solid waste landfill site, Dekalb County, Georgia (150 acres)

Data recovery at a soapstone quarry site, solid waste landfill site, Dekalb County, Georgia

Cultural resources survey and testing, solid waste landfill site, Spartanburg County, South Carolina (90 acres)

Cultural resources survey, solid waste landfill site, Florence County, South Carolina (600 acres)

Cultural resources survey, solid waste landfill site, Louisville, Kentucky (300 acres)

Cultural resources survey, solid waste landfill site, Mt. Pleasant, Tennessee (15 acres)

Cultural resources survey, solid waste landfill site, Blount County, Tennessee (50 acres)

Cultural resources survey, solid waste landfill site, Johnson City, Tennessee (20 acres)

Cultural resources survey, solid waste landfill site, Jackson County, Florida (2 acres)

Cultural resources survey, solid waste landfill site, Jasper County, South Carolina (250 acres)

Cultural resources survey, solid waste landfill site, Harris County, Texas (500 acres)

U.S. Army Corps of Engineers Waterways

Testing of two prehistoric sites, Tennessee-Tombigbee Waterway, Monroe County, Mississippi

U.S. Forest Service Timber Sale Areas

Cultural resources survey, Chattahoochee National Forest, Georgia (990 acres)

Five cultural resources surveys, Nantahala National Forest, North Carolina (1,667 acres)

Cultural resources survey, Pisgah National Forest, North Carolina (349 acres)

Six cultural resources surveys, Oconee National Forest, Georgia (18,268 acres)

Utilities Projects

Cultural resources survey, proposed Old Atlanta Road transmission line, Oglethorpe Power Corporation, Forsyth County, Georgia

Evaluative testing at Site 9FO218, proposed Old Atlanta Road transmission line, Oglethorpe Power Corporation, Forsyth County, Georgia

More than 20 other cultural resources survey and testing projects, transmission line corridors and substation sites across Georgia, Oglethorpe Power Corporation, Decatur, Georgia

Cultural resources survey and evaluative testing, sewer line extensions, Davidson County, Tennessee

Cultural resources survey, water treatment plant site and water intake corridor, Banks County, Georgia

Cultural resources survey (Phase Ia), proposed Mohawk Power Corporation gas pipeline, Jefferson County, New York

Cultural resources reconnaissance survey, transmission line alternatives study, Curles Neck, Virginia

Cultural resources literature and records search, U.S. Generating Company power facilities alternatives study, various sites across Georgia

Cultural resources survey and testing, Butler Creek sewer line, Richmond County, Georgia

Cultural resources survey, realignment monitoring, in-place preservation planning, public meeting, agency presentation and evaluation of impacts to the Augusta Canal National Historic Landmark and a prehistoric shell midden site, Richmond water line and intake, Richmond and Columbia Counties, Georgia

Cultural resources survey, Proctor Creek MARTA rail line, Atlanta, Georgia

Evaluative testing of a 19th century landfill, Proctor Creek MARTA station, Atlanta, Georgia

Cultural resources survey, north, east and west MARTA rail extensions, Atlanta, Georgia

Cultural resources survey, East Point MARTA rail line, Atlanta, Georgia

Cultural resources survey and testing, Brookhaven MARTA rail line and station, Atlanta, Georgia

Data recovery at historic Johnsontown, Lennox Square MARTA station, Atlanta, Georgia

Cultural resources survey, gas pipeline, Big Thicket, Texas (field director)

Cultural resources survey, gas pipeline, Calcasieu Parrish, Louisiana (field director)

Cultural resources survey, Wildwood Park water line and water treatment site, Columbia County, Georgia

Cultural resources surveys, Phases I and II, sewer line improvements, Commerce, Georgia

Cultural resources survey, water system improvements, Senoia, Georgia

Cultural resources survey, sewer and water system improvements, Tallapoosa, Georgia

FCC Checklist Studies (Cultural Resources)

Literature review and field survey of over 4,000 communication tower sites in Georgia, North Carolina, South Carolina, Tennessee, Alabama, Florida and Virginia

Wastewater Treatment Projects

Cultural resources reconnaissance survey, land application site, Spalding County, Georgia (750 acres)

Cultural resources survey and testing, Piedmont Park and White Park CSO projects, Atlanta, Georgia

Cultural resources survey, land application site, Turner County, Georgia (264 acres)

Cultural resources survey, land application site, Rochelle, Georgia (10 acres)

Cultural resources survey, land application site, Blackshear, Georgia (90 acres)


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JONATHAN A. BLOOM

EDUCATION: B.S., Zoology, Southern Illinois University at Carbondale
M.A., Anthropology, Southern Illinois University at Carbondale

PROFESSIONAL MEMBERSHIPS: Society for Georgia Archaeology, Southeastern Archaeological Conference, Alabama Archeological Society, Illinois Archaeological Survey, Society for Bead Research

CAREER SUMMARY

Mr. Bloom has over 20 years experience in cultural resource management including nine years directing archaeological survey, testing, and data recovery projects. His extensive field experience is complemented by artifact preparation and analysis, literature research, and report preparation. From 1980 to 1987 he served as an archaeological field technician and laboratory assistant in Arkansas, Illinois, Kentucky, Missouri, and West Virginia. During this period, and primarily in Illinois, Mr. Bloom was also a consulting faunal analyst. Between 1987 and 1994 he directed field projects in Illinois, Georgia, Florida, Alabama, and Delaware. Since 2002, he has been directing field projects in Georgia. His familiarity with the treatment and removal of faunal remains in the field provided a foundation for his expertise in the relocation of historic and prehistoric human burials. During his work as an archaeological field director for an Atlanta-based firm, his recommendations initiated the donation of specific artifacts to three museums in Georgia.

SELECTED ARCHEOLOGICAL PROJECTS

Unless otherwise noted, Mr. Bloom served as Field Director on the selected projects below.

Historic Cemetery Relocations

Archeological excavation of a Late 18th Century Family Cemetery (Site 7S-F-68), Sussex County, Delaware.

Assistant Crew Chief at archeological excavation of a mid-18th Century slave cemetery in New York City.

Solid Waste Landfill Sites

Archeological survey and testing within the proposed Live Oak Landfill expansion, Dekalb and Fulton Counties, Georgia.

Archeological data recovery at the Charlotte Woods Soapstone Quarry, Dekalb County, Georgia.

Cultural resources survey of a proposed landfill site, Fulton County, Georgia.

Highway Projects

Archeological reconnaissance of the proposed Northern Arc, Bartow, Cherokee, and Forsyth Counties, Georgia.

Archaeological testing four sites in the proposed Ronald Reagan Expressway Corridor, Gwinnett Co., Georgia.

Archeological survey, and testing of four sites, prior to highway improvements, Chippewa County, Wisconsin.

Archeological survey of the proposed Monroe bypass, Walton County, Georgia.

Archeological reconnaissance of the proposed Northern Arc, Bartow, Cherokee and Forsyth Counties, Georgia.

Development Projects

Cultural resources survey of two proposed lakes and borrow areas, Bartow County, Georgia.

Recommendations:

None of the project area has been previously surveyed and no archaeological sites have recorded in this survey area. The area has a high to medium prospect for locating aboriginal site due to Little Creek flowing through the survey area. Several drainages intersect the creek and a portion of the survey tract appears to be located in swampland and landforms suitable for habitation are likely adjacent to Little Creek and the ridge tops and ridge slopes located inside the project boundaries. There is a low to medium probability of a historic home place located within the tract. Of interest is a C.C.C. Camp depicted on the 1937 Mobile County Highway Map in Section 8 of T1N, R2W. The area indicated as the C.C.C. Camp was likely dismantled but artifacts, structures, or features associated with the camp are still possible in the area. Other historic sites are possible on the ridge tops as well. The survey parcel has been disturbed from pipelines and the numerous roads associated with the oil well pads. It is the recommendation of this office that the proposed SECARB Phase III Project near Citronelle, Mobile County, Alabama has a moderate to high potential for aboriginal archaeological sites and a low to medium probability for historic nonaboriginal archaeological sites. A survey by a professional archaeologist is recommended for the proposed development.

7/22/09
Date

Signature, Robert Clouse

R.S. Webb & Associates
Cultural Resource Management Consultants
2800 Holly Springs Parkway, Suite 200 - P.O. Drawer 1319
Holly Springs, Georgia 30142
Phone: 770-345-0706 - Fax: 770-345-0707

July 31, 2009

Ms. Katey Grange
ENTRIX, Inc.
50 Glenlake Parkway, Suite 600
Atlanta, Georgia 30328

Subject: **Letter of Findings: Cultural Resources Literature Review**
SECARB Phase III Tract
Mobile County, Alabama
R.S. Webb & Associates No. 09-198-009

Dear Ms. Grange:

BACKGROUND

During the period of July 22 through 29, 2009, R.S. Webb & Associates conducted a cultural resources literature review of the proposed SECARB Phase III Tract near Citronelle in Mobile County, Alabama. The project area covers approximately 1,000 acres and is located in the north, central section of the county, east of Citronelle, within the Citronelle East, Alabama U.S. Geologic Survey (USGS) 7.5-minute quadrangle (Figure 1). The literature review was conducted to identify previously recorded cultural resources within or near the project area. A "cultural resource" is defined as a discrete area of human activity that is more than 50 years old (e.g., prehistoric artifact scatters, historic houses or house sites, abandoned cemeteries, etc.)

METHODOLOGY

Literature and Records Search: At the Alabama State Site File (Moundville) the official archeological site files and maps were examined, along with a review of the pertinent site forms and manuscripts. At the Alabama Historic Commission (AHC) in Montgomery, pertinent Mobile County compliance document files, official maps, and National Register of Historic Places (NRIIP)/study list files were reviewed, as well as the Alabama Register of Landmarks and Heritage (ARLH) and the Mobile County historic structures survey files. Historic maps, historic photographs, and relevant documents were examined at the State Archives (Montgomery).

RESULTS

Previous Cultural Resources Studies: No previous cultural resources investigations have been performed within a 1.0-mile radius of the project area.

National Register of Historic Places: The files at the AHC revealed that no NRHP-listed properties are located within 1.0 mile of the project area.

Alabama Register of Landmarks and Heritage: The ARLH contains no listed properties within a 1.0 mile radius of the project area.

Recorded Archeological Resources: A site file search was conducted by the staff at the Alabama State Site File. Review of official maps and files revealed that no recorded archeological sites are located within or near the project area. The closest site, 1MB139, is approximately 1.0 mile west of the project area. Based on site form data, 1MB139 may in fact be an isolated artifact find rather than an archeological site. As part of the file search, Site File personnel provided a base line assessment of the study track based on data at this facility. That assessment is attached (Attachment No. 1) and states that there are varying probabilities for different types of archeological sites (i.e., prehistoric, historic Native American, and historic Euro/African American) being present within the project area. The assessment suggests a moderate to high probability for prehistoric sites and a low to moderate probability for historic Native American and historic Euro/African American sites.

Cemeteries: No recorded cemeteries are known to be within the project area. No cemetery symbols were noted on any of the historic maps reviewed during the current study. Though no cemeteries are known to be present, there is always the possibility of unrecorded or unmarked cemeteries being present within a tract as large as the project area.

Mobile County Historic Structures Survey: Historic structure files at the AHC revealed that there are two recorded historic structures within 1.0 mile of the project area. Structure 7585 is located approximately 4,000 feet (ft) southwest of the project area and is a two story, traditional vernacular structure south of Celeste Road (Figure 1). This structure, built in 1939 was recommended ineligible for the NRHP. Structure 7586, built in 1949, is on the southwest side of Celeste Road approximately 3,000 ft southwest of the project area; it is a one and a half story traditional vernacular structure and is recommended ineligible for the NRHP.

Historic Structures or Features on Historic Maps and Aerial Photographs: A number of historic maps were examined during this investigation. These include: the 1895 Alabama Township/Section map; 1911 U.S. Department of Agriculture Soil Map; 1943 Citronelle 15-minute USGS quadrangle; and Highway Maps from 1937, 1955, 1962, 1966, 1982, and 2000.

The 1943 quad map is the earliest map showing roads and structures within the project area; four structures were within the project area at that time (HS-1, HS-2, HS-3, and HS-4, Figure 1; Figure 2). The 1943 road system exhibits the rudiments of the modern transportation network as shown on the 1983 7.5-minute quad (Figure 1). None of the 1943 roads appear on state highway maps until 1966, suggesting that these roads may not have been county- or state-maintained until the 1960s. Between the 1960s and 1982, when the Citronelle East USGS quad was issued (Figure 1), this road system was extended to access oil wells. A variety of structures were built along the primary roads during this period. The primary importance of this observation is that there is a high probability that many of the structures and/or industrial features (e.g., oil wells and associated facilities) within and near the project area were constructed within the last 50 years.

No historic aerial photography was available for the project area at the State Archives. Reviewing post-2005 Google Earth aerial photography (Figure 3), an "old house" vegetation signature is present at the location of HS-4 (Figure 4). No such signatures could be discerned at the locations of HS-1, HS-2, or HS-3 (Figure 4).

CONCLUSIONS

Based on the information reviewed during the literature review, no NRHP eligible/listed properties or ARHL properties are recorded within 1.0 mile of the project area.

No previously recorded archeological sites or cemeteries are located within or near the project area. The closest recorded archeological site (or isolated artifact find) is approximately 1.0 mile west of the project area. According to a base line assessment of the project area by Alabama State Site File staff, there is the potential for archeological sites being present within the project area.

Two state-recognized historic structures dating to the first half of the 20th century are located within a 1.0-mile radius of the project area, but are 3,000 to 4,000 ft from the project area. Both of these structures are recommended ineligible for the NRHP. Regardless of NRHP eligibility status, the proposed undertaking would not affect these properties.

Historic maps indicate that the project vicinity was sparsely populated/utilized prior to the 1960s; Four structures were noted within the project area on the 1943 quad map, indicating some potential for 19th to early 20th century occupation. Map research suggests that most of the extant structures in the project are probably related to middle to late 20th century oil production activities.

CLOSING COMMENTS

Ms. Grange, we appreciate the opportunity to work with you and ENTRIX on the project. If you have any questions or comments concerning our findings, please contact Mr. Steve Webb at 770-345-0706.

Sincerely,
R.S. WEBB & ASSOCIATES

Robert S. Webb
President and Senior Principal Archeologist

Attachments: Figures 1, 2, 3, and 4
Alabama State Site Files Site Base Line Assessment

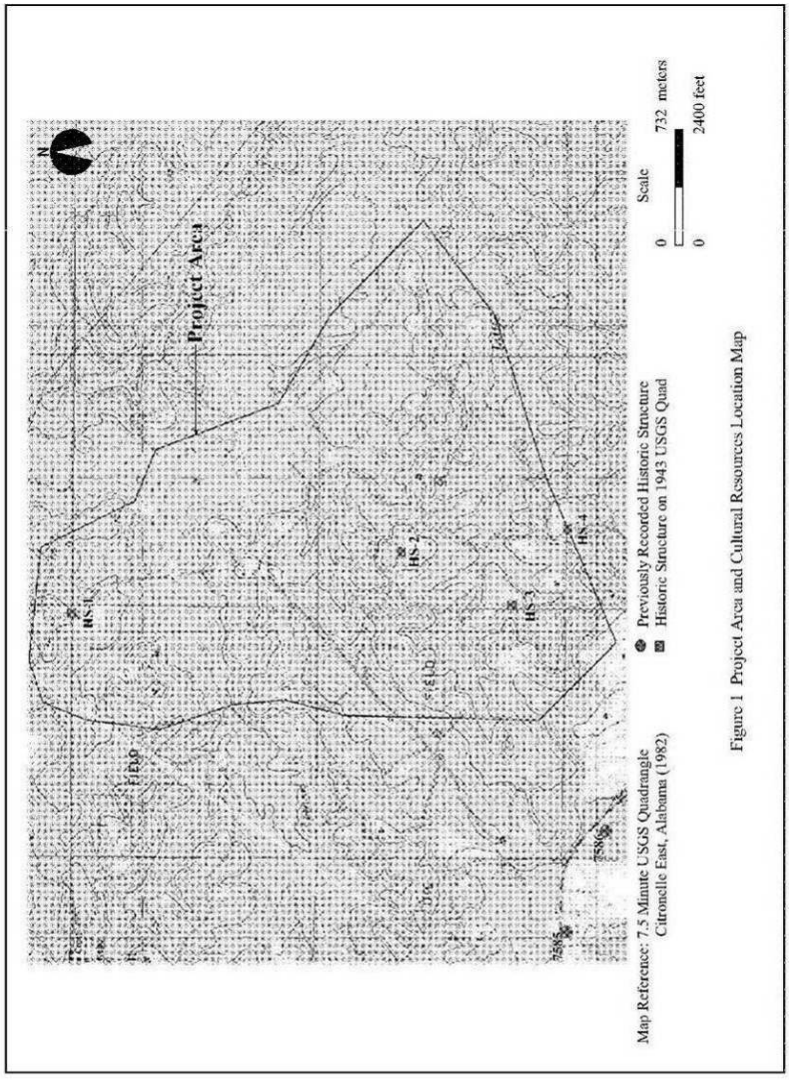

Figure 1 Project Area and Cultural Resources Location Map

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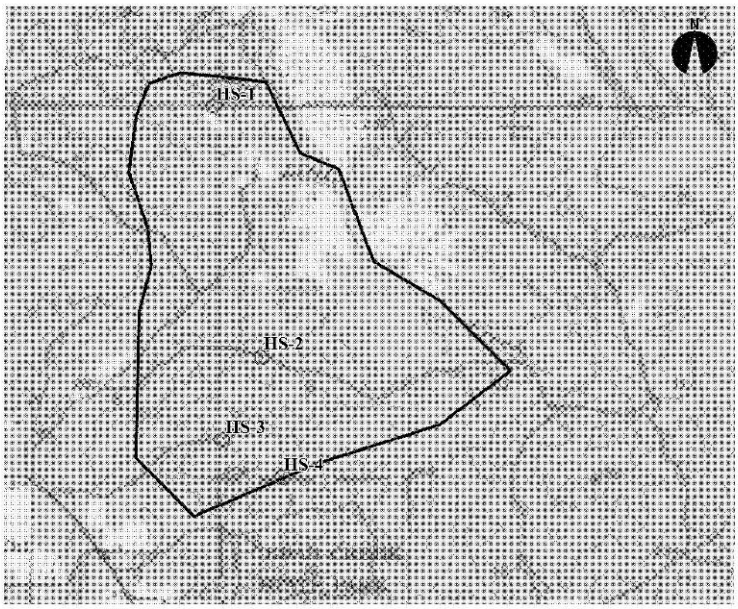


Map Reference: 7.5 Minute USGS Quadrangle
Citronelle East, Alabama (1943)

Scale
0 981 meters
0 3220 feet

Figure 2 1943 Quadrangle Showing Roads and Structures Within the Project Area

Figure 3 Aerial Photograph (Virtual Earth) Showing Locations of Historic Structures on 1943 Quad Map

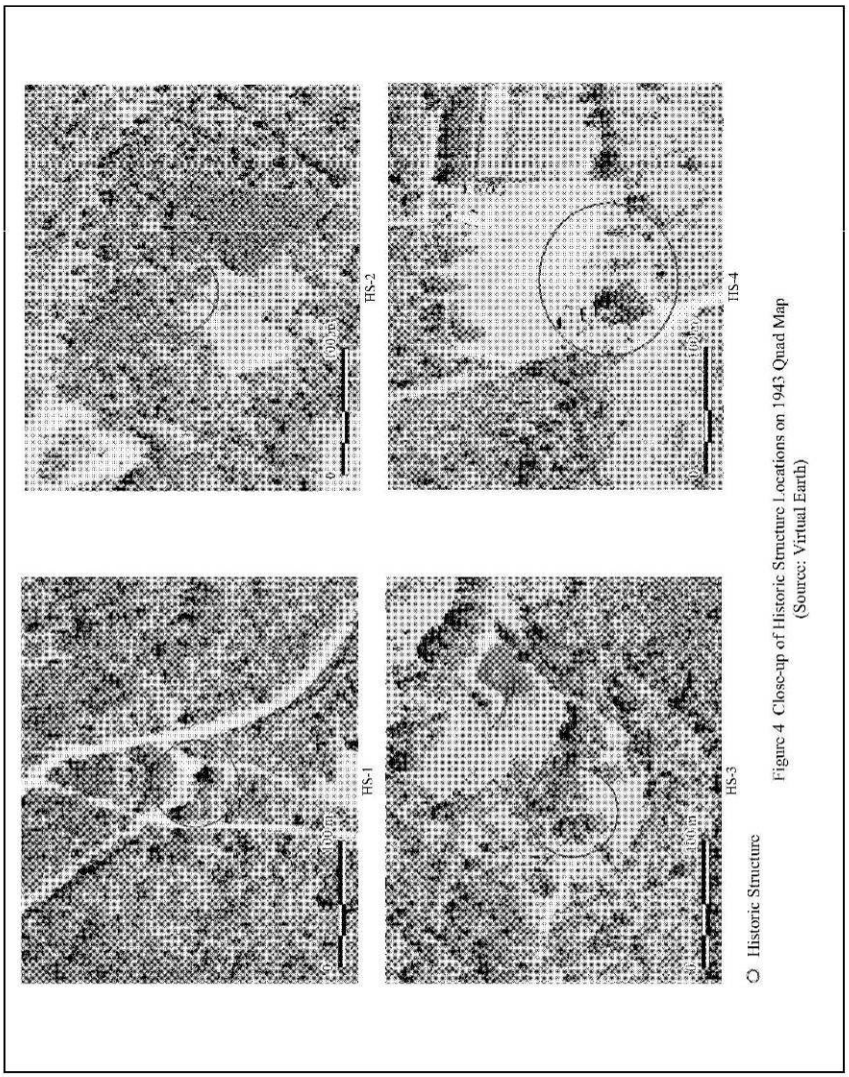
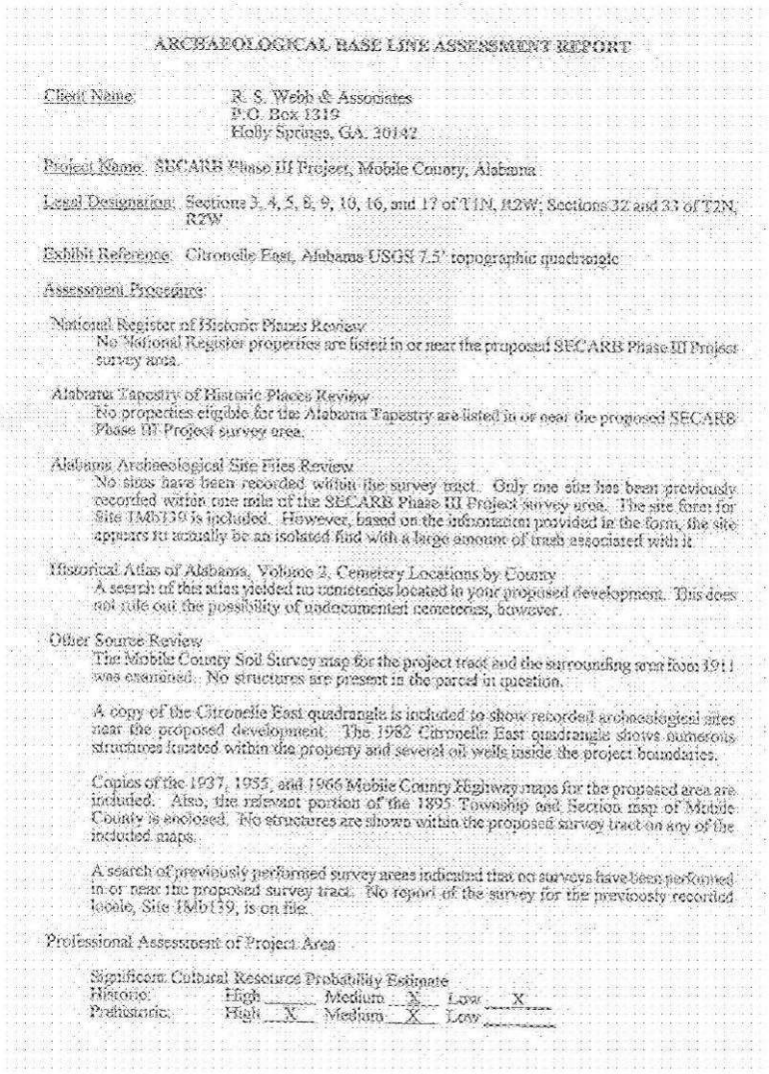


Figure 4 Close-up of Historic Structure Locations on 1943 Quad Map
(Source: Virtual Earth)



ARCHAEOLOGICAL BASE LINE ASSESSMENT REPORT

Client Name: R. S. Webb & Associates
P.O. Box 1319
Holly Springs, GA. 30142

Project Name: SECARB Phase III Project, Mobile County, Alabama

Legal Designation: Sections 3, 4, 5, 8, 9, 10, 16, and 17 of T1N, R2W; Sections 32 and 33 of T2N, R2W

Exhibit Reference: Citronelle East, Alabama USGS 7.5' topographic quadrangle

Assessment Procedure:

National Register of Historic Places Review
No National Register properties are listed in or near the proposed SECARB Phase III Project survey area.

Alabama Tapestry of Historic Places Review
No properties eligible for the Alabama Tapestry are listed in or near the proposed SECARB Phase III Project survey area.

Alabama Archaeological Site Files Review
No sites have been recorded within the survey tract. Only one site has been previously recorded within one mile of the SECARB Phase III Project survey area. The site form for Site 1Mb139 is included. However, based on the information provided in the form, the site appears to actually be an isolated find with a large amount of trash associated with it.

Historical Atlas of Alabama, Volume 2, Cemetery Locations by County
A search of this atlas yielded no cemeteries located in your proposed development. This does not rule out the possibility of undocumented cemeteries, however.

Other Source Review
The Mobile County Soil Survey map for the project tract and the surrounding area from 1911 was examined. No structures are present in the parcel in question.

A copy of the Citronelle East quadrangle is included to show recorded archaeological sites near the proposed development. The 1982 Citronelle East quadrangle shows numerous structures located within the property and several oil wells inside the project boundaries.

Copies of the 1937, 1955, and 1966 Mobile County Highway maps for the proposed area are included. Also, the relevant portion of the 1895 Township and Section map of Mobile County is enclosed. No structures are shown within the proposed survey tract on any of the included maps.

A search of previously performed survey areas indicated that no surveys have been performed in or near the proposed survey tract. No report of the survey for the previously recorded locale, Site 1Mb139, is on file.

Professional Assessment of Project Area

Significant Cultural Resources Probability Estimate
Historic: High _____ Medium __X__ Low __X__
Prehistoric: High __X__ Medium __X__ Low _____

NATIONAL ENERGY TECHNOLOGY LABORATORY
Albany, OR • Morgantown, WV • Pittsburgh, PA

U.S. DEPARTMENT OF ENERGY

July 8, 2010

Amanda Hill
Alabama Historical Commission
ATTN: 106 Reviews
468 S. Perry Street
Montgomery, AL 36130-0900

Dear Ms. Hill:

Due to some clarification with the proponent, I am sending this supplement to our June 7th communication regarding project AHC 10-0916. The change in the project is that up to two injection wells and up to two deep monitoring wells may be drilled on the well pads that are 3 acres. Thus, the total disturbance is expected to be about 1.5 acres per pad or 3 acres total due to the existing clearing in the proposed well locations. Further, the CO_2 to be injected has changed from 125,000 tons per year for three years to 125,000 to 182,500 metric tons per year (or 375,000 to 547,500 total metric tons injected over 3 years). Please see the map below. All other components remain the same.

Please let me know if you have any questions, I can be reached via email (william.gwilliam@netl.doe.gov) or by telephone (304-285-4401).

Sincerely,

W. J. Gwilliam

William J. Gwilliam

Enclosure

Note: Please Copy All Responses To:
Meghan Morse
Mangi Environmental Group
7915 Jones Branch Drive, Ste. 2300
McLean, VA 22102
(E-mail address: MMorse@mangi.com)

3610 Collins Ferry Road, P.O. Box 880, Morgantown, WV 26507

[Note: the same maps accompanying the supplemental USFWS letter accompanied this one].

STATE OF ALABAMA
ALABAMA HISTORICAL COMMISSION
468 SOUTH PERRY STREET
MONTGOMERY, ALABAMA 36130-0900

FRANK W. WHITE
EXECUTIVE DIRECTOR

TEL: 334-242-3184
FAX: 334-240-3477

July 21, 2010

William J. Gwilliam
NETL
U.S. Department of Energy
P.O. Box 880
Morgantown, West Virginia 26505

Re: AHC 10-0916
Anthropogenic Test Project
Change in Project Status at Well Sites
Mobile County, Alabama

Dear Mr. Gwilliam:

Upon review of the above referenced project, we have determined that we previously concurred with this project. We concur with the revised project activities provided they remain within the area previously surveyed by R. S. Webb. Also, we have had consultation with the Corp of Engineers, Mobile District about an archaeological site which may be in an area scheduled for impact. As the Cultural Resource Assessment located no archaeological or structures in the propose impact areas, we need to discuss this with you and the Corp of Engineers.

We appreciate your efforts on this project and we look forward to working with you. Should you have any questions, please contact Greg Rhinehart at (334) 230-2662. Please have the AHC tracking number referenced above available and include it with any correspondence.

Truly yours,

Elizabeth Ann Brown
Deputy State Historic Preservation Officer

EAB/GCR/gcr

cc: Joe Giliberti, USACE Mobile District

STATE OF ALABAMA
ALABAMA HISTORICAL COMMISSION
468 SOUTH PERRY STREET
MONTGOMERY, ALABAMA 36130-0900

FRANK W. WHITE
EXECUTIVE DIRECTOR

TEL.: 334-242-3184
FAX: 334-240-3477

September 28, 2010

W. J. Gwilliam
DOE National Energy Tech Lab
P.O. Box 880, MS B07
Morgantown, West Virginia 26507-0880

Re: AHC 10-0916
Draft EA
SECARB Phase III Anthropogenic Test Project
Mobile County, Alabama

Dear Mr. Gwilliam:

Thank you for the information forwarded by your office. We look forward to receiving the reports for future activities.

We appreciate your efforts on this project. Should you have any questions, please contact Amanda Hill at (334) 230-2692. Please have the AHC tracking number referenced above available and include it with any correspondence.

Truly yours,

Elizabeth Ann Brown
Deputy State Historic Preservation Officer

EAB/AMH/gcr

STATE OF ALABAMA
ALABAMA HISTORICAL COMMISSION
468 SOUTH PERRY STREET
MONTGOMERY, ALABAMA 36130-0900

FRANK W. WHITE
EXECUTIVE DIRECTOR

TEL: 334-242-3184
FAX: 334-240-3477

February 1, 2011

Doug Mooneyhan
Cardno ENTRIX
50 Glenlake Parkway, Suite 600
Atlanta, Georgia 30328

Re: AHC 10-0916
SE Regional Carbon Sequestration Partnership
Phase III Anthropogenic Test Project
CRA for Transmission Pipeline and Laydown/Contractor Yards
CRA for Supporting and Associated Facilities
Mobile County, Alabama

Dear Mr. Mooneyhan:

Upon review of the two cultural resource assessments conducted by R. S. Webb and Associates, we have determined that we agree with the author's findings. Although 4 archaeological sites were discovered in the Transmission Line survey, these are not eligible for the National Register of Historic Places (NRHP) and no further investigations are warranted. We also agree with the findings of the Supporting Facilities survey. No cultural resources were discovered and no further investigations are warranted. Therefore, we concur with the proposed project. However, should artifacts or archaeological features be encountered during project activities, work shall cease and our office shall be consulted immediately.

We appreciate your efforts on this project. Should you have any questions, please contact Greg Rhinehart at (334) 230-2662. Please have the AHC tracking number referenced above available and include it with any correspondence.

Truly yours,

Elizabeth Ann Brown
Deputy State Historic Preservation Officer

EAB/GCR/gcr

THE STATE HISTORIC PRESERVATION OFFICE
www.preserveala.org

Appendix F: Consultation with Bureau of Indian Affairs and Tribes

NATIONAL ENERGY TECHNOLOGY LABORATORY
Albany, OR • Morgantown, WV • Pittsburgh, PA

June 7, 2010

A.D. Ellis, Principal Chief
Muscogee (Creek) Nation
P.O. Box 580
Okmulgee, OK 74447

Dear Chief Ellis:

The Southern States Energy Board (SSEB) manages the Southeast Regional Carbon Sequestration Partnership (SECARB). With the support of the U.S. Department of Energy's (DOE) National Energy Technology Laboratory (NETL), SSEB proposes to conduct a large-scale demonstration of the sequestration of carbon dioxide (CO_2) originating from an anthropogenic source, referred to as the "Phase III Anthropogenic Test Characterization Project" (SECARB Phase III Anthropogenic Project or Project). Federal funding would be committed by NETL for the fieldwork contemplated, and the federal action (i.e. DOE's proposed action) is to provide $23,600,878.00 to implement the SSEB proposed project. The Project, as proposed by SSEB, would be located within the Southeast Unit of the Citronelle Oilfield (Citronelle Field) in Mobile County, Alabama (See Attached Vicinity Map).

SSEB's proposed project would inject and closely monitor the flow of 125,000 metric tons of CO_2 per year for three years into the brine bearing Paluxy Formation (See Injection Map). In order to inject this CO_2, three connected actions exist, which are related activities that are part of an overall effort to implement SSEB's proposed project. First, the CO_2 source for this study would be Southern Company's coal-fired Plant Berry electric generating plant located approximately 12 miles away from the injection point. Secondly, 10.9 miles of 4.5-inch pipeline would need to be installed to transport the CO_2 from Plant Berry to the injection site at the Denbury's Citronelle Field. A user fee would be paid by DOE/NETL for the CO2 delivered by this pipeline system. Lastly, 1,000 feet of electrical right-of-way would be established to provide electrical power to the injection point.

As part of our coordination and consultation responsibilities and to comply with the implementing provisions of The American Indian Religious Freedom Act, 42 United States Code § 1996, we would appreciate receiving any information you have regarding Native American sacred locations, traditional resources, or traditional religious practices potentially affected by SSEB's proposed project.

Based on the scope of the proposed project, DOE plans to prepare an Environmental Assessment (EA) in accordance with requirements of the National Environmental Policy Act (NEPA), to analyze, document, and disseminate information on the potential environmental consequences of the proposed project. Information that you provide will be incorporated and appropriately addressed in the EA. If your initial review concludes that no Native American sacred locations, traditional resources, or traditional religious practices would potentially be affected by the proposed project, a written acknowledgement of that conclusion would be appreciated. In any case, the information you provide will be considered in preparing a draft EA, which will be provided to you upon request.

3610 Collins Ferry Road, P.O. Box 880, Morgantown, WV 26507

Should you require additional information, please contact me by telephone at 304-285-4401 or by email at william.gwilliam@netl.doe.gov.

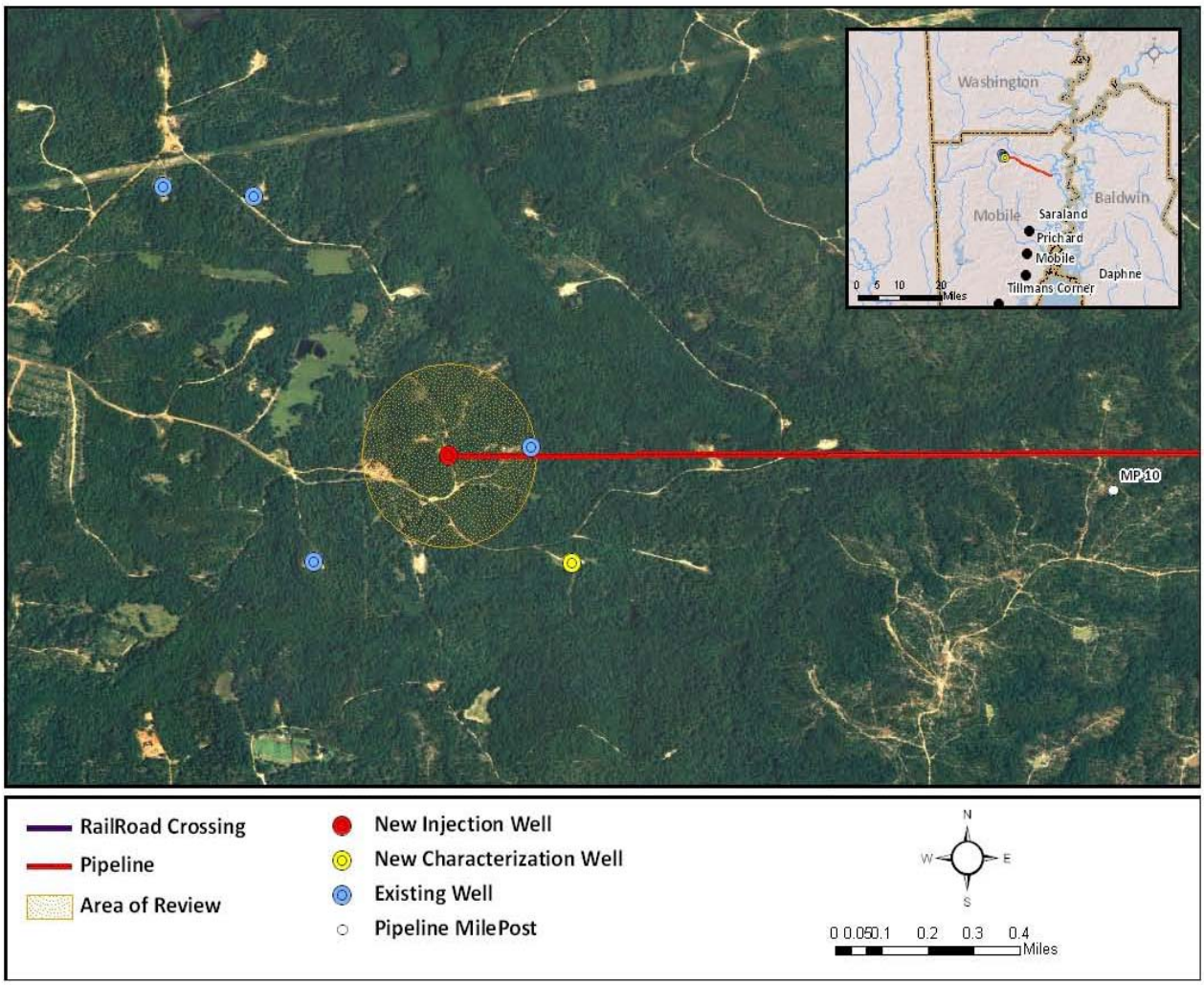
Sincerely,

W. J. Gwilliam

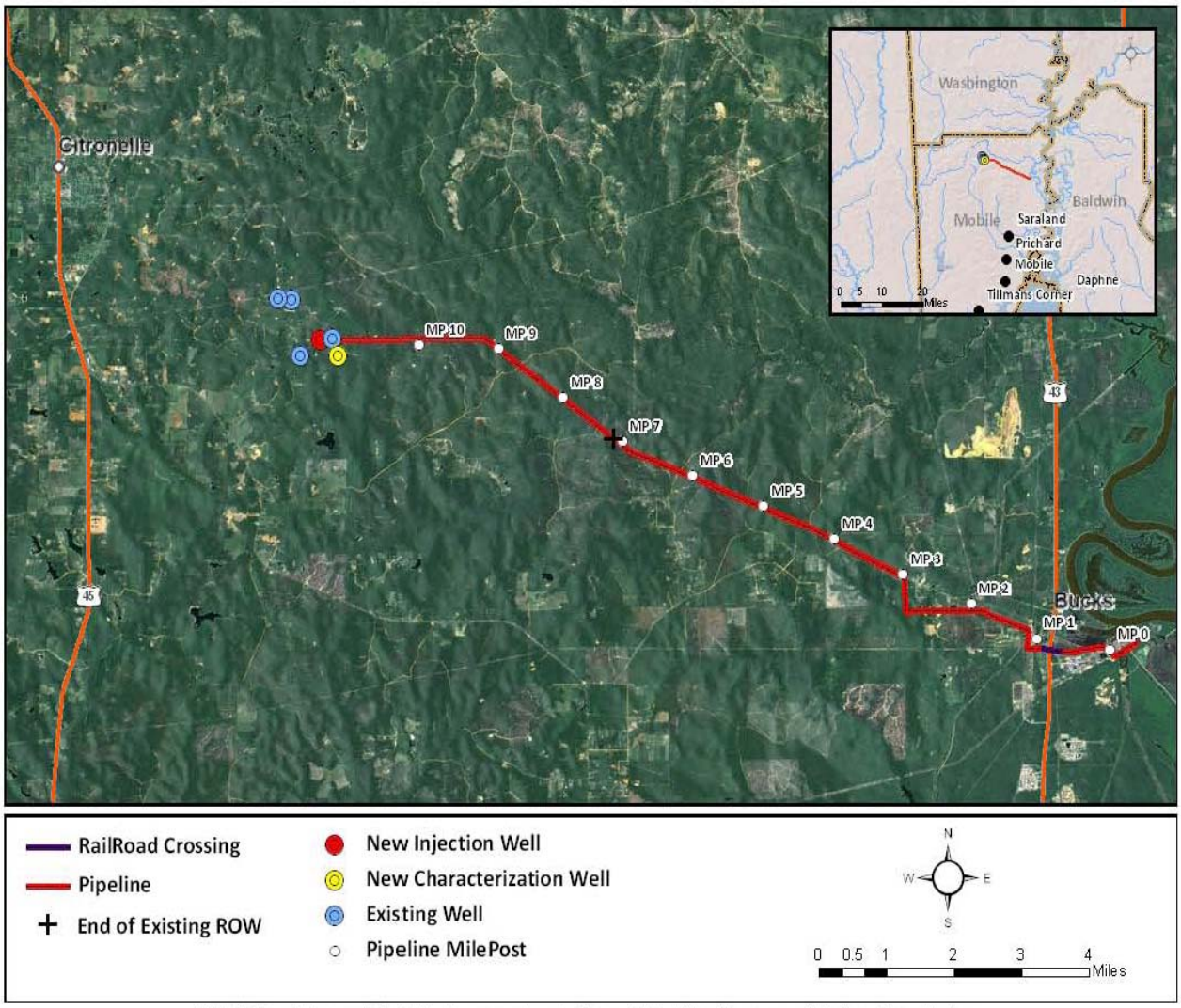
William J. Gwilliam
NEPA Document Manager

Attachments

Note: Please Copy All Responses To:
Meghan Morse
Mangi Environmental Group
7915 Jones Branch Drive, Ste. 2300
McLean, VA 22102
(E-mail address: MMorse@mangi.com)



Injection Site



Vinicity Map with CO_2 Source Location, CO_2 Pipeline, and Injection Point

NATIONAL ENERGY TECHNOLOGY LABORATORY
Albany, OR • Morgantown, WV • Pittsburgh, PA

U.S. DEPARTMENT OF ENERGY

June 7, 2010

Franklin Keel, Regional Director
Bureau of Indian Affairs, Eastern Regional Office
545 Marriott Drive, Suite 700
Nashville, TN 37214

Dear Mr. Keel:

The Southern States Energy Board (SSEB) manages the Southeast Regional Carbon Sequestration Partnership (SECARB). With the support of the U.S. Department of Energy's (DOE) National Energy Technology Laboratory (NETL), SSEB proposes to conduct a large-scale demonstration of the sequestration of carbon dioxide (CO_2) originating from an anthropogenic source, referred to as the "Phase III Anthropogenic Test Characterization Project" (SECARB Phase III Anthropogenic Project or Project). Federal funding would be committed by NETL for the fieldwork contemplated, and the federal action (i.e. DOE's proposed action) is to provide $23,600,878.00 to implement the SSEB Proposed Project. The Project, as proposed by SSEB, would be located within the Southeast Unit of the Citronelle Oilfield (Citronelle Field) in Mobile County, Alabama (See Attached Vicinity Map).

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3610 Collins Ferry Road, P.O. Box 880, Morgantown, WV 26507

addressed in the EA. If your initial review concludes that no Native American sacred locations, traditional resources, or traditional religious practices would potentially be affected by the proposed project, a written acknowledgement of that conclusion would be appreciated. In any case, the information you provide will be considered in preparing a draft EA, which will be provided to you upon request.

Should you require additional information, please contact me by telephone at 304-285-4401 or by email at william.gwilliam@netl.doe.gov.

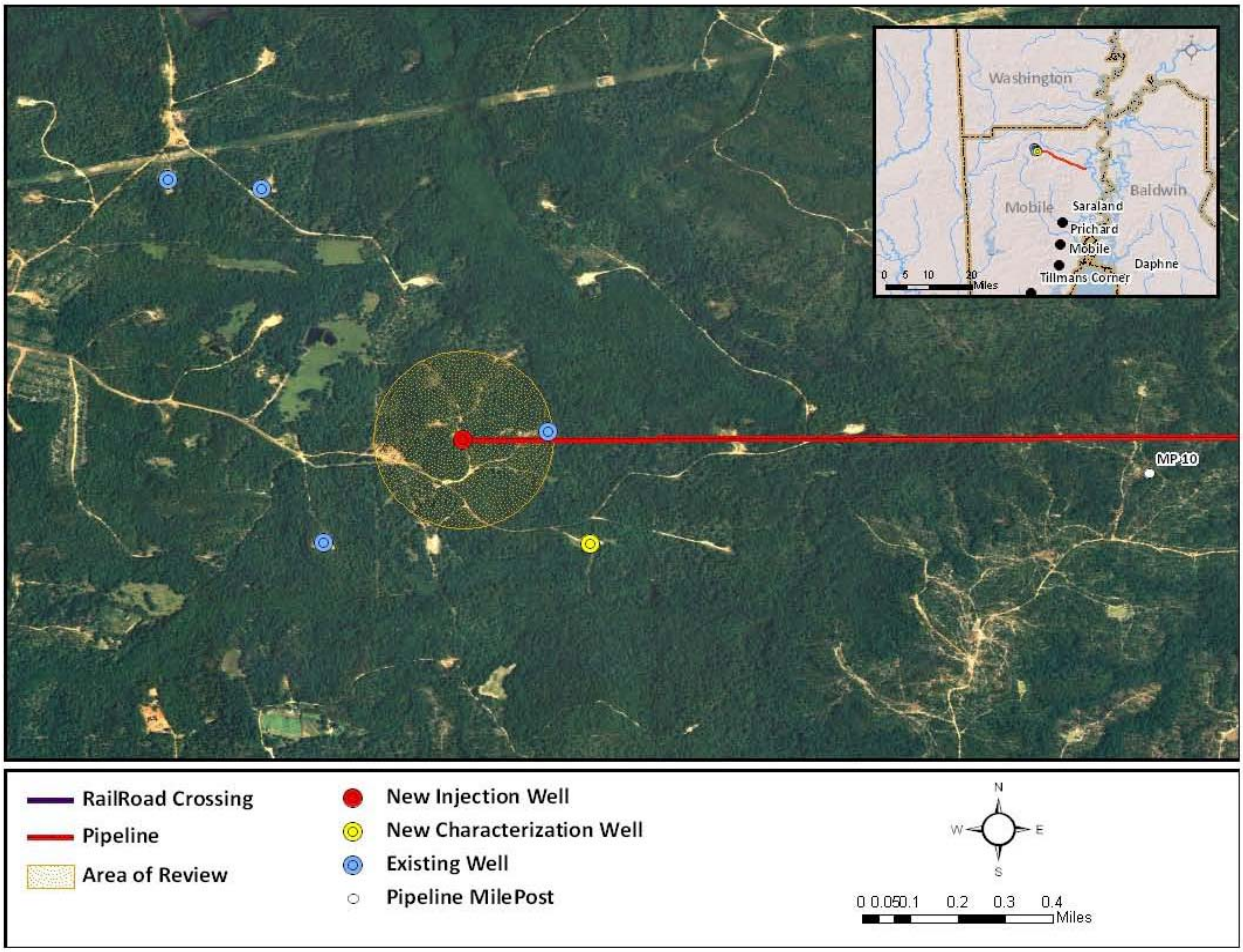
Sincerely,

W. J. Gwilliam

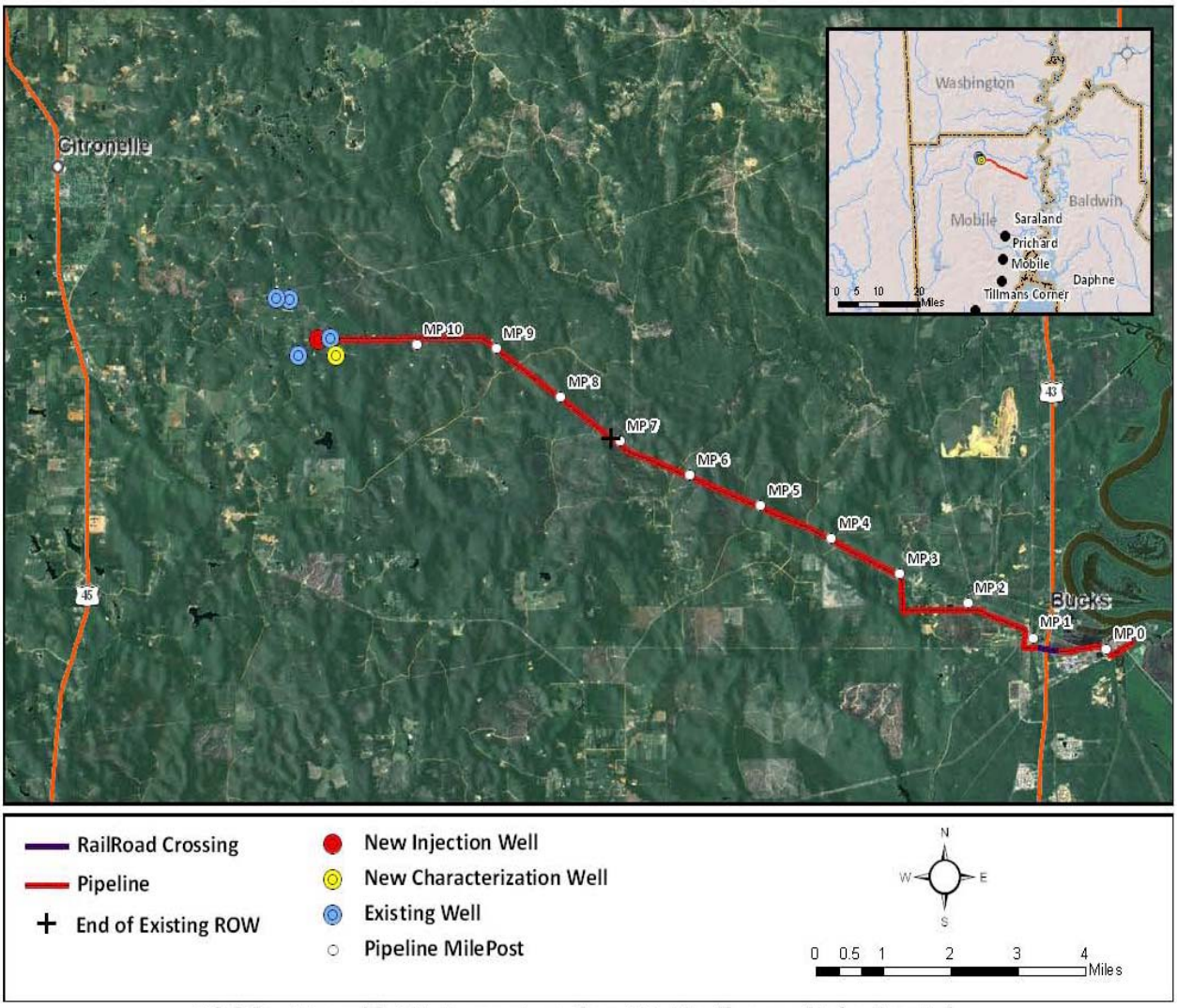
William J. Gwilliam
NEPA Document Manager
U.S. Department of Energy/National Energy Technology Laboratory
3610 Collins Ferry Road, P.O. Box 880
Morgantown, WV 26505

Attachments

Note: Please Copy All Responses To:
Meghan Morse
Mangi Environmental Group
7915 Jones Branch Drive, Ste. 2300
McLean, VA 22102
(E-mail address: MMorse@mangi.com)



Injection Site



Vinicity Map with CO_2 Source Location, CO_2 Pipeline, and Injection Point

United States Department of the Interior

BUREAU OF INDIAN AFFAIRS
Eastern Regional Office
545 Marriott Drive, Suite 700
Nashville, TN 37214

IN REPLY REFER TO:
Trust Services
Environment, Safety, and Cultural Resources Division

Mr. William Gwilliam
NEPA Document Manager
U.S. Department of Energy
National Energy Technology Laboratory
P.O. Box 880
Morgantown, West Virginia 26505

JUL - 6 2010

RE: Draft Environmental Assessment: SECARB Phase III Anthropogenic Test Characterization Project

Dear Mr. Gwilliam:

Thank you for contacting the Bureau of Indian Affairs (BIA), Eastern Regional Office, about the location of American Indian traditional resources, sacred sites, and traditional religious sites in Mobile County, Alabama. The project cited above is not on American Indian land held in trust by the U.S. Government, therefore the project does not concern the BIA.

Mobile County, Alabama, was historically occupied by the Upper Creeks. There are seven federally recognized descendant tribes and nations in Alabama, Florida, and Oklahoma: Poarch Band of Creek Indians, Muscogee (Creek) Nation, Kialegee Tribal Town (Creek), Thlopthlocco Tribal Town (Creek), Seminole Indian Tribe, Seminole Nation of Oklahoma, and Miccosukee Indian Tribe. An address-telephone directory for these tribes and nations is enclosed.

Tribal consultation information is available on the internet. An annually updated tribal leaders directory for federally recognized tribes and nations can be found on the internet at *http://www.bia.gov* - **Site Map - BIA – OIS – Division of Tribal Government Services - Tribal Directory**. A map titled *Indian Reservations in the Continental United States* is located at *http://www.nps.gov/history/nagpra/documents*, and a Native American Consultation Database is at *http://home.nps.gov/nacd*. Maps of each reservation are available at *http://www.census.gov/geo/bas/bas10/aia/entlist_aia.html*. For additional consultation, a current list of State Historic Preservation Officers is at http://www.ncshpo.org, and a current list of Tribal Historic Preservation Officers is at http://www.nathpo.org.

If you have questions, please contact David Saunders, Eastern Regional Archaeologist, at (615) 564-6840.

Sincerely,

Director, Eastern Region

(SIGNED) Scott C. Meneely

Acting

Enclosure

American Indian tribes and nations contact information

Honorable Buford Rolin
Chairman
Poarch Band of Creek Indians
5811 Jacks Spring Rd.
Atmore, AL 36502
Telephone: (251) 368-9136
FAX: (251) 368-1026

Honorable A. D. Ellis
Principal Chief
Muscogee (Creek) Nation
P.O. Box 580
Okmulgee, OK 74447
Telephone: (918) 732-8700
FAX: (918) 756-2911

Honorable Vernon Yarholar
Town King
Thlopthlocco Tribal Town
P.O. Box 188
Okemah, OK 74859
Telephone: (918) 560 6198
FAX: (918) 560 6196

Honorable Mitchell Cypress
Chairman
Seminole Indian Tribe
6300 Stirling Rd.
Hollywood, FL 33024
Telephone: (954) 966-6300
FAX: (954) 967-3463

Honorable Enoch Kelly Haney
Principal Chief
Seminole Nation of Oklahoma
P.O. Box 1498
Wewoka, OK 74884
Telephone: (405) 257-6287
FAX: (405) 257-6205

Robert Thrower
Tribal Historic Preservation Officer
Poarch Band of Creek Indians
5811 Jacks Spring Rd.
Atmore, AL 36502
Telephone: (251) 368-9136 x2281
FAX: (251) 368-0835

Honorable Jennie Lillard
Town King
Kialegee Tribal Town
P.O. Box 332
Wetumka, OK 74883
Telephone: (405) 452-3262
FAX: (405) 452-3413

Honorable Colley Billie
Chairman
Miccosukee Indian Tribe
P.O. Box 440021
Miami, FL 33144
Telephone: (305) 323-8380
FAX: (305) 323-1011

Willard Steele
Tribal Historic Preservation Officer
Seminole Tribe of Florida
Ah-Tah-Thi-Ki Museum
HC 61 Box 21 A
Clewiston, FL 33440
Telephone: (863) 902-1113 x218
FAX: (863) 902-1117

NATIONAL ENERGY TECHNOLOGY LABORATORY
Albany, OR • Morgantown, WV • Pittsburgh, PA

U.S. DEPARTMENT OF ENERGY

July 8, 2010

A.D. Ellis, Principal Chief
Muscogee (Creek) Nation
P.O. Box 580
Okmulgee, OK 74447

Dear Chief Ellis:

Due to some clarification with the proponent, I am sending this supplement to our June 7th communication regarding the SECARB Anthropogenic Project. The change in the project is that up to two injection wells and up to two deep monitoring wells may be drilled on the well pads that are 3 acres. Thus, the total disturbance is expected to be about 1.5 acres per pad or 3 acres total due to the existing clearing in the proposed well locations. Further, the CO_2 to be injected has changed from 125,000 tons per year for three years to 125,000 to 182,500 metric tons per year (or 375,000 to 547,500 total metric tons injected over 3 years). Please see the map below. All other components remain the same.

Please let me know if you have any questions, I can be reached via email (william.gwilliam@netl.doe.gov) or by telephone (304-285-4401).

Sincerely,

W. J. Gwilliam

William J. Gwilliam
NEPA Document Manager

Enclosure

Note: Please Copy All Responses To:
Meghan Morse
Mangi Environmental Group
7915 Jones Branch Drive, Ste. 2300
McLean, VA 22102
(E-mail address: MMorse@mangi.com)

3610 Collins Ferry Road, P.O. Box 880, Morgantown, WV 26507

[Note: the same maps accompanying the supplemental USFWS letter accompanied this one].

NATIONAL ENERGY TECHNOLOGY LABORATORY
Albany, OR • Morgantown, WV • Pittsburgh, PA

U.S. DEPARTMENT OF ENERGY

July 8, 2010

Franklin Keel, Regional Director
Bureau of Indian Affairs, Eastern Regional Office
545 Marriott Drive, Suite 700
Nashville, TN 37214

Dear Mr. Keel:

Due to some clarification with the proponent, I am sending this supplement to our June 7th communication regarding the SECARB Anthropogenic Project. The change in the project is that up to two injection wells and up to two deep monitoring wells may be drilled on the well pads that are 3 acres. Thus, the total disturbance is expected to be about 1.5 acres per pad or 3 acres total due to the existing clearing in the proposed well locations. Further, the CO_2 to be injected has changed from 125,000 tons per year for three years to 125,000 to 182,500 metric tons per year (or 375,000 to 547,500 total metric tons injected over 3 years). Please see the map below. All other components remain the same.

Please let me know if you have any questions, I can be reached via email (william.gwilliam@netl.doe.gov) or by telephone (304-285-4401).

Sincerely,

W. J. Gwilliam

William J. Gwilliam
NEPA Document Manager

Enclosure

Note: Please Copy All Responses To:
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Mangi Environmental Group
7915 Jones Branch Drive, Ste. 2300
McLean, VA 22102
(E-mail address: MMorse@mangi.com)

3610 Collins Ferry Road, P.O. Box 880, Morgantown, WV 26507

[Note: the same maps accompanying the supplemental USFWS letter accompanied this one].

The above letter was sent to the additional Tribes that the BIA requested the letter be sent, which the below letter is a representative example of the letter sent to the Florida Tribal Historic Preservation Officer, Alabama Tribal Historic Preservation Officer, Kialegee Tribal Town, Miccosukee Indian Tribe, Poarch Band of Creek Indians, Seminole Indian Tribe, Seminole Nation of Oklahoma, and Thlopthlocco Tribal Town.

NATIONAL ENERGY TECHNOLOGY LABORATORY
Albany, OR • Morgantown, WV • Pittsburgh, PA

U.S. DEPARTMENT OF ENERGY

July 9, 2010

Robert Thrower
Tribal Historic Preservation Officer
Poarch Band of Creek Indians
5811 Jack Springs Road
Atmore, AL 36502-5025

Dear Mr. Thrower:

Per the direction of the BIA, you are receiving this letter. Should you require additional information, please contact me by telephone at 304-285-4401 or by email at william.gwilliam@netl.doe.gov.

Sincerely,

W. J. Gwilliam

William J. Gwilliam
NEPA Document Manager

Attachments

Note: Please Copy All Responses To:
Meghan Morse
Mangi Environmental Group
7915 Jones Branch Drive, Ste. 2300
McLean, VA 22102
(E-mail address: MMorse@mangi.com)

3610 Collins Ferry Road, P.O. Box 880, Morgantown, WV 26507

SEMINOLE TRIBE OF FLORIDA
TRIBAL HISTORIC PRESERVATION OFFICE

TRIBAL HISTORIC
PRESERVATION OFFICE

SEMINOLE TRIBE OF FLORIDA
AH-TAH-THI-KI MUSEUM

34725 WEST BOUNDARY ROAD
CLEWISTON, FL 33440

PHONE: (863) 983-6549
FAX: (863) 902-1117

Bill Gwilliam
U.S. Department of Energy
National Energy Technology Laboratory
3610 Collins Ferry Road
P.O. Box 880 MS B07
Morgantown, WV 26507-0880

THPO#:006509A

October 7, 2010

Subject: SECARB Phase III Anthropogenic Test Project, near Citronelle Oil Field, Mobile County, Alabama

Dear Mr. Gwilliam,

The Seminole Tribe of Florida's Tribal Historic Preservation Office (STOF-THPO) has received the U.S. Department of Energy's correspondence concerning the aforementioned project. The STOF-THPO has no objection to your findings at this time. However, the STOF-THPO would like to be informed if cultural resources that are potentially ancestral or historically relevant to the Seminole Tribe of Florida are inadvertently discovered during the construction process. We thank you for the opportunity to review the information that has been sent to date regarding this project. Please reference ***THPO-006509A*** for any related issues.

We look forward to working with you in the future.

Sincerely,

Direct routine inquiries to:

Willard Steele
Tribal Historic Preservation Officer
Seminole Tribe of Florida

Anne Mullins
Compliance Review Supervisor
annemullins@semtribe.com

JLP:am

Appendix G: Public Comments Received

LANCE R. LEFLEUR
DIRECTOR

BOB RILEY
GOVERNOR

Alabama Department of Environmental Management
adem.alabama.gov
1400 Coliseum Blvd. 36110-2400 ■ Post Office Box 301463
Montgomery, Alabama 36130-1463
(334) 271-7700 ■ FAX (334) 271-7950

September 29, 2010

Mr. Bill Gwilliam
U.S. Department of Energy
National Energy Technology Laboratory
3610 Collins Ferry Road
P.O. Box 880, MS B07
Morgantown, WV 26507-0880

Dear Mr. Gwilliam:

We have completed our review of the Draft Environmental Assessment for the Southeast Regional Carbon Sequestration Partnership Phase III Anthropogenic Test Project submitted by the U.S. Department of Energy dated September 17, 2010. The Department has no comment at the current time.

As you are probably aware, construction activities in Alabama may be subject to permitting under the Department's Construction Stormwater program. Information about this program and its requirements can be found at the following web address:

http://www.adem.state.al.us/programs/water/constructionstormwater.cnt

If you have additional questions or need additional information, please call me at (334) 274-4165.

Sincerely,

Chris Bettger

Chris Bettger, Senior Environmental Engineering Specialist
Water Quality Branch

CB/nc

Cc: Chip Crockett, Chief, Stormwater Management Branch

Birmingham Branch
110 Vulcan Road
Birmingham, AL 35209-4702
(205) 942-6168
(205) 941-1603 (FAX)

Decatur Branch
2715 Sandlin Road, S. W.
Decatur, AL 35603-1333
(256) 353-1713
(256) 340-9359 (FAX)

Mobile Branch
2204 Perimeter Road
Mobile, AL 36615-1131
(251) 450-3400
(251) 479-2593 (FAX)

Mobile-Coastal
4171 Commanders Drive
Mobile, AL 36615-1421
(251) 432-6533
(251) 432-6598 (FAX)