

Environmental Assessment Report
CO₂ PIPELINE CROSSING EASEMENT
NATCHEZ TRACE PARKWAY, MILEPOST 113
MADISON COUNTY, MISSISSIPPI

June 2012

Prepared for:

NATIONAL PARK SERVICE
2680 Natchez Trace Parkway
Tupelo, Mississippi 38804

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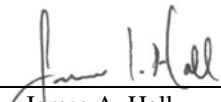


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1.0 PURPOSE AND NEED

1.1 Purpose and Need for the Proposed Action

The National Park Service (NPS) is reviewing a proposal by Denbury Onshore, LLC (Denbury) to install a 24-inch (24”) diameter pipeline across the Ross Barnett Reservoir adjacent to two existing 8-inch (8”) diameter pipelines and underneath the Natchez Trace Parkway near milepost 113 in Madison County, Mississippi, hereinafter referred to as the proposed action. Installation of the proposed pipeline across the Natchez Trace Parkway will utilize the horizontal boring method in order to avoid interference with traffic flow and damage to the road or road bed. The proposed new line is being located adjacent to an existing cleared utility easement in order to avoid and minimize direct impacts to resources within the park boundaries.

The purpose of the proposed action is to provide for transport of liquid carbon dioxide (CO₂) from the Barksdale Dehydration Plant located in Rankin County to the Tinsley Oil & Gas Field located in Yazoo County. Transport of the CO₂ from the existing production and processing facilities in Rankin County to the Oil & Gas Field in Yazoo County is needed in order to improve production of crude oil from existing wells. Injection of CO₂ into crude oil containing formations increases pressure within the formation, making the crude oil miscible, thereby improving oil production. The production, processing, and transmission of CO₂ and the resulting improved production of crude oil resources has direct and indirect beneficial impacts to domestic oil production and employment in the energy services industry. The use of new technologies to recover greater amounts of crude oil from existing facilities results in reduced need for importation of oil from foreign sources, increased employment opportunities, and increased tax revenues to local, state, and federal governments. These results provide a direct benefit to the public while at the same time reducing the environmental impacts associated with constructing new oil production facilities in currently undeveloped lands.

1.2 Purpose and Significance of the Natchez Trace Parkway

The Natchez Trace, or “Old Trace” was an early transportation route developed from a series of trails used by native Americans and subsequently by European explorers and settlers. The Natchez Trace provided an important route for transportation of people and goods for traders and settlers during the colonial and early American periods by providing a land route connecting interior portions of what was to become the southeastern U.S. with the major port city of Natchez. The Natchez Trace was designated as a national port road for mail delivery in 1800, and later figured prominently in movement of troops during the War of 1812 and the Civil War. More modern modes of transportation eventually replaced the Natchez Trace, and many sections became parts of modern local road systems, while other sections were simply abandoned.

The Natchez Trace Parkway is a National Scenic Byway managed by the U.S. Department of Interior, National Park Service. The Parkway is one of 75 designated National Scenic Byways and 21 All-American Roads. The Natchez Trace Parkway was

established by Congress on May 18, 1938, and roughly follows the original Natchez Trace, or Old Trace for 444 miles from Natchez, Mississippi to Nashville, Tennessee. The Natchez Trace Parkway is unique among federal parkways because it commemorates an earlier transportation route. The primary purpose of the Natchez Trace Parkway is to memorialize the historical importance of the Old Trace with a useful and attractive parkway for public use. The Parkway is designed principally for passenger vehicle traffic and has been designed and developed for the benefit and enjoyment of recreational motorists, but also includes sections of maintained trails for hiking and horseback riding. Its design includes a wide insulating zone and excludes commercial roadside development in order to preserve scenic, recreational, natural and historic features. The Parkway includes numerous designated stops for visitors that reflect the history and natural features of the Parkway including Civil War, early American and colonial period historical sites, native American sites, scenic viewpoints, and natural areas. The primary themes commemorated by the Parkway are: Indigenous American Populations, westward expansion of the British colonies and the United States, transportation and American expansion, and the Civil War.

The NPS manages Parkway resources to maintain them in unimpaired condition for future generations in accordance with NPS statutes including the Organic Act of 1916 and the National Parks Omnibus Management Act of 1998 as well as various applicable environmental laws such as the Clean Air Act, the Clean Water Act, the National Environmental Policy Act (NEPA), the Endangered Species Act, and the National Historic Preservation Act.

1.3 Project Background and Scoping

1.3.1 Project Background

The proposed pipeline crossing of the Parkway is located near milepost 113 in Madison County, Mississippi. The subject section of the Parkway parallels the western shore of Ross Barnett Reservoir and lands owned by the Pearl River Valley Water Supply District to the east of the Parkway, and privately owned lands to the west of the Parkway. The proposed crossing includes approximately 542 linear feet within National Park Service lands. Two existing eight-inch (8") underground CO₂ pipelines exist within a thirty feet (30') wide easement adjacent to the proposed new pipeline location. The new proposed new twenty four-inch (24") pipeline will be installed approximately ten feet (10') south of the southern most existing line within a forty feet (40') wide easement, altogether resulting in a pipeline easement containing three lines within a seventy feet (70') wide easement.

Denbury proposes to install the new pipeline underneath the Natchez Trace Parkway using the horizontal boring method. The proposed horizontal boring will utilize boring equipment installed in a bore pit to be excavated on the eastern side of the Parkway to perform the installation of the pipeline underneath the Parkway. This method is a widely used and accepted means of pipeline installation for avoiding traffic disturbances and damage to the road bed and to the roadway. The entry and exit points of the bore will be located approximately twenty five feet (25') from the western and eastern sides of the Parkway. The pipeline will be installed underneath the Parkway and adjacent borrow

ditches at a depth no less than six feet (6') below existing ground surface. A plan and profile view of the Parkway and the design pipeline location is included in the attached exhibits.

1.3.2 Project Scoping

Scoping is the process of involving government agencies, organizations, and public in determining the issues to be addressed in the environmental document. The scoping process allows for determination of important issues to be considered and allows for determination of those issues not considered important. Scoping identifies other permits, surveys, and consultations that may be required with other agencies and stakeholders, and develops a schedule for preparation and distribution of the environmental document for public review and comment. The scoping process is intended to allow for provision and consideration of opinions and consultation from the interested public, affected parties, and agencies with interests or legal jurisdiction.

1.3.3 Internal Scoping

National Park Service and Parkway staff with relevant expertise and roles have been consulted regarding the issues and impact topics appropriate for consideration in this environmental document.

1.3.4 External Scoping

On behalf of the NPS, Denbury informally consulted with the U.S. Fish & Wildlife Service (USFWS) regarding the potential of the proposed action to affect federally protected species and critical habitat, consistent with the conditions of the Endangered and Threatened Species Act. Denbury likewise informally consulted with the Mississippi Department of Wildlife, Fisheries and Parks (MDWFP) concerning the potential of the proposed action to affect state listed species and habitats of special concern. NPS will consult with the Mississippi Department of Archive and History, State Historic Preservation Officer (SHPO) regarding the potential of the proposed action to affect cultural and historic resources, consistent with the conditions of Section 106 of the National Historic Preservation Act. The environmental assessment will undergo a public review. The NPS will consider comments received from the public, agencies, and other entities.

1.4 Determination of Non-Impairment Discussion

The NPS *Management Policies 2006* requires consideration of the impacts of the proposed action and a written determination that the activity will not lead to an impairment of park resources and values. *Management Policies 2006*, Section 1.4.5 states impacts are considered more likely to constitute impairments to the extent that they affect a resource or value whose conservation is necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park, key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or identified in the park's general management plan or other relevant NPS planning documents as being of significance. A written determination of non-impairment will be prepared for the selected action and included as an appendix to the Record of Decision (ROD) or Finding of No Significant Impact (FONSI).

2.0 ISSUES

The issues relevant to the proposed action were identified through evaluation of the proposed action with respect to the potential direct and indirect impacts to the Parkway resources as directed by the Department of Interior, Department Manual, Part 516 (DM 516) and National Park Service, Director's Order 12 Handbook (DO-12). Issues considered fall under the following general categories:

1. Natural Resources – The potential of the proposed action to have direct or indirect impacts to the Parkway's soils, vegetation, and wildlife;
2. Visitor Experience – The potential for the proposed action to have direct or indirect impacts to visitors' experience because of impacts to the Parkway viewscape and road condition; and
3. Parkway Operations – The potential for the proposed action to have direct or indirect impacts to Parkway commitments and maintenance operations.

2.1 Determination of Impact Topics

Specific impact topics were developed for this review to focus the analysis and allow comparison of the potential environmental consequences of each alternative. The impact topics were identified through internal and external scoping, review of applicable federal laws, regulations, and Executive Orders, NPS management policies, and NPS knowledge of sensitive resources. A brief rationale for the selection of each impact topic discussed in provided in the following sections, as well as the rationale for dismissing other topics from further consideration.

2.2 Impact Topics Analyzed in Detail

2.2.1 Soils

DO-12 requires protection of park resources, including soils, to maintain a park's scenery, natural and historic objects, and the processes and conditions that sustain them. NEPA requires an examination of impacts from major federal actions to include all components of affected ecosystems. Because the proposed action would have a potential impact to soil materials, soil is an impact topic analyzed in further detail in this environmental assessment.

2.2.2 Vegetation

DO-12 requires protection of park resources, including vegetation, to maintain a park's scenery, natural and historic objects, and the processes and conditions that sustain them. NEPA requires an examination of impacts from major federal actions to include all components of affected ecosystems. Because the proposed action would have a potential impact to vegetation within the NPS lands, vegetation is an impact topic analyzed in further detail in this environmental assessment.

2.2.3 Wildlife

DO-12 requires protection of park resources, including wildlife, to maintain a park's scenery, natural and historic objects, and the processes and conditions that sustain them. NEPA requires an examination of impacts from major federal actions to include all components of affected ecosystems. Because the proposed action would have the potential to impact wildlife within the NPS lands, wildlife is an impact topic analyzed in further detail in this environmental assessment.

2.3 Impact Topics Dismissed From Further Analysis

2.3.1 Wetlands

Executive Order 11990, Protection of Wetlands, requires an examination of impacts to wetlands. The Federal Water Pollution Control Act, and amendments contained in the Clean Water Act, set forth a national policy to restore and maintain the chemical, physical, and biological integrity of the nation's waters, to enhance the quality of water resources, and to prevent, control, and abate pollution of the nation's waters. NPS Director's Order 77-1 establishes NPS policies, requirements, and standards for implementing Executive Order 11990, and DO-12 provides direction for the preservation, use and quality of water in national parks. NPS utilizes the U.S Fish & Wildlife Service's (USF&WS) *Classification of Wetlands and Deepwater Habitats of the United States*, Cowardin et al. 1979 (DOI Report FWS/OBS-79/31) to classify wetlands pursuant to E.O. 11990. According to the Cowardin definition a wetland must possess one or more of the following three attributes: at least periodically, the land supports predominately hydrophytic vegetation; the substrate is predominately undrained hydric soils; or the substrate is non-soil and is saturated with water or covered by shallow water at some time during the growing season of each year.

The proposed action does not meet the requirements of the federal wetland permitting process under Section 404 of the Clean Water Act. USF&WS, National Wetland Inventory (NWI) maps do not indicate the presence of designated wetland areas within the Parkway at the proposed crossing location. The soil descriptions published by the U.S. Natural Resource Conservation Service do not list the soil type as hydric. A wetland delineation was performed at the site to document conditions relative to the presence or absence of potential wetlands and other "Waters of the U.S." and is included as Attachment H. The investigation revealed no areas that meet the criteria for classification as wetland according to the Cowardin classification system or the U.S. Army Corps of Engineers wetland delineation procedures. Therefore, wetlands are an impact topic that is not analyzed in further detail in this environmental assessment. A copy of the NWI map showing the approximate project location is included as Attachment G. Neither the proposed action nor the no-action alternative will impact wetlands or water quality within the Natchez Trace Parkway right-of-way.

2.3.2 Visitor Use and Experience

Providing an enjoyable experience for visitors is one of the fundamental purposes of the NPS according to the Organic Act. The 1999 Natchez Trace Parkway *Statement for Management* and other park policy documents reiterate the importance and significance

of recreational values and establish provisions for recreational uses by providing quality facilities for a meaningful visitor experience.

The proposed action will require posting two identification markers (see Exhibits for marker diagram) consisting of circular shaped signs measuring less than twelve inches (12") in diameter mounted to posts approximately fifty inches (50") above ground to mark the location of the underground line within Parkway boundaries. Posting location and emergency information is required either side of public roadways per DOT requirements as described in 49 CFR §195.410, with federal penalties including fines up to \$5,000 and/or up to one year prison sentence if convicted for damage or removal of pipeline markers. The markers are to be the minimum size permitted, resulting in a sign less than one foot (1') in diameter installed at approximately four feet (4') above ground, which is closer in size to a fence post than a typical roadside sign. The two identification markers will be identical to the four existing ones marking the locations of the two existing lines. The new marker located on the eastern side of the roadway will be visible to vehicles traveling the roadway, but the marker located on the western side will not be visible from the roadway. The small size and location of the markers is unlikely to have a significant impact to visual resources or visitor experience. Although one new marker will be visible from the roadway, neither is to be located nearby visitor facilities, historic sites, designated stops or scenic vistas.

Neither the proposed action nor the no-action alternative has potential for significant impacts to visitor experience at the Natchez Trace Parkway due to the minimal impacts to Parkway resources. No significant direct or indirect impacts to visitor use is anticipated due to the brief duration of planned construction activities and the presence of visual screening from the adjacent construction activities provided by existing vegetation buffers. Therefore, visitor experience is an impact topic that is not analyzed in further detail in this environmental assessment.

2.3.3 Safety

The proposed action involves placement of a pipeline utility for transporting liquid CO₂. The proposed crossing is designed to be installed at a minimum depth of three feet (3') beneath the natural ground surface of the Parkway. The pipeline will have a twenty four inch (24") diameter with a 0.562" wall thickness consisting of coated steel with a maximum operating pressure of 1,797 pounds per square inch (psi). Pipeline integrity will be tested by water pressure testing to 2,250 psi minimum prior to operation in accordance with applicable safety testing guidelines. Pipeline locations will be marked with emergency contact information in accordance with 49 CFR §195.410.

Due to the depth of installation of the pipeline the potential for accidental impacts from any means within the Parkway area is highly unlikely. Liquid CO₂ rapidly vaporizes into a gaseous state when released from a pressurized pipeline. In order for gaseous CO₂ to be a safety concern the concentration must equal or exceed five percent (5%) concentration in the atmosphere, which would only realistically be achieved in a confined or enclosed space. Therefore, a leak or accidental release at the Parkway crossing would not present a safety concern to Parkway visitors or staff, or to wildlife. The gas is not combustible and does not pose a threat for explosion in the presence of an ignition

source. Based on these considerations there is no significant potential for impacts to safety from the proposed action, therefore safety is an impact topic not analyzed in further detail in this environmental assessment.

2.3.4 Parkway Operations

Activities associated with installation of the proposed pipeline will be of brief duration and will not result in a significant demand for staff supervision or result in impacts to land use. Operation and routine maintenance of the pipeline will have no impacts to Parkway staff, operations, or land use, and therefore Parkway operations is an impact topic not analyzed in further detail in this environmental assessment.

2.3.5 Unique or Important Wildlife Habitat

No areas of unique or habitats of special concern have been identified in proximity to the proposed action. Habitat impacts resulting from construction activities and limited clearing along the edge of the existing cleared utility corridor may have temporary minor impacts to the existing wildlife habitat. The existing habitat consists of mixed pine and hardwood forest edge dominated by species typical of clearing edges and roadsides, and is not considered unique, uncommon to the area, or of exceptional value to native wildlife species of concern. Therefore, unique or important wildlife habitat is an impact topic not analyzed in further detail in this environmental assessment.

2.3.6 Threatened and Endangered Species

The federal Endangered Species Act of 1973, as amended, requires an examination of potential impacts on all federally listed threatened and endangered species and designated critical habitat. NPS DO-12 establishes policies for considering potential impacts on federal candidate species, as well as state listed threatened, endangered, candidate, rare, declining, and sensitive species.

The proposed action will result in no direct or indirect impacts to known protected species including federally listed or candidate species and critical habitat, and including state listed species of special concern. Correspondence with USFWS and MDWFP (included as Attachment A) concerning the potential for impacts to federally or state listed species and habitat provides written concurrence of no known impacts. Therefore, threatened and endangered species is an impact topic not analyzed in further detail in this environmental assessment.

2.3.7 Paleontology and Geology

The area of the proposed action is within the North Central Hills physiographic province and is underlain by the Cockfield and Yazoo Formations, neither of which is considered geologically active. Surface topography is gently sloping to undulating with elevations ranging from 475 to 140 foot above mean sea level. The fossil record from surface and near surface soils is very low with only 128 fossils recorded statewide from soils developed during the same period as soils in vicinity of the proposed action. Therefore, geology and paleontology are impact topics not further discussed in this environmental assessment.

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2.3.8 Water Quality

The 1972 Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977 (33 U.S.C 1251 et seq.), is a national policy to restore and maintain the chemical, physical, and biological integrity of the nation's waters, to enhance the quality of water resources, and to prevent, control, and abate water pollution. Section 401 of the Clean Water Act requires a permit for any activity which may result in discharge into navigable waters of the United States. Section 404 of the Clean Water Act requires a permit for any activity which may result in the discharge of dredged or fill material into navigable waters, including adjacent wetlands. NPS DO-12 provides direction to the preservation, use, and quality of water in national parks.

No direct impacts to water resources within the Parkway boundaries will result from the proposed action therefore, water quality is an impact topic not analyzed in further detail in this environmental assessment.

2.3.9 Floodplains

Executive Order 11988 (*Floodplain Management*) requires examination of potential impacts to floodplains and potential risk involved in placing facilities with designated special flood hazard areas. NPS DO-12 establishes guidelines for considering actions within floodplains and provides direction for the preservation, use, and quality of water in national park lands.

The proposed action is not within a designated floodplain or other special flood hazard area and will not result in placement of structures or modifications to flood patterns within regulated floodplains. Therefore, floodplains in an impact topic not analyzed in further detail in this environmental assessment.

2.3.10 Indian Trust Resources

Secretarial Order 3175 requires that any anticipated impacts to designated Indian Trust resources from a proposed action by Department of Interior agencies be explicitly addressed in the related environmental documents. The federal Indian Trust responsibility is a legally enforceable fiduciary obligation on the part of the United States to protect tribal lands, assets, resources, and treaty rights, and it represents a duty to carry out mandates of federal law with respect to American Indian and Alaskan Native tribes. The lands in proximity to the Parkway and proposed action are not held in trust by the Secretary of the Interior for the benefit of Indians due to their status as Indians. Therefore, Indian Trust resources is an impact topic not analyzed further in this environmental assessment.

2.3.11 Prime or Unique Farmland

The Council on Environmental issued a 1980 directive for federal agencies to assess the effects of proposed actions on farmland soils classified as prime or unique by the United States Department of Agriculture, Natural Resource Conservation Service. Prime or unique farmland is defined as containing soils particularly suited to production of crops such as common foods, forage, fiber, and oil seed. Unique farmland produces specialty crops such as fruits, vegetables, and nuts.

Review of the soils status for lands in proximity to the proposed action indicates no soils classified as prime or unique farmland occur in proximity to the proposed action. Therefore, no impacts to prime or unique farmland are identified and are not analyzed further in this environmental assessment.

2.3.12 Environmental Justice

Executive Order 12898 (*General Actions to Address Environmental Justice in Minority Populations and Low Income Populations*) requires that all federal agencies incorporate environmental justice into their missions by identifying and addressing the disproportionately high and adverse health or environmental effects of their programs and policies on minorities or low income populations or communities.

The proposed action will have no direct or indirect impacts to individual residences or populations of individuals and as such will not have a disproportionate adverse health or environmental effect on minority or low income populations or communities as defined in the Environmental Protection Agency's *Draft Environmental Justice Guidance*. Therefore environmental justice is an impact topic not analyzed further in this environmental assessment.

2.3.13 Soundscapes and Noise

NPS Directors Order 47 (*Sound Preservation and Noise Management*) identifies preservation of natural soundscapes within national park lands as an important part of the NPS mission. Natural soundscapes are those sounds that exist in the absence of human-caused sound. The natural ambient soundscape consists of the aggregate of all the natural sounds that occur together with the landscapes physical capacity for transmitting those sounds. Natural sounds occur within and beyond the range of sounds that humans can perceive and can be transmitted through air, water, or solid materials. The frequencies, magnitudes, and durations of human-caused sound considered acceptable varies among NPS units and throughout a given park unit, being generally greater in developed areas and less in undeveloped areas.

The proposed action will result in temporary noise impacts near milepost 113 for the duration of construction activities related to the horizontal bore. The impacts are anticipated to persist for a period of approximately two weeks. The location of the proposed action is principally utilized by motor vehicle traffic and the resulting occupancy in the area of the proposed action is of short duration. Visitor use associated with motor vehicle traffic and the resulting roadway noise is such that noise impacts to visitor use and experience for the proposed action are not considered significant. Following completion of construction activities the soundscape will return to the existing condition. Therefore soundscapes and noise is an impact topic not analyzed further in this environmental assessment.

2.3.14 Air Quality

The federal Clean Air Act, as amended, establishes procedures for improving air quality conditions including establishment of a set of National Ambient Air Quality Standards. The Air Quality Standards are based on six constituents of concern; carbon monoxide,

nitrogen dioxide, ozone, particulate matter, sulfur dioxide, and lead. A system of monitoring is established across the nation to measure levels of these constituents, and if an area is found to exceed allowable levels, the area is considered in “nonattainment” and local officials are required to develop a plan for achieving air quality that meets the standards.

The proposed action will not occur within designated nonattainment areas and will not require new source permitting by Mississippi Department of Environmental Quality or directly result in additional volumes of constituents of concern. Therefore air quality is an impact topic not analyzed further in this environmental assessment.

2.3.15 Socioeconomic Environment, Including Land Use

The proposed action will not result in land use changes within NPS lands. The proposed action will provide a beneficial short-term impact to the local economy due to increased employment opportunities for construction work force and revenues for local businesses and government generated from construction activities and workers. An internal zoning system, described as the *Natchez Trace Parkway General Management Plan* identifies land management requirements within the Parkway. The proposed action will not require changes in land use or have no significant impacts to Parkway land use. Therefore, socioeconomic environment and land use are impact topics not analyzed further in this environmental assessment.

2.3.16 Cultural Resources

NPS DO-12 and Section 106 of the federal Historic Preservation Act require that potential effects on cultural resources be evaluated, and that appropriate steps be taken to avoid, minimize, or mitigate harmful effects. The NPS recognizes five categories of cultural resources; archeological resources, historic structures, ethnographic resources, cultural landscapes, and museum collections.

The proposed action will result in no significant impacts to the land surface resources within the Parkway boundaries. A copy of a completed Phase I Cultural Resource Assessment Report covering the project area is included as Attachment E. Coordination with the State Historic Preservation Officer (SHPO) concerning the potential for impacts to cultural resources was conducted and resulted in a determination of no known impacts. Copies of written correspondence with the SHPO are included as Attachment F. No cultural resources are known to exist within proximity to the proposed action, therefore, cultural resources is an impact topic not analyzed further in this environmental assessment.

3.0 ALTERNATIVES CONSIDERED

3.1 Introduction

The alternatives section describes and analyzes alternative pathways to achieving a particular result. The alternatives examined are the preferred alternative and the no action alternative. Two construction methods for achieving the preferred alternative are considered. No other logistically or economically feasible alternative for transporting CO₂ from Rankin County to Yazoo County has been identified.

The purpose of considering a no action alternative is to provide a basis for comparison of the proposed action and the associated potential environmental impacts. The no action alternative is defined as no construction activity on or below Parkway lands for installation of the proposed pipeline.

3.2 No Action Alternative (Alternative A)

The no action alternative would result in the absence of any commitment of NPS staff to review the proposed action and to process the associated easement request. The no action alternative would result in no potential for any occurrence of near-term direct effects to Parkway resources outside of those presented by the continued existence of the two current 8" lines at the proposed crossing location. The no action alternative would effectively preclude efficient transportation of CO₂ produced at the Rankin County facility to the Oil & Gas fields in Yazoo County, as the Natchez Trace Parkway effectively creates a geographic obstacle between Rankin and Yazoo Counties, and other means of transportation (road or rail transport) are insufficient to realistically move adequate volumes at a meaningful or cost-effective rate. Additionally, transportation by other means would result in high levels of heavy traffic and associated engine emissions (road transport), or extensive development of currently undeveloped areas and associated impacts for construction of a rail transportation route. The no action alternative would limit the need for production of CO₂ from the producing formation in Rankin County and production of crude oil from existing wells in the Tinsley Oil & Gas field, resulting in reduction of jobs and hydrocarbon production along with the associated economic benefits those provide. The no-action alternative is not the preferred alternative for several reasons:

- There is no realized environmental benefit with forcing alternate methods of transportation or precluding transportation from existing CO₂ production facilities to existing oil production facilities;
- The cumulative effects of alternate methods of transportation would greatly exceed the impacts of the proposed action; and
- The proposed action will have no significant impacts to Parkway resources.

3.3 Proposed Action (Alternative B)

The proposed action would require review and approval of the request for easement to allow installation of the proposed CO₂ pipeline using a combination of open trenching and horizontal boring construction methods. The proposed action will increase the existing 30 feet wide easement to 70 feet wide and result in temporary disturbance of vegetation and soils within the narrow linearly-shaped area where excavation will occur. Operation of construction equipment and limited vehicle traffic for access would occur within park boundaries during installation of the pipeline. The proposed action would utilize horizontal boring techniques for approximately 72 linear feet to prevent impacts to the road surface. Open trenching construction methods will be used for the remaining approximately 470 linear feet section of the pipeline. Considering the length of the entire crossing, installation using open trenching eliminates a number of concerns associated with installation using horizontal drilling of the entire length, including fracturing of drilling fluids into the environment, integrity of the line construction, and operational requirements of the drilling equipment. Therefore, the proposed action will provide a significantly greater level of safety to the human and natural environment compared to Alternative C. Based on the analysis of effects to environmental resources resulting from the proposed action and alternatives it is reasonable to conclude that the proposed action is the preferred alternative.

3.4 Horizontal Directional Drilling Installation (Alternative C)

Alternative C is described as utilization of horizontal directional drilling (HDD) construction methods to install the pipeline underneath Parkway lands. As in Alternative B, this method of pipeline installation would also require review and approval of the request for easement by NPS, and would increase the existing 30 feet wide easement to a 70 feet wide easement. HDD installation may reduce the total area of land surface disturbed within Parkway boundaries, but would not eliminate the need for disturbance of soils and operation of construction equipment within Parkway boundaries. HDD installation would result in operation of substantially larger scale drilling equipment within parkway boundaries than Alternative B, and would also require a larger area for staging and operation of equipment and materials. This alternative would also result in additional clearing and soil disturbance on lands adjacent to the Parkway that would not be necessary in Alternatives A or B. A detailed description addressing the technical limitations of the HDD construction method applicable to the subject site is included with the report as Attachment C. HDD construction methods would also introduce additional environmental and technical concerns associated with fracturing of drilling fluids and integrity of the installed pipeline. There is also the possibility that HDD construction methods, if attempted, would not prove successful, and installation using open trench construction methods would ultimately be required. Based on these considerations, Alternative C is not the preferred alternative.

3.5 Environmentally Preferred Alternative

NPS DO-12 requires identification of the environmentally preferred alternative in all environmental documents. The environmentally preferred alternative is determined by applying the criteria identified in Section 101 of NEPA, which includes:

- Fulfilling the responsibilities of each generation as a trustee of the environment for succeeding generations;
- Assuring for all generations safe, healthful, productive, aesthetic, and culturally pleasing surroundings;
- Attaining the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable or unintended consequences;
- Preserving important historic, cultural, and natural aspects of our national heritage and maintaining wherever possible an environment that supports diversity and variety of individual choice;
- Achieving a balance between populations and resource use that will permit high standards of living and a wide sharing of life's amenities; and
- Enhancing the quality of renewable resources and approaching the maximum attainable recycling of depletable resources.

The environmentally preferred alternative is the alternative that causes the least damage to the biological and physical environment, and that best protects, preserves, and enhances historic, cultural, and natural resources. The section summarizes the extent to which each alternative is consistent with the six policies outlined above.

Alternative A (no-action) would satisfy most of the requirements outlined above with regard to direct impacts of park resources. However, this alternative would result in impacts to areas outside of Park Service lands that would substantially exceed the minimal and temporary impacts to Parkway resources from Alternatives B and C. In comparison to Alternatives B and C, the no-action alternative would not serve to achieve a balance between populations and resource use that would permit high standards of living and a wide sharing of life's amenities due to the increased impacts and costs associated with alternative methods of transporting the CO₂ to the oil fields.

Alternatives B and C would temporarily have impacts to park resources during construction and therefore would not satisfy the first four requirements outlined above to the extent the no-action alternative would. Both Alternative B and C would better satisfy the fifth requirement than the no-action alternative, as discussed in the preceding paragraph. Both Alternative B and C would also better satisfy the sixth requirement than the no-action alternative as a result of allowing efficient production of hydrocarbon resources from existing fields. Although production of hydrocarbons is not enhancing quality of renewable resources and does not meet a strict definition for recycling of depletable resources, efficient transportation of CO₂ to the oil fields will maximize production of a depletable resource that would otherwise go unrecovered, while reducing

the need for development of new exploration, producing, and transportation facilities within currently undeveloped areas.

Alternative C in particular is not considered to attain the widest range of beneficial uses of the environment without degradation, risk or health or safety, or other undesirable or unintended consequences due to the possibility for fracturing of drilling fluids during construction, and the possibility the construction methods may fail to effectively install the pipeline. Therefore, Alternative C is not considered the environmentally preferred alternative.

3.6 Summary of Mitigation for Proposed Action

Mitigation measures are those actions intended to avoid or reduce harmful impacts to potentially affected resources. The proposed action has been determined to have the potential for minimal impacts to soils, vegetation, and wildlife resources. The mitigation measures proposed to reduce the intensity of the potential impacts are primarily related to minimization of the size and duration of the proposed construction activities. Work is to be performed in an efficient manner in order to avoid long term impacts from construction activities. Clearing and soil disturbance is to be limited to smallest area necessary for performed the required tasks in order to minimize impacts to soils, vegetation, and wildlife habitat. Appropriate erosion and sediment control practices will be employed to prevent impacts to water quality from stormwater runoff, including scheduling work during dry weather conditions, limiting vehicle and equipment access to areas of stable soils, utilization of temporary runoff controls, and returning the site to existing conditions by reestablishing vegetative cover. All temporary markers, flagging, and extraneous materials present during the construction process will be entirely removed. Permanent markers will be installed in the minimum size and number permitted with only one of the two required markers placed in a location visible to vehicles traveling the roadway. An equivalent number of pine and/or hardwood tree species will be planted at an appropriate location as determined by NPS in order to help mitigate for the required clearing of an approximately 0.1-acre area of forest within Parkway boundaries. In the event that previously undocumented vegetation or wildlife of species of special concern, or cultural resources are discovered during the course of construction, all construction operations will be immediately halted and NPS personnel contacted in order to determine the appropriate course of action.

3.7 Alternatives Considered but Dismissed

Other alternatives considered included alternative locations for the proposed crossing and alternative construction methods for implementing the proposed crossing. No other feasible alternative location was identified that would reduce the potential impacts further than the proposed action, which makes use of an existing utility corridor and easement and reduces the need for establishment of a new utility corridor for a crossing at a different location. The environmental impacts of creating a new utility corridor for crossing the Parkway are considered to be significantly greater than those associated with the proposed action.

TABLE 1:

COMPARITIVE SUMMARY OF ALTERNATIVES		
Alternative A (No-Action)	Alternative B (Preferred Alternative)	Alternative C
<p>No-Action alternative is described as no approval of the request for easement and no installation of an additional pipeline at the existing crossing.</p> <p>The No-Action alternative will not meet the project needs.</p>	<p>Alternative B is described as approval of an easement to allow installation of a 24" CO₂ pipeline adjacent to an existing easement containing two 8" CO₂ pipelines. Alternative B proposes to utilize a combination of open trench excavation and directional boring construction methods for installation of the proposed pipeline.</p> <p>Alternative B will meet the project needs by providing access for efficient transportation of CO₂ and locating the crossing of Parkway lands adjacent to an existing cleared pipeline easement.</p>	<p>Alternative C is described as approval of an easement to allow installation of a 24" CO₂ pipeline adjacent to an existing easement containing two 8" CO₂ pipelines. Alternative C proposes to utilize Horizontal Directional Drilling construction methods for installation of the proposed pipeline.</p> <p>Alternative C will not meet the project needs due to the limitations of the construction equipment to operate effectively within the constraints of the area and topography of the site.</p>

TABLE 2:

SUMMARY OF ENVIRONMENTAL CONSEQUENCES			
Impact Topics	Alternative A (No-Action)	Alternative B (Preferred Alternative)	Alternative C
Soils	The No-Action Alternative would have no direct impacts to soils beyond those presented by the continued presence of the existing pipelines. The No-Action Alternative would have indirect impacts to the environment by necessitating alternative methods of transportation for the CO ₂ that would be less efficient and/or impact larger areas of currently undeveloped land.	Minor, short-term, adverse impacts to surface soils would occur as a result of the proposed action. No long-term adverse impacts are anticipated due to the proposed restoration of surface features following completion of construction. No significant, adverse, short or long-term impacts to surface or near surface soils of the Parkway at the proposed crossing location will result from the Preferred Alternative. No impacts to groundwater resources would result from the boring and trenching activities or from the pipeline placement. The proposed action would not result in adverse impacts to soils in a manner that would affect Parkway resources or visitor use or experience.	Alternative C has potential to cause limited adverse impacts to soils and groundwater due to the possibility of drilling fluids fracturing the soils and discharging to the surface or entering near surface groundwater. Fracturing of drilling fluids could result in unintended, although localized, adverse impacts to soils and groundwater.
Vegetation	The No-Action Alternative would have no direct impacts to vegetation beyond those presented by the continued presence of the existing pipelines. The No-Action Alternative would have indirect impacts to the environment by necessitating alternative methods of transportation for the CO ₂ that would be less efficient and/or impact larger areas of currently undeveloped land.	The Preferred Alternative will result in removal of existing vegetation from within a small area of NPS lands, and is considered to have minor short and long-term adverse impacts. The vegetation to be cleared is not considered unique, uncommon to the area, or of exceptional value to native wildlife species of concern. The forested area to be cleared is located along the eastern edge of the Parkway boundary and is largely screened from view by visitors traveling the roadway by an earthen bank and existing forest. The proposed action is not considered to have a significant adverse impact to vegetation resources in the Parkway or to visitor use or experience.	Alternative C would result in no long-term adverse impacts to vegetation. A portion of the grassy area east of the Trace roadway would be disturbed for operation of the drilling equipment and staging of necessary equipment and materials, resulting in minor, short term adverse impacts.

TABLE 2: (continued)

SUMMARY OF ENVIRONMENTAL CONSEQUENCES			
Impact Topics	Alternative A (No-Action)	Alternative B (Preferred Alternative)	Alternative C
Wildlife	The No-Action Alternative would have no direct impacts to wildlife beyond those presented by the continued presence of the existing pipelines. The No-Action Alternative would have indirect impacts to the environment by necessitating alternative methods of transportation for the CO ₂ that would be less efficient and/or impact larger areas of currently undeveloped land.	No significant, direct, adverse impact to wildlife or overall ecosystems that sustain native wildlife within the Parkway will occur as part of the proposed action. Limited clearing along the edge of the existing cleared utility corridor and the temporary presence of construction equipment may have minor, temporary adverse impacts to wildlife during the construction period, but no permanent adverse impacts and no long-term displacement of native wildlife is anticipated to result from post-construction operations of the pipeline facilities. The wildlife habitat to be disturbed is not considered unique, uncommon to the area, or of exceptional value to native wildlife species.	Alternative C would result in no direct impact to wildlife or overall ecosystems that sustain native wildlife within Parkway boundaries. Temporary presence of construction equipment may have minor, temporary impacts to wildlife during the construction period, but no permanent impacts and no long-term displacement of native wildlife is anticipated to result from post-construction operations of the pipeline facilities. The wildlife habitat to be disturbed is not considered unique, uncommon to the area, or of exceptional value to native wildlife species.

4.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

4.1 Soils

4.1.1 No-Action Alternative

Under the No-Action Alternative the ROW easement would not be expanded beyond the existing dimensions and no additional pipeline would be installed across Parkway lands at the proposed location. No soils within Parkway boundaries would be disturbed under the No-Action Alternative. The No-Action Alternative would have no adverse impacts to soils beyond those presented by the continued presence of the existing pipelines.

4.1.1.1 Intensity of Impacts

The intensity of both adverse and beneficial impacts to soils from the No-Action Alternative would be negligible due to the absence of disturbance for installation of a pipeline. The continued presence of the 2 existing lines within the existing ROW is considered to have negligible adverse impacts due to the absence of realized impacts to Parkway resources since installation.

4.1.1.2 Duration of Impacts

No adverse or beneficial impacts to soils within Parkway boundaries would occur as part of the No-Action Alternative, therefore the duration of impacts would not exist. Impacts to soils resulting from the continued presence of the 2 existing lines within the existing ROW are considered long-term.

4.1.1.3 Cumulative Effects

Cumulative impact is defined in 40 CFR 1508.7 as the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. The No-Action Alternative would have no cumulative effects to soils within Parkway boundaries. The No-Action Alternative would have reasonably foreseeable cumulative effects to soils in areas outside of Parkway lands by requiring alternative CO₂ transportation methods that would have greater overall adverse environmental impacts, as discussed in Sections 3.2 and 3.5 of this report.

4.1.1.4 Conclusion

The No-Action Alternative will result in no short or long term adverse impacts, and no beneficial impacts, to Parkway soils. The No-Action Alternative would have no adverse impacts to soils beyond those presented by the continued presence of the existing pipelines, which are considered site-specific, long-term and negligible. The No-Action Alternative would result in additional adverse impacts to soils in areas outside of Parkway lands associated with alternative methods needed for CO₂ transportation or hydrocarbon production.

4.1.2 Preferred Alternative

The horizontal boring beneath the Parkway would result in adverse impacts to subsurface soils in a cylindrical area $\geq 6'$ below the road surface, and $\geq 3'$ below the ground surface in an open cut trench along the remaining length of the crossing. The published *Soil Survey of Madison County* list the soils of the project area as Smithdale-Providence complex, 12-17 percent slopes, eroded. The soils are classified as well drained silt loams with a depth to water table beyond 80 inches (the maximum depth of soils described in the *Soil Survey*). Based on information contained in the *Soil Survey* and analysis of soils at adjacent locations, it is likely the subsurface soils at the impacted depths consist of loam and/or silt loam in texture and composition. The context of impacts to soils is considered to be site-specific.

4.1.2.1 Intensity of Impacts

Impacts to soils from the installation of the proposed pipeline beneath the Parkway using the horizontal boring method would consist of loss of a small amount of soils removed during the boring process. Impacts to soils from the open trench excavation would consist of temporary displacement of soils and the likelihood of some degree of mixing of soils layers in the materials excavated. Neither of these impacts is likely to have a noticeable effect on soil resources in comparison to surrounding soils. Given the nature of impacts and the small area to be disturbed, adverse impacts to soils are considered minor.

4.1.2.2 Duration of Impacts

Long-term impacts are defined as those that last more than one year, and short-term impacts are those that attenuate in less than one year. The impacts to soils from the proposed action are anticipated to persist throughout construction with the surface being restored to existing conditions immediately upon completion of construction, and therefore are classified as short-term, adverse impacts.

4.1.2.3 Cumulative Effects

Although the proposed crossing placement would have short-term adverse impacts to soils as described above, the presence of pipelines at $\geq 3'$ below ground surface is not anticipated to have any long-term adverse impacts to surface soil uses and functions. This determination is further supported by the lack of recognized impacts from the two existing pipelines currently present at the location.

4.1.2.4 Conclusion

The proposed action will result in minor, short-term, adverse impacts during construction of the pipeline. The proposed action will result in no long-term adverse impacts to soils due to restoration of the site to original conditions following construction. No significant short or long-term adverse impacts to surface or near surface soils of the Parkway at the proposed crossing location will result from the proposed project. No adverse impacts to groundwater resources would result from the boring and trenching activities or from the pipeline placement. The proposed action would not result in adverse impacts to soils in a manner that would affect Parkway resources or visitor use or experience.

4.2 Vegetation

4.2.1 No-Action Alternative

Under the No-Action Alternative the ROW easement would not be expanded beyond the existing dimensions and no additional pipeline would be installed across Parkway lands at the proposed location. No additional vegetation would be disturbed under the No-Action Alternative, however the existing cleared ROW would continue to be maintained by mowing. The No-Action Alternative would have no adverse impacts to vegetation beyond those presented by the continued presence of the existing pipelines and cleared ROW.

4.2.1.1 Intensity of Impacts

The intensity of both adverse and beneficial impacts to vegetation from the No-Action Alternative would be negligible due to the absence of disturbance for installation of a pipeline. The existing lines are within an existing cleared ROW maintained by mowing. The continued presence of the 2 existing lines within the existing ROW is considered to have negligible adverse impacts due to the absence of realized impacts to Parkway resources since installation. The lack of realized impacts to vegetation from the existing lines is due in part to the presence of cleared areas of open field adjacent to the majority of the pipeline crossing ROW.

4.2.1.2 Duration of Impacts

No adverse or beneficial impacts to vegetation within Parkway boundaries would occur as part of the No-Action Alternative, therefore the duration of impacts would not exist. Impacts to vegetation resulting from the continued presence of the 2 existing lines within the existing ROW are considered long-term due to indefinite continuation of mowing practices.

4.2.1.3 Cumulative Effects

Cumulative impact is defined in 40 CFR 1508.7 as the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. The No-Action Alternative would have no cumulative effects to vegetation within Parkway boundaries. The No-Action Alternative would have reasonably foreseeable cumulative effects to vegetation in areas outside of Parkway lands by requiring alternative CO₂ transportation methods that would have greater overall adverse environmental impacts, as discussed in Sections 3.2 and 3.5 of this report.

4.2.1.4 Conclusion

The No-Action Alternative will result in no short or long term adverse impacts, and no beneficial impacts, to Parkway vegetation. The No-Action Alternative would have no adverse impacts to vegetation beyond those presented by the continued presence of the existing pipelines, which are considered site-specific, long-term and negligible. The No-Action Alternative would result in additional adverse impacts to vegetation in areas outside of Parkway lands associated with alternative methods needed for CO₂ transportation or hydrocarbon production.

4.2.2 Preferred Alternative

The proposed action will result in adverse impacts consisting of the clearing of a small area (approximately 0.1 acre) of forest edge vegetation present along the outer edge of the existing cleared utility corridor within Parkway boundaries. The area of clearing is to be located immediately south of the existing 8" lines and associated existing cleared utility corridor. No other clearing within Parkway boundaries is proposed. The context of impacts to vegetation is considered site-specific.

The vegetation of the area to be cleared consists of mixed pine and hardwood forest edge and is dominated by weedy herbaceous and brush species typical of clearing and roadside edges including giant ragweed (*Ambrosia trifida*), loblolly pine saplings (*Pinus taeda*), post oak saplings (*Quercus stellata*), and longleaf woodoats (*Chasmanthium sessiliflorum*). The forested areas along the proposed pipeline crossing consist of a canopy of loblolly pine and post oak along with red oak (*Quercus falcata*) and hackberry (*Celtis laevigata*). An area of open grasses along the proposed pipeline crossing and located on the eastern side of the roadway consists of a generally complete coverage of grass and herbaceous species tolerant of mowing dominated by bahia grass (*Paspalum notatum*), carpet grass (*Axonopus fissifolius*), and dallis grass (*Paspalum dilatatum*).

4.2.2.1 Intensity of Impacts

Limited clearing may be necessary along the western Parkway boundary. Clearing would be limited to the smallest area possible to provide for the necessary operation of the required equipment. Following construction, vegetation would be allowed to naturally reestablish. Impacts to vegetation in other areas of Parkway lands are not anticipated to result from the proposed action. Given the small area of clearing required and the relative abundance of similar vegetative cover in the vicinity, as well as the degree of existing disturbances in the vicinity relative to the disturbance resulting from the proposed action, adverse impacts to vegetation are considered minor.

4.2.2.2 Duration of Impacts

Construction activities are anticipated to be completed within two weeks from commencement of clearing. Following construction, vegetation would be allowed to naturally reestablish. Reestablishment of vegetation in the existing open areas containing grass and herbaceous species is not expected to take longer than one growing season, and therefore would be considered short term. Reestablishment of vegetation consistent with current conditions in forested portions of the site would reasonably be expected to take longer than one growing season, and therefore adverse impacts to cleared forested areas would be considered long term.

4.2.2.3 Cumulative Effects

No cumulative impacts are anticipated as a result of the proposed action.

4.2.2.4 Conclusion

The proposed action will result in minor, short-term and minor, long-term adverse impacts to vegetation. Long-term impacts will occur due to the clearing of a small area of forest edge vegetation. Short-term impacts will occur due to surface disturbances

associated with pipeline installation in areas of open field with grass and herbaceous vegetation. The proposed construction will result in removal of existing vegetation from within a small area of NPS lands. Restoration of surface features to existing conditions is to be conducted immediately following construction, and trees are to be established as directed by NPS in order to mitigate for the loss of trees cleared during construction. The vegetation to be cleared is not considered unique, uncommon to the area, or of exceptional value to native wildlife species of concern. The forested area to be cleared is located along the eastern edge of the Parkway boundary and is largely screened from view by visitors traveling the roadway by an earthen bank and existing forest. The proposed action is not considered to have a significant adverse impact to vegetation resources in the Parkway or to visitor use or experience. A copy of an estimate of monetary value of the merchantable timber within the area to be cleared is included as an attachment to this report.

4.3 Wildlife

The federal Organic Act directs parks to conserve wildlife unimpaired for future generations. Application of the directive provides for protection of native animal life and the park's ecosystems that sustain it. Protection measures give preference to natural processes for control of populations of native species to the extent possible, and are intended to protect native species from harvest, harassment, or harm by human activities. NPS management goals for wildlife include maintaining components and processes of naturally evolving park ecosystems including natural abundance, diversity, and the ecological integrity of plants and animals.

4.3.1 No-Action Alternative

Under the No-Action Alternative the ROW easement would not be expanded beyond the existing dimensions and no additional pipeline would be installed across Parkway lands at the proposed location. No wildlife would be disturbed under the No-Action Alternative. The No-Action Alternative would have no adverse impacts to wildlife beyond those presented by the continued presence of the existing pipelines and cleared ROW.

4.3.1.1 Intensity of Impacts

The intensity of both adverse and beneficial impacts to wildlife from the No-Action Alternative would be negligible due to the absence of disturbance for installation of a pipeline. The continued presence of the 2 existing lines within the existing ROW is considered to have negligible adverse impacts due to the absence of realized impacts to Parkway resources since installation.

4.3.1.2 Duration of Impacts

No adverse or beneficial impacts to wildlife within Parkway boundaries would occur as part of the No-Action Alternative, therefore the duration of impacts would not exist. Impacts to wildlife resulting from the continued presence of the 2 existing lines within the existing ROW are considered long-term due to continued presence of the existing cleared area.

4.3.1.3 Cumulative Effects

Cumulative impact is defined in 40 CFR 1508.7 as the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. The No-Action Alternative would have no cumulative effects to wildlife within Parkway boundaries. The No-Action Alternative would have potential cumulative effects to wildlife in areas outside of Parkway lands by requiring alternative CO₂ transportation methods that would have greater overall adverse environmental impacts, as discussed in Sections 3.2 and 3.5 of this report.

4.3.1.4 Conclusion

The No-Action Alternative will result in no short or long term adverse impacts, and no beneficial impacts, to Parkway wildlife. The No-Action Alternative would have no adverse impacts to wildlife beyond those presented by the continued presence of the existing pipelines, which are considered site-specific, long-term and negligible. The No-Action Alternative would result in additional adverse impacts to wildlife in areas outside of Parkway lands associated with alternative methods needed for CO₂ transportation or hydrocarbon production.

4.3.2 Preferred Alternative

The existing conditions within the Parkway boundaries consist of a linear clearing through adjacent mixed pine and hardwood forest on the western side of the roadway and open areas of grasses on the eastern side of the roadway. The surrounding areas contain a similar mix of open grassy areas and mixed forest, with a narrow strip of emergent wetland vegetation present along the shoreline of the Ross Barnett Reservoir. Signs of wildlife observed included tracks of whitetail deer (*Odocoileus virginianus*), armadillo (*Dasypus novemcinctus*), raccoon (*Procyon lotor*), and either coyote (*Canis latrans*) or domestic dog in the forested area, and scat of geese (*Branta canadensis*) observed in the grassy area. Wildlife use of the project area appears to consist predominately of foraging and cover areas. The context of impacts to wildlife resources resulting from the proposed action is considered local to the project vicinity.

4.3.2.1 Intensity of Impacts

Soil disturbance will occur within the area of excavation during construction of the pipeline. Limited clearing may be necessary along the western Parkway boundary. Clearing of vegetation and excavation of soils has potential to cause harm or injury to small mammals, reptiles, birds, and insects. Noise produced by construction equipment has potential to discourage wildlife from utilizing the immediate area and may interfere with movement of wildlife through the area. Given the nature of the wildlife habitat to be impacted and the abundance of similar habitat in the vicinity, as well as the small area in which impacts to wildlife could occur, the intensity of adverse impacts on wildlife resources is considered minor.

4.3.2.2 Duration of Impacts

Construction activities are anticipated to be completed within two weeks from commencement of clearing. Following construction, disturbed areas will be stabilized

and vegetation reestablished. Once the noise from construction ceases and vegetation begins to reestablish wildlife would be expected to move back into the area, and therefore adverse impacts to wildlife would be considered short term.

4.3.2.3 Cumulative Effects

No cumulative impacts are anticipated as a result of the proposed action.

4.3.2.4 Conclusion

No significant adverse impact to wildlife or overall ecosystems that sustain native wildlife within the Parkway will occur as part of the proposed action. Limited clearing along the edge of the existing cleared utility corridor and the temporary presence of construction equipment may have temporary, minor adverse impacts to wildlife during the construction period, but no long-term displacement of native wildlife and no permanent adverse impact is anticipated to result from post-construction operations of the pipeline facilities. The wildlife habitat to be disturbed is not considered unique, uncommon to the area, or of exceptional value to native wildlife species of concern. Impacts to wildlife are considered adverse, minor, local, and short term.

5.0 CONSULTATION AND COORDINATION

Organizations and agencies contacted for information, assisting in identifying important issues, or analyzing impacts include the following:

5.1 Federal Agencies

United States Department of Interior, National Park Service

United States Department of Interior, Fish & Wildlife Service, Ecological Services

5.2 Mississippi State Agencies

Mississippi Department of Wildlife, Fisheries, and Parks, Natural Heritage Inventory

Mississippi Department of Archives and History, State Historic Preservation Officer

REFERENCES

National Park Service, Director's Order 12, *Conservation Planning, Environmental Impact Analysis, and Decision Making*, and NEPA Handbook 12

Mississippi State Oil & Gas Board website, www.ogb.state.ms.us

Web Soil Survey, U.S. Department of Agriculture, Natural Resource Conservation Service, August 2011

7.5 Minute Topographic Quadrangle Map, *Shoccoe Quadrangle, Mississippi*, United States Geological Survey, 1987

U.S. EPA, *Green Book Nonattainment Areas for Criteria Pollutants*; www.epa.gov/oaqps001/greenbk, August 2011

U.S. Fish & Wildlife Service, *Classification of Wetlands and Deepwater Habitats of the United States*, Lewis M. Cowardin, 1979

National Wetland Inventory Maps, U.S. Fish & Wildlife Service; www.fws.gov/wetlands; August 2011

National Park Service. 2012. *National Park Service Procedural Manual #77-1: Wetland Protection*.

Radford, Ahles, and Bell, *Manual of the Vascular Flora of the Carolinas*, University of North Carolina Press; 1968

ATTACHMENT A

Agency Correspondence Documentation

TELEPHONE: 601-482-4800
FAX: 601-939-8799



POST OFFICE BOX 1849
MERIDIAN, MISSISSIPPI 39302

August 17, 2011

U.S. Fish and Wildlife Service
Ecological Services Branch
6578 Dogwood View
Jackson, Mississippi 39213

Re: Request for Information
Endangered / Threatened Species Assessment
Proposed Pipeline Crossing Project, Denbury Onshore LLC
Natchez Trace Parkway MP 113, Madison County, Mississippi

Ladies and Gentlemen:

On behalf of Denbury Onshore, LLC., (Denbury) Engineering Service wishes to request assistance from the United States Wildlife Service in providing an endangered or threatened species/critical habitat determination for the proposed pipeline crossing of the Natchez Trace Parkway located in Madison County, Mississippi. The project is more specifically located near MP 113 in the center of Section 28, Township 8 North, Range 3 East, of the *Shoccoe Mississippi* Quadrangle. The project will involve the installation of a twenty-four inch (24") pipeline alongside two existing eight inch (8") lines underneath National Park Service (NPS) lands by utilizing horizontal directional boring construction methods. The purpose of the proposed project is to provide for the transport of carbon dioxide from a dehydration plant to the Tinsley Oil and Gas Field. The proposed project will impact a linear area of soils underneath the Parkway, which may temporarily impact surface features; however, there will be no impact to wildlife within NPS lands. The existing conditions within the Parkway boundaries consist of a linear clearing through adjacent mixed pine and hardwood forest on the western side of the roadway, and open areas of grasses on the eastern side of the roadway. Signs of wildlife observed included tracks of whitetail deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), and either coyote (*Canis latrans*) or domestic dog in the forested area, and scat of geese (*Branta canadensis* observed) in the grassy area. The approximate location of the proposed crossing is indicated on the map enclosed.

Engineering Service is preparing documentation necessary to qualify the project for a Finding of No Significant Impact per 40 CFR 1500-1508 and NPS 516 DM. The project will require documentation regarding the potential for impacts to endangered or threatened species and critical habitat within the Parkway boundaries in order to receive approval by the NPS.

Engineering Service greatly appreciates your help and expertise concerning this project. If you need additional information or have any questions regarding this request, please contact me at (601) 482-4800.

Sincerely,
Engineering Service

A handwritten signature in dark ink, appearing to read "James A. Hall".

James A. Hall
Environmental Scientist

Enclosure: Location Map



United States Department of the Interior
FISH AND WILDLIFE SERVICE
Mississippi Field Office
6578 Dogwood View Parkway, Suite A
Jackson, Mississippi 39213

August 23, 2011

Mr. James Hall
Engineering Service
Post Office Box 1849
Meridian, Mississippi 39032

Dear Mr. Hill:

The Fish and Wildlife Service (Service) has reviewed your letter, dated August 17, 2011, requesting information on the presence of federal threatened and endangered species, which may be affected by the proposed Denbury pipeline crossing of the Natchez Trace Parkway in Madison County, Mississippi. The following comments are provided in accordance with the Endangered Species Act (ESA) (87 Stat. 884, as amended 16 U.S.C. 1531 et seq.).

Based on the location and nature of the proposed project, the Service has determined that no federally listed species or their habitats or any Candidate species are likely to be adversely affected from the proposed work. No further consultation under Section 7 of the ESA will be necessary unless the size or location of the project were to change.

However, we recommend that you contact the National Park Service regarding any concerns they may have about the proposed pipeline where it crosses the Natchez Trace Parkway.

If you have any questions, please feel free to contact Daniel Gregg with this office, telephone: (601) 321-1136.

Sincerely,

For Stephen Ricks
 Field Supervisor



TELEPHONE: 601-482-4800
FAX: 601-939-8799

POST OFFICE BOX 1849
MERIDIAN, MISSISSIPPI 39302

August 17, 2011

Mississippi Natural Heritage Program
Mississippi Department of Wildlife, Fisheries, and Parks
2148 Riverside Drive
Jackson, Mississippi 39202-1353

Re: Request for Information
Protected and Special Concern Species Assessment
Proposed Pipeline Crossing Project, Denbury Onshore LLC
Natchez Trace Parkway MP 113, Madison County, Mississippi

Ladies and Gentlemen:

On behalf of Denbury Onshore, LLC., (Denbury) Engineering Service wishes to request assistance from the Mississippi Natural Heritage Program in providing a protected species/special concern species determination for the proposed pipeline crossing of the Natchez Trace Parkway located in Madison County, Mississippi. The project is more specifically located near MP 113 in the center of Section 28, Township 8 North, Range 3 East, of the *Shoccoe Mississippi* Quadrangle. The project will involve the installation of a twenty-four inch (24") pipeline alongside two existing eight inch (8") lines underneath National Park Service (NPS) lands by utilizing horizontal directional boring construction methods. The purpose of the proposed project is to provide for the transport of carbon dioxide from a dehydration plant to the Tinsley Oil and Gas Field. The proposed project will impact a linear area of soils underneath the Parkway, which may temporarily impact surface features; however, there will be no impact to wildlife within NPS lands. The existing conditions within the Parkway boundaries consist of a linear clearing through adjacent mixed pine and hardwood forest on the western side of the roadway, and open areas of grasses on the eastern side of the roadway. Signs of wildlife observed included tracks of whitetail deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), and either coyote (*Canis latrans*) or domestic dog in the forested area, and scat of geese (*Branta canadensis* observed) in the grassy area. The approximate location of the proposed crossing is indicated on the map enclosed.

Engineering Service is preparing documentation necessary to qualify the project for a Finding of No Significant Impact per 40 CFR 1500-1508 and NPS 516 DM. The project will require documentation regarding the potential for impacts to protected species and critical habitat within the Parkway boundaries in order to receive approval by the NPS.

Engineering Service greatly appreciates your help and expertise concerning this project. If you need additional information or have any questions regarding this request, please contact me at (601) 482-4800.

Sincerely,
Engineering Service

James A. Hall
Environmental Scientist

Enclosure: Location Map



MISSISSIPPI
DEPARTMENT OF WILDLIFE, FISHERIES, AND PARKS

Sam Polles, Ph.D.
Executive Director

September 6, 2011

James Hall
Engineering Services
P.O. Box 1849
Meridian, MS 39302

Re: Proposed Pipeline Crossing Project, Denbury Onshore, LLC
Natchez Trace Parkway MP 113
Madison County, Mississippi

R# 8542

To Whom It May Concern,

In response to your request for information dated August 17, 2011, we have searched our database for occurrences of state or federally listed species and species of special concern that occur within 2 miles of the site of the proposed project. Please find our concerns and recommendations below.

We do not currently have any records of rare, threatened, or endangered species or communities in the vicinity of your proposed project area. However, the quantity and quality of data collected by the Mississippi Natural Heritage Program are dependent on the research and observations of many individuals and organizations and, in many cases, this information is not the result of comprehensive or site-specific field surveys. In fact, most natural areas in Mississippi have not been thoroughly surveyed and new occurrences of plant and animal species are often discovered. Therefore, we recommend that best management practices are implemented to minimize any potential negative impacts resulting from this project.

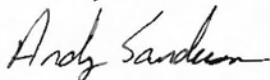
Based on information provided, we conclude that if best management practices are properly implemented, monitored, and maintained (particularly measures to prevent, or at least, minimize negative impacts to water quality), the proposed project likely poses no threat to listed species or their habitats.

Recommendations:

We recommend that best management practices be properly implemented, monitored, and maintained for compliance, specifically measures that will prevent suspended silt and contaminants from leaving the site in stormwater run-off as this may negatively affect water quality and habitat conditions within nearby streams and waterbodies.

Please feel free to contact us if we can provide any additional information, resources, or assistance that will help minimize negative impacts to this area. We are happy to work with you to ensure that our state's precious natural heritage is conserved and preserved for future Mississippians.

Sincerely,



Andy Sanderson, Ecologist
Mississippi Natural Heritage Program
(601) 576-6049

The Mississippi Natural Heritage Program (MNHP) has compiled a database that is the most complete source of information about Mississippi's rare, threatened, and endangered plants, animals, and ecological communities. The quantity and quality of data collected by MNHP are dependent on the research and observations of many individuals and organizations. In many cases, this information is not the result of comprehensive or site-specific field surveys; most natural areas in Mississippi have not been thoroughly surveyed and new occurrences of plant and animal species are often discovered. Heritage reports summarize the existing information known to the MNHP at the time of the request and cannot always be considered a definitive statement on the presence, absence or condition of biological elements on a particular site.

ATTACHMENT B

Timber Appraisal

SIRMON & ASSOCIATES

FOREST MANAGEMENT & CONSULTATION • REAL ESTATE SALES & APPRAISALS
P.O. Box 1033 / 103 SOUTH BROOKS STREET
PELAHATCHIE, MS 39145
PHONE (601) 854-6631 • FAX (601) 854-7792

Denbury Onshore, LLC
 C/O Mr. John Fournet
 2929 Layfair Drive, Suite 200
 Flowood, Mississippi 39232

July 12, 2011

Dear Mr. Fournet:

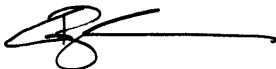
Based on our inspection of the proposed pipeline easement crossing the Natchez Trace Parkway owned by the United States of America, located in Madison County, Mississippi, we estimate the volume and value of the merchantable timber lying within the proposed easement as follows:

Merchantable Timber Valuation

Pine Sawtimber	3,653 Board Feet @ \$250.00/MBF=	\$ 913.23
Pine Pulpwood	1.788 Cords @ \$21.00/Cord=	\$ 37.56
Oak Sawtimber	458 Board Feet @ \$325.00/MBF=	\$ 148.93
Misc. Hardwood Sawtimber	1,433 Board Feet @ \$275.00/MBF=	\$ 394.12
Hardwood Pulpwood	1.736 Cords @ \$19.00/Cord =	\$ 32.99
Total Merchantable Timber Value		\$1,526.83

TOTAL TIMBER VALUE \$1,526.83 ~ \$1,530.00

Respectively Submitted,



Greg B. Sirmon

Mississippi Registered Forester # 2128

ATTACHMENT C

Horizontal Directional Drilling Considerations

**RESPONSES TO NATIONAL PARK SERVICE COMMENTS
ON
ENVIRONMENTAL ASSESSMENT “PROPOSED PIPELINE CROSSING
EASEMENT, MADISON COUNTY, MISSISSIPPI”**

**Prepared by Enerteq Engineering Company
12/21/11**

NPS COMMENTS #22 and #23

It is suggested by the NPS that the crossing of the Natchez Trace Parkway be achieved by the boring method only with all bore pits located outside the Park boundaries thereby precluding boring equipment from being located on the Park property.

If it were possible to utilize the horizontal directional drilling (HDD) method of construction, the location of the pipeline pull string (approximately 600' long) would need to be on the west side of the Park boundary since space on the east side is limited by the Ross Barnett Reservoir. This means that the drill rig side must be on the east side of the Park boundary. The space available on the east side of the Park boundary for the drill rig is 37 feet (distance from the reservoir bank to the Park boundary). The minimum space required for the drill rig is approximately 100' wide x 150' long. The pilot entry point needs to be approximately 25' in front of the drill rig site. Thus, it can be seen that to set up a drill rig on the east side of the Natchez Trace Parkway would require a minimum encroachment of 158' onto Park property. The pilot entry point would be 67' from the paved edge of the Parkway.

Due to the constraints of the proposed crossing location, a true HDD crossing cannot be constructed. A HDD drill rig can be placed in a very deep pit (15' +) and the crossing can be drilled horizontally to achieve the 10' minimum cover suggested by the NPS in its comment #22. This method of construction requires the bore pit to be within the Park boundary as discussed above. Furthermore, the risk of a “frac out” or “inadvertent return” of drilling mud at the 10' depth of cover is significantly great.

The open cut ditch installation with a 72' long auger bore under the Natchez Trace Parkway would produce a crossing with a proven design life and with no risk of drilling mud “frac out”. The auger bore pits on the east and west sides of the Parkway will be much smaller than the bore pit required for a horizontal bore. The cleanup and restoration of the open cut ditch installation is relatively easy to achieve. Attention is directed to the results of the after construction cleanup and restoration for the two existing 8” OD pipelines that cross the Parkway adjacent to the proposed 24” OD pipeline crossing. These pipelines were installed in 1980 using the open ditch method of construction.

**RESPONSES TO NATIONAL PARK SERVICE QUESTIONS
ON
ENVIRONMENTAL ASSESSMENT "PROPOSED PIPELINE CROSSING
EASEMENT, MADISON COUNTY, MISSISSIPPI"**

**Prepared by Enerteq Engineering Company
5/7/12**

**NPS QUESTIONS REGARDING THE PROPOSED DENBURY 24" OD
PIPELINE CROSSING OF THE NATCHEZ TRACE PARKWAY**

Denbury has proposed crossing the Natchez Trace Parkway (the Parkway) with a pipeline for the transmission of carbon dioxide (CO₂). This crossing will be in a section of heavy wall thickness pipe (24" OD x 0.562" WT API 5L Grade X65 ERW) coated with 12 to 20 mil thick fusion bonded epoxy for cathodic protection with an outer coating of 40 mil thick abrasion resistant overcoat. The carrier pipe will be installed in an auger bored hole having an approximate 26" bore size. This small oversize bore hole will not cause any roadway settling or heaving during construction or later after being placed in service. A small amount of water will be introduced in the bore hole to mix with the soil creating mud for lubrication to allow the carrier pipe to be easily pushed/pulled through the bore hole. Silt screens will be installed on both sides of the Parkway in the area adjacent to the bore to prevent any muddy soil from exiting the bore hole and flowing across the pavement of the Parkway. The top of the carrier pipe will be installed at a minimum depth of 6 feet below the bottom of the deepest borrow ditch on the Parkway at the location of the pipeline crossing. Installation of pipelines across roads, highways and railroads utilizing the auger bore method is commonly done and is a proven and safe method of construction.

Pipeline casing is not installed to protect the roadway from damage resulting from a ruptured pipeline. This practice dates back to the beginning of natural gas pipeline construction when pipelines were built using cast iron pipe joined by screwed connections, mechanical couplings or bell and spigot joints. The casing allowed pipe with joint failures, and corrosion leaks to be removed and replaced without affecting the road surface. It is now recognized by most authorities on pipeline operations that casing significantly reduces the ability to provide adequate cathodic protection for the cased carrier pipe. As a result, casing, which once provided a simple and economical method for maintaining, repairing and replacing pipe sections under roadways, has now become the source of a major maintenance problem. An increasing number of agencies and organizations concerned with pipeline safety are urging and recommending discontinuing the use of cased pipeline crossings.

The primary reason for considering uncased pipeline crossings is the difficulty experienced in providing adequate cathodic protection to the carrier pipe in cased crossings as well as the likelihood of an electrical short occurring between the carrier pipe and the casing after installation.

Project DENBURY NATCHEZ TRACE PIPELINE CROSSING			
Location MISSISSIPPI	Date 5/7/2012		

API 1102 - Liquid Pipeline Crossing Highway

PIPE AND OPERATIONAL DATA: Operating Pressure [psi] 1,797.0 Operating Temperature [°F] 60 Pipe Outside Diameter [in] 24.00 Pipe Wall Thickness [in] 0.562 Pipe Grade: X65 Specified Minimum Yield Stress 65,000 Design Factor 0.60 Weld Joint Factor 1.000 Pipe Class: Electric Resistance Welded and Flash Welded Young's Modulus for Steel [ksi] 30,000 Poisson's Ratio for Steel 0.3 Coefficient of Thermal Expansion [per°F] 0.0000065	SITE AND INSTALLATION DATA: Soil Type: Soft to medium clays and silts with high plasticities E' - Modulus of Soil Reaction [ksi] 0.2 Er - Resilient Modulus [ksi] 5.0 Average Unit Weight of Soil [lb/ft³] 120.0 Pipe Depth [ft] 6.0 Bored Diameter [in] 26.0 Installation Temperature [°F] 60.0 Design Wheel Load from Single Axle [kips] 12.0 Design Wheel Load from Tandem Axles [kips] 10.0 Pavement Type: Flexible Impact Factor Method: ASCE - Highway
---	--

RESULTS:

Hoop (Barlow) Stress [psi]	38,370	Maximum Circumferential Stress [psi]	42,124
Allowable Hoop Stress [psi]	39,000	Maximum Longitudinal Stress [psi]	13,424
Stiffness Factor for Earth Load Circumferential Stress	2,386	Maximum Radial Stress [psi]	-1,797
Burial Factor for Earth Load Circumferential Stress	0.82	Total Effective Stress [psi]	38,629
Excavation Factor for Earth Load Circumferential Stress	0.97	Allowable Effective Stress [psi]	46,800
Circumferential Stress from Earth Load	3,143		
Impact Factor	1.47		
Highway Stiffness Factor for Cyclic Circumferential	17.20		
Highway Geometry Factor for Cyclic Circumferential	0.86		
Cyclic Circumferential Stress [psi]	1,509		
Highway Stiffness Factor for Cyclic Longitudinal Stress	13.50		
Highway Geometry Factor for Cyclic Longitudinal Stress	0.90		
Cyclic Longitudinal Stress [psi]	1,240		

Notes: UNCASED PIPELINE CROSSING STRESS ANALYSIS

Reference: API RP 1102 "Steel Pipelines Crossing Railroads and Highways"

Prepared By Dwight L. Recht, PE	Approved By	Revision: 10.0.0
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ATTACHMENT D

Easement Legal Descriptions

RE: DENBURY ONSHORE, LLC
EXISTING EASEMENT
UNITED STATES OF AMERICA
NATCHEZ TRACE PARKWAY
SECTION 28, T8N-R3E
MADISON COUNTY, MISSISSIPPI

DESCRIPTION

A certain permanent easement containing 0.36 acres, more or less, crossing the lands of United States of America Natchez Trace Parkway, situated in the Northeast Quarter of the Southwest Quarter and the Northwest Quarter of the Southeast Quarter of Section 28, Township 8 North, Range 3 East, Madison County, Mississippi, being 30.0 feet in width and 15.0 feet right and left of a centerline described as follows:

Commencing at a ½" rebar marking the Northwest corner of Section 28, Township 8 North, Range 3 East, Madison County, Mississippi; run thence South 39°38' East for 3804.9 feet to a point on the West right of way line of the Natchez Trace Parkway, said point being the Point of Beginning of said permanent easement:

Thence South 65°42' East along
the centerline of said easement for
526.5 feet to a point on the East right of
way line of the Natchez Trace Parkway.

NOTE: All bearings are based from the Mississippi State Plane Coordinate System.
Transverse Mercator – NAD83 – Mississippi West Zone.

RE: DENBURY ONSHORE, LLC
PROPOSED EASEMENT
UNITED STATES OF AMERICA
NATCHEZ TRACE PARKWAY
SECTION 28, T8N-R3E
MADISON COUNTY, MISSISSIPPI

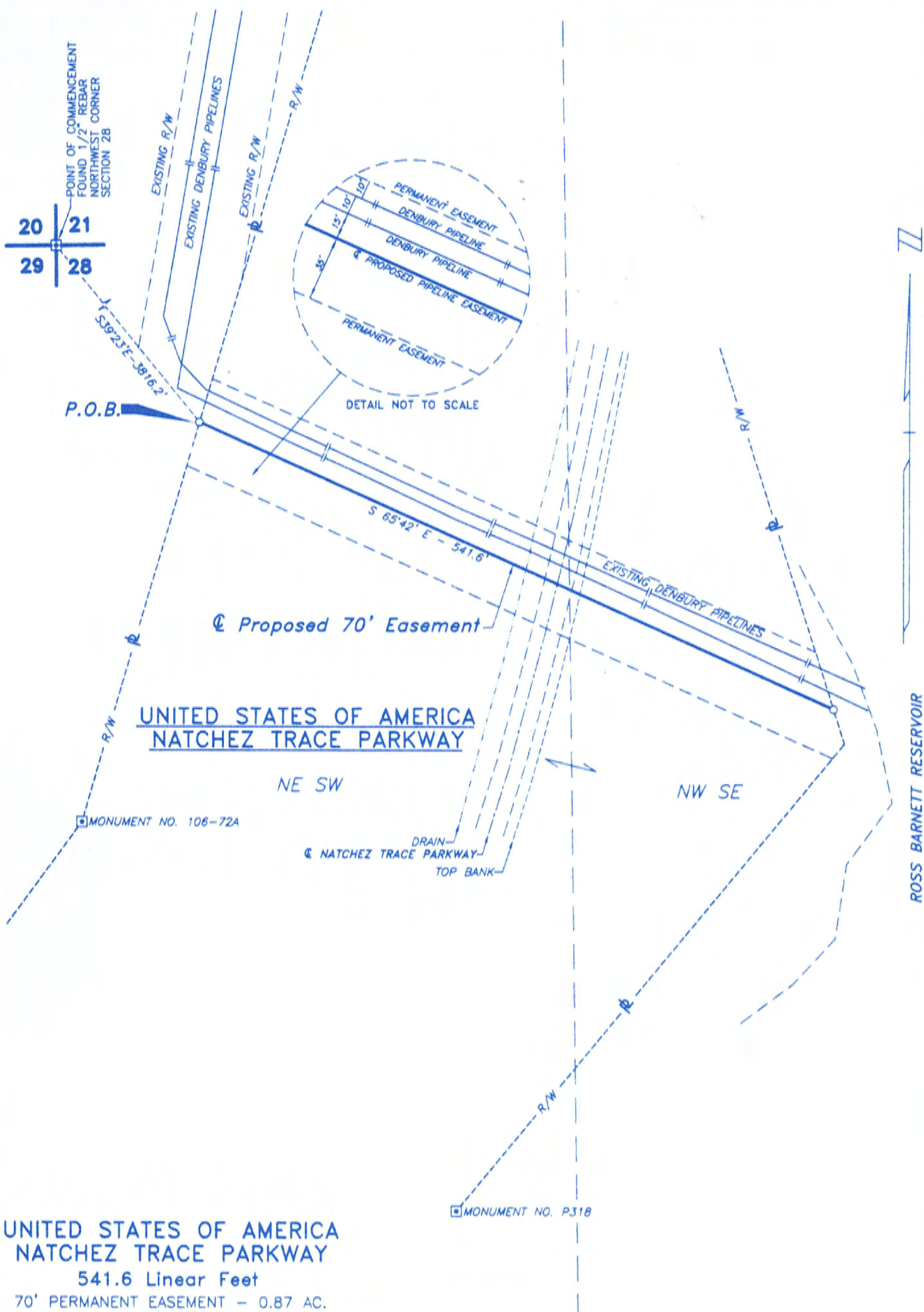
DESCRIPTION

A certain permanent easement containing 0.51 acres, more or less, crossing the lands of United States of America Natchez Trace Parkway, situated in the Northeast Quarter of the Southwest Quarter and the Northwest Quarter of the Southeast Quarter of Section 28, Township 8 North, Range 3 East, Madison County, Mississippi, being 40.0 feet in width and 20.0 feet right and left of a centerline described as follows:

Commencing at a ½" rebar marking the Northwest corner of Section 28, Township 8 North, Range 3 East, Madison County, Mississippi; run thence South 39°12' East for 3824.8 feet to a point on the West right of way line of the Natchez Trace Parkway, said point being the Point of Beginning of said permanent easement:

Thence South 65°42' East along
the centerline of said easement for
552.3 feet to a point on the East right of
way line of the Natchez Trace Parkway.

NOTE: All bearings are based from the Mississippi State Plane Coordinate System.
Transverse Mercator – NAD83 – Mississippi West Zone.



**UNITED STATES OF AMERICA
NATCHEZ TRACE PARKWAY**

541.6 Linear Feet

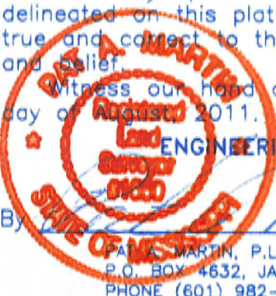
70' PERMANENT EASEMENT - 0.87 AC.
TOTAL = 0.87 AC.

NOTE: All Bearings Based On Mississippi State
Plane Coordinate System, Transverse
Mercator-Mississippi West Zone NAD83.

SURVEYORS CERTIFICATE

This is to certify that we have made an
actual survey upon the ground of the area
delineated on this plat and that the same is
true and correct to the best of our knowledge
and belief.

Witness our hand and seal this the 16th
day of August, 2011.



ENGINEERING SERVICE

By *Paul A. Martin*

PAUL A. MARTIN, P.L.S. NO. 1660
P.O. BOX 4632, JACKSON, MS. 39296
PHONE (601) 982-3401

PROPOSED EASEMENT
FOR
DENBURY ONSHORE, LLC
CROSSING UNITED STATES OF AMERICA
NATCHEZ TRACE PARKWAY
SECTION 28, T8N - R3E
MADISON COUNTY, MISSISSIPPI

BY

ENGINEERING SERVICE - JACKSON, MISSISSIPPI



SCALE IN FEET

AUGUST 16, 2011

REVISED: AUGUST 19, 2011

ATTACHMENT E

Cultural Resource Assessment Report

ATTACHMENT F
SHPO Correspondence

MISSISSIPPI DEPARTMENT *of* ARCHIVES AND HISTORY

PO Box 571, Jackson, MS 39205-0571
601-576-6850 • Fax 601-576-6975
mdah.state.ms.us
H.T. Holmes, Director

December 7, 2011

Jeffery M. Messinger
Messinger and Associates
630 East Jefferson Avenue
Bastrop, LA 71221

RE: Cultural Resource Survey for the Terrestrial Portions of the Proposed Reservoir Loop Project, MDAH Project Log #11-108-11 (Previously 07-035-11), Report #11-0579, Madison and Rankin Counties

Dear Jeffery:

We have reviewed the November 21, 2011, resources survey report by Michael P. Fedoroff, received November 22, 2011, for the above referenced undertaking, pursuant to our responsibilities under Section 106 of the National Historic Preservation Act and 36 CFR Part 800. After reviewing the information provided, we concur that the isolated finds are not significant and that there are no cultural resources that eligible for listing in the National Register of Historic Places likely to be affected by the terrestrial portions of the pipeline project. As such we have no reservations with the terrestrial portion of the project.

We would like to point out, however, that eligible underwater archaeological site, 22Md518, is in the one mile area of potential effects, but was not mentioned in the report. Also, on page iv, please change the Quad map name "Goshen" to Goshen Springs. Please ensure these changes are included in the final report and that the underwater site, 22Md518, is discussed in the aquatic portion of the investigations to come.

Please provide a copy of this letter to Michael Fedoroff. If you need further information, please let me know.

Sincerely,


Greg Williamson
Review and Compliance Officer

FOR: H.T. Holmes
State Historic Preservation Officer

ATTACHMENT G

NWI Map



U.S. Fish and Wildlife Service

National Wetlands Inventory

NWI

Aug 3, 2011



Wetlands

- Freshwater Emergent
- Freshwater Forested/Shrub
- Estuarine and Marine Deepwater
- Estuarine and Marine
- Freshwater Pond
- Lake
- Riverine
- Other

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

User Remarks:

— Project Location

ATTACHMENT H

Wetland Delineation Report

WETLAND DELINEATION REPORT

PREPARED FOR



DENBURY ONSHORE, LLC.
2929 Layfair Drive, Suite 200
Flowood, Mississippi

**CO₂ PIPELINE CROSSING EASEMENT
NATCHEZ TRACE PARKWAY, MILEPOST 113
MADISON COUNTY, MISSISSIPPI**

MAY 2012

PREPARED BY

ENGINEERING SERVICE



CONSULTING ENGINEERS

MERIDIAN, MISSISSIPPI

601-482-4800

BACKGROUND

Engineering Service was requested by Denbury Onshore, LLC. (Denbury) of Flowood, Mississippi to determine the presence and aerial extent of potential jurisdictional wetlands and other “Waters of the United States” (other waters) within the proposed construction limits of a proposed pipeline crossing located within the Natchez Trace Parkway boundaries near milepost 113 in Madison County, Mississippi. Specifically, the proposed site is located within Section 28 in Township 8 North, Range 3 East of the Shoccoe, Mississippi Quadrangle. A site location map using portions of the USGS 7.5 minute topographic map is enclosed as Exhibit 1. The project will involve installation of a 24 inch, carbon dioxide pipeline alongside two existing lines underneath National Park Service (NPS) lands utilizing a combination of open trenching and horizontal directional boring construction methods.

To adequately and accurately evaluate the presence of wetlands indicators and the wetland boundaries, a routine wetland delineation was performed following the procedures set forth in the *United States Army Corps of Engineers (USACE) Wetlands Delineation Manual Technical Report Y-87-1*, as amended, as well as the U.S Fish & Wildlife Service’s (USF&WS) *Classification of Wetlands and Deepwater Habitats of the United States*, Cowardin et al. 1979 (DOI Report FWS/OBS-79/31) to classify wetlands pursuant to E.O. 11990. The evaluation was initiated with an offsite determination of possible wetland areas at the site by reviewing published literature such as the digital satellite imagery, United States Geological Survey (USGS) topographic quadrangle maps, USF&WS National Wetland Inventory (NWI) maps, and United States Department of Agriculture (USDA) soil data. This information was supplemented with a field visit to the area. The field visit included observations of site conditions for positive identification of hydric soils, wetland hydrology, and hydrophytic vegetation.

On May 25, 2012 Engineering Service conducted a wetland delineation and determined potential jurisdictional wetland and other waters boundaries at the site. Data were recorded from 2 observation points across the site. The locations of the observation points were selected to provide a thorough representation of site conditions relative to the presence of potential jurisdictional waters. At each observation point a test pit was dug to a depth of at least 18 inches, soils were observed and recorded, dominant vegetation was identified and recorded, and signs of hydrology were observed and recorded. Copies of field data forms are included as Appendix A. Data regarding potential jurisdictional boundaries and locations was determined using points recorded in the field using a DGPS receiver providing sub-meter accuracy position recording along with a civil boundary survey.

SITE DESCRIPTION

The site is a linear-shaped area approximately 70 feet wide and 542 linear feet within Parkway boundaries. The site is located adjacent to the Ross Barnett Reservoir and Pearl River. The site consists of open areas of grasses on the eastern side of the Trace roadway and a cleared area of existing pipeline ROW with a narrow strip of mixed pine and hardwood forest on the western side. The site is located within generally sloping topography. The portion on the western side of the roadway consists of hillside landform and the portion on the eastern side of the roadway consists of a nearly level area nearby the Ross Barnett Reservoir and adjacent to lands owned by Pearl River Valley Water Supply District. Photographs of site conditions are included as Appendix B.

Vegetation

The vegetation of the portion of the site to be cleared (OP-1) consists of mixed pine and hardwood forest edge and is dominated by weedy herbaceous and brush species typical of clearing and roadside edges including *Toxicodendron radicans* (poison ivy), *Ambrosia trifida* (giant ragweed), *Pinus taeda* (loblolly pine), *Ulmus alata* (winged elm), *Quercus nigra* (water oak) and *Quercus falcata* (red oak). The forested areas adjacent to the proposed pipeline crossing consist of a canopy of loblolly pine, red oak, and water oak along with *Quercus stellata* (post oak). The majority of mature pines within the site appeared insect infested and/or diseased, and were dead or dying. An open area along the proposed pipeline crossing and located on the eastern side of the roadway (OP-2) consists of a generally complete coverage of grass and herbaceous species tolerant of mowing, and dominated by *Paspalum notatum* (bahia grass) and *Lolium perenne* (perennial rye), with lesser amounts of *Festuca arundinacea* (tall fescue), *Paspalum urvillei* (Vasey's grass), *Rumex crispus* (curly dock), *Axonopus fissifolius* (carpet grass), and *Paspalum dilatatum* (dallis grass).

Soils

The soils of the area are within the Smithdale-Providence complex, 12 to 17 percent slopes, eroded map unit composed of well drained silt loams on hillslopes. The USDA Natural Resource Conservation Service, Web Soil Survey indicates the soils include 5 percent hydric components located in linear drainage ways. The soil descriptions and locations provided in the Soil Report appear generally consistent with the observations of soils recorded at OP-1. The soils recorded at OP-2 appear influenced by an artificially induced seasonal high water table resulting from the normal pool elevation of the nearby Ross Barnett Reservoir, and also by prior land uses.

Observations of soils were made by excavating a test pit to at least 18 inches below ground surface at each observation point. Soil characteristics including color, horizons, structures, mottles, moisture, odor, and type were recorded. Soil colors were determined using *Munsell Soil Color Charts*.

The soils recorded at OP-1 consisted of brown (10YR, 4/3) silt loam to 4 inches below ground surface, brown (10YR, 5/3) silt loam from 4 to 7 inches, and strong brown (7.5YR, 5/8) silty clay loam from 7 to beyond 20 inches below ground surface.

The soils recorded at OP-2 consisted of very dark grayish brown (2.5Y, 3/2) silt loam to 4 inches below ground surface, and light olive brown (2.5Y, 5/3) silt loam with moderate dark reddish brown (5YR, 3/3) mottling in approximately 5 percent abundance.

Hydrology

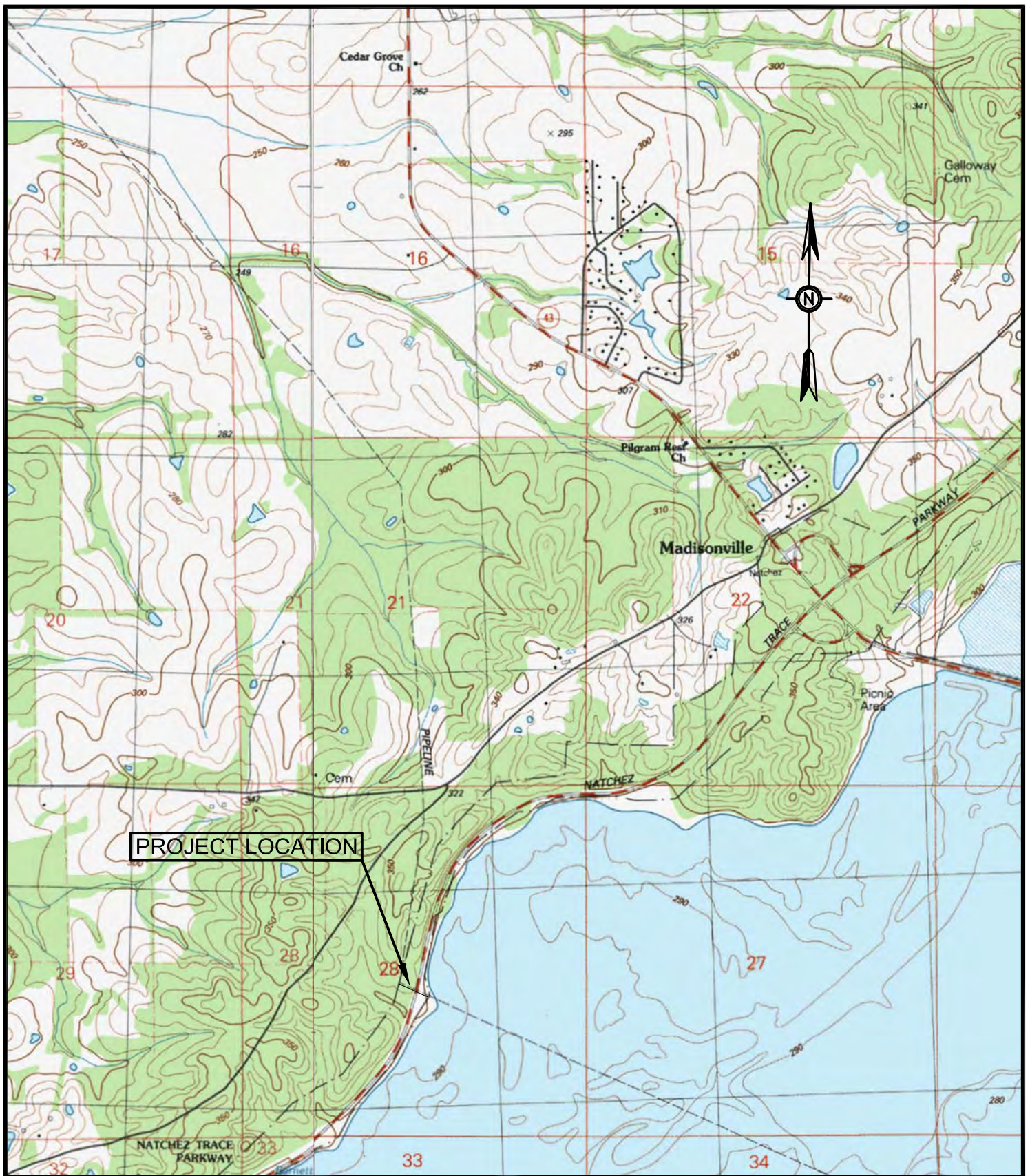
The natural hydrologic setting of the site is well drained. Faint to moderate oxidative mottling was observed within the upper 12 inches in the soils recorded at OP-2. As discussed in the preceding section, the soils appear influenced by past land uses and the pool elevation of the nearby Ross Barnet Reservoir. Surface elevations across the nearly level area recorded at OP-2 were generally 12 inches above the normal water level of the Reservoir, which would influence water table and soil drainage characteristics.

CONCLUSIONS

The entire area exhibits characteristics typical of upland conditions according to the criteria established in both the Corps' wetland delineation manual and the Cowardin classification system. The site is dominated by upland and mesophytic species of vegetation. Soils do not display hydric soil conditions according to criteria established by the National Technical Committee on Hydric Soils and the USDA Guide for Identifying and Delineating Hydric Soils. A site drawing illustrating the locations of the project area and the observation points identified above is included as Exhibit 2. The estimation of measurements were made using points recorded in the field with a DGPS receiver providing sub-meter accuracy position recording, in addition to a detailed civil survey.

References

1. Web Soil Survey, Madison County, USDA Natural Resource Conservation Service, December 2011.
2. 7.5 Minute topographic Quadrangle Map, *Shoccoe, Mississippi Quadrangle*, United States Geological Survey, 1982.
3. *Corps of Engineers Wetland Delineation Manual*, Technical Report Y-87_1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS, Environmental Laboratory, 1987.
4. *Munsell Soil Color Charts*, GretagMacbeth, 2000.
5. *Mississippi Hydric Soils List*, USDA Natural Resources Conservation Service, updated December 15, 1995.
6. Robert W. Lichvar and John T. Kartesz. 2009. *North American Digital Flora: National Wetland Plant List, version 2.4.0* (https://wetland_plants.usace.army.mil). U.S. Army Corps of Engineers, Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory, Hanover, NH, and BONAP, Chapel Hill, NC. June 1, 2012.
7. *Field Indicators of Hydric Soils in the United States*, Version 6.0, G.W. Hurt and L.M. Vasilas (eds.), USDA Natural Resources Conservation Service in cooperation with the National Technical Committee for Hydric Soils, 2006.
8. *Aquatic and Wetland Plants of the Southeastern United States*, R.K. Godfrey and J.W. Wooten, University of Georgia Press, 1979.
9. U.S. Fish & Wildlife Service, *Classification of Wetlands and Deepwater Habitats of the United States*, Lewis M. Cowardin, 1979



CONSULTING ENGINEERS
RICHLAND - JACKSON - PHILADELPHIA - MOBILE

DESIGNED BY
J.A.H.

DRAWN BY
H.M.M.

DATE
8/2011

DRAWING SCALE
1"=2000'

FIGURE 2
DENBURY ONSHORE, LLC
PIPELINE CROSSING
NATCHEZ TRACE PARKWAY
MADISON COUNTY, MISSISSIPPI
SECTION 28, T8N-R3E

APPENDIX A

Field Data Forms

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Denbury Pipeline, Trace Crossing City/County: Madison County Sampling Date: 5-25-2012
 Applicant/Owner: Denbury/United States of America State: MS Sampling Point: OP-1
 Investigator(s): James Hall, Engineering Service Section, Township, Range: Section 28, T 8N, R 3E
 Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): sloping Slope (%): 12-17%
 Subregion (LRR or MLRA): LRR-P Lat: 32.508401799°N Long: 89.995501532°W Datum: WGS 1984
 Soil Map Unit Name: Smithdale-Providence complex, 12-17% slopes, eroded NWI classification: Upland
 Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)
 Are Vegetation , Soil , or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes X No
 Are Vegetation , Soil , or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <u> </u> No <u>X</u>	Is the Sampled Area within a Wetland? Yes <u> </u> No <u>X</u>
Hydric Soil Present? Yes <u> </u> No <u>X</u>	
Wetland Hydrology Present? Yes <u> </u> No <u>X</u>	
Remarks:	

HYDROLOGY

Wetland Hydrology Indicators:		<u>Secondary Indicators (minimum of two required)</u>
<u>Primary Indicators (minimum of one is required; check all that apply)</u>		<u> </u> Surface Soil Cracks (B6)
<u> </u> Surface Water (A1)	<u> </u> Aquatic Fauna (B13)	<u> </u> Sparsely Vegetated Concave Surface (B8)
<u> </u> High Water Table (A2)	<u> </u> Marl Deposits (B15) (LRR U)	<u> </u> Drainage Patterns (B10)
<u> </u> Saturation (A3)	<u> </u> Hydrogen Sulfide Odor (C1)	<u> </u> Moss Trim Lines (B16)
<u> </u> Water Marks (B1)	<u> </u> Oxidized Rhizospheres along Living Roots (C3)	<u> </u> Dry-Season Water Table (C2)
<u> </u> Sediment Deposits (B2)	<u> </u> Presence of Reduced Iron (C4)	<u> </u> Crayfish Burrows (C8)
<u> </u> Drift Deposits (B3)	<u> </u> Recent Iron Reduction in Tilled Soils (C6)	<u> </u> Saturation Visible on Aerial Imagery (C9)
<u> </u> Algal Mat or Crust (B4)	<u> </u> Thin Muck Surface (C7)	<u> </u> Geomorphic Position (D2)
<u> </u> Iron Deposits (B5)	<u> </u> Other (Explain in Remarks)	<u> </u> Shallow Aquitard (D3)
<u> </u> Inundation Visible on Aerial Imagery (B7)		<u> </u> FAC-Neutral Test (D5)
<u> </u> Water-Stained Leaves (B9)		<u> </u> Sphagnum moss (D8) (LRR T, U)
Field Observations:		Wetland Hydrology Present? Yes <u> </u> No <u>X</u>
Surface Water Present? Yes <u> </u> No <u>X</u> Depth (inches): <u> </u>		
Water Table Present? Yes <u> </u> No <u>X</u> Depth (inches): <u> </u>		
Saturation Present? Yes <u> </u> No <u>X</u> Depth (inches): <u> </u> (includes capillary fringe)		
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:		
Remarks:		

VEGETATION (Four Strata) – Use scientific names of plants.

 Sampling Point: OP-1

Tree Stratum (Plot size: <u>30'</u>)	Absolute % Cover	Dominant Species?	Indicator Status															
1. <u><i>Pinus taeda</i></u>	<u>25%</u>	<u>yes</u>	<u>FAC</u>	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>3</u> (A) Total Number of Dominant Species Across All Strata: <u>7</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>43%</u> (A/B)														
2. <u><i>Ulmus alata</i></u>	<u>20%</u>	<u>yes</u>	<u>FACU</u>															
3. <u><i>Quercus nigra</i></u>	<u>5%</u>	<u>no</u>	<u>FAC</u>															
4. <u><i>Quercus falcata</i></u>	<u>2%</u>	<u>no</u>	<u>FACU</u>															
5. _____	_____	_____	_____															
6. _____	_____	_____	_____															
7. _____	_____	_____	_____															
8. _____	_____	_____	_____															
<u>52%</u> = Total Cover 50% of total cover: <u>26%</u> 20% of total cover: <u>10.4%</u>				Prevalence Index worksheet: <table style="width: 100%;"> <tr> <td style="width: 50%;">Total % Cover of:</td> <td style="width: 50%;">Multiply by:</td> </tr> <tr> <td>OBL species <u>0</u></td> <td>x 1 = <u>0</u></td> </tr> <tr> <td>FACW species <u>0</u></td> <td>x 2 = <u>0</u></td> </tr> <tr> <td>FAC species <u>57</u></td> <td>x 3 = <u>171</u></td> </tr> <tr> <td>FACU species <u>42</u></td> <td>x 4 = <u>168</u></td> </tr> <tr> <td>UPL species <u>0</u></td> <td>x 5 = <u>0</u></td> </tr> <tr> <td>Column Totals: <u>99</u> (A)</td> <td><u>339</u> (B)</td> </tr> </table> Prevalence Index = B/A = <u>3.4</u>	Total % Cover of:	Multiply by:	OBL species <u>0</u>	x 1 = <u>0</u>	FACW species <u>0</u>	x 2 = <u>0</u>	FAC species <u>57</u>	x 3 = <u>171</u>	FACU species <u>42</u>	x 4 = <u>168</u>	UPL species <u>0</u>	x 5 = <u>0</u>	Column Totals: <u>99</u> (A)	<u>339</u> (B)
Total % Cover of:	Multiply by:																	
OBL species <u>0</u>	x 1 = <u>0</u>																	
FACW species <u>0</u>	x 2 = <u>0</u>																	
FAC species <u>57</u>	x 3 = <u>171</u>																	
FACU species <u>42</u>	x 4 = <u>168</u>																	
UPL species <u>0</u>	x 5 = <u>0</u>																	
Column Totals: <u>99</u> (A)	<u>339</u> (B)																	
Sapling/Shrub Stratum (Plot size: <u>30'</u>)																		
1. <u><i>Ulmus alata</i></u>	<u>10%</u>	<u>yes</u>	<u>FACU</u>															
2. <u><i>Prunus serotina</i></u>	<u>5%</u>	<u>yes</u>	<u>FACU</u>															
3. _____	_____	_____	_____															
4. _____	_____	_____	_____															
5. _____	_____	_____	_____															
6. _____	_____	_____	_____															
7. _____	_____	_____	_____															
8. _____	_____	_____	_____															
<u>15%</u> = Total Cover 50% of total cover: <u>7.5%</u> 20% of total cover: <u>3%</u>																		
Herb Stratum (Plot size: <u>30'</u>)																		
1. <u><i>Toxicodendron radicans</i></u>	<u>15%</u>	<u>yes</u>	<u>FAC</u>	Hydrophytic Vegetation Indicators: <input type="checkbox"/> 1 - Rapid Test for Hydrophytic Vegetation <input type="checkbox"/> 2 - Dominance Test is >50% <input type="checkbox"/> 3 - Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain)														
2. <u><i>Ambrosia trifida</i></u>	<u>10%</u>	<u>yes</u>	<u>FAC</u>															
3. <u><i>Ampelopsis arborea</i></u>	<u>2%</u>	<u>no</u>	<u>FAC</u>															
4. _____	_____	_____	_____															
5. _____	_____	_____	_____															
6. _____	_____	_____	_____															
7. _____	_____	_____	_____															
8. _____	_____	_____	_____															
<u>27%</u> = Total Cover 50% of total cover: <u>13.5%</u> 20% of total cover: <u>5.4%</u>																		
Woody Vine Stratum (Plot size: <u>30'</u>)																		
1. <u><i>Smilax smallii</i></u>	<u>5%</u>	<u>yes</u>	<u>FACU</u>	Definitions of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vine – All woody vines greater than 3.28 ft in height.														
2. _____	_____	_____	_____															
3. _____	_____	_____	_____															
4. _____	_____	_____	_____															
5. _____	_____	_____	_____															
<u>5%</u> = Total Cover 50% of total cover: _____ 20% of total cover: _____																		
Hydrophytic Vegetation Present? Yes _____ No <u>X</u>																		

Remarks: (If observed, list morphological adaptations below).

 Point at edge of mixed pine/hardwood forest and cleared pipeline ROW.

SOIL

Sampling Point: OP-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)							
Depth (inches)	Matrix		Redox Features			Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹		
0-4 "	10YR, 4/3		none				silt loam
4-7 "	10YR, 5/3		none				silt loam
7>20 "	7.5YR, 5/8		none				silty clay loam

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)		Indicators for Problematic Hydric Soils ³ :
<input type="checkbox"/> Histosol (A1)	<input type="checkbox"/> Polyvalue Below Surface (S8) (LRR S, T, U)	<input type="checkbox"/> 1 cm Muck (A9) (LRR O)
<input type="checkbox"/> Histic Epipedon (A2)	<input type="checkbox"/> Thin Dark Surface (S9) (LRR S, T, U)	<input type="checkbox"/> 2 cm Muck (A10) (LRR S)
<input type="checkbox"/> Black Histic (A3)	<input type="checkbox"/> Loamy Mucky Mineral (F1) (LRR O)	<input type="checkbox"/> Reduced Vertic (F18) (outside MLRA 150A,B)
<input type="checkbox"/> Hydrogen Sulfide (A4)	<input type="checkbox"/> Loamy Gleyed Matrix (F2)	<input type="checkbox"/> Piedmont Floodplain Soils (F19) (LRR P, S, T)
<input type="checkbox"/> Stratified Layers (A5)	<input type="checkbox"/> Depleted Matrix (F3)	<input type="checkbox"/> Anomalous Bright Loamy Soils (F20)
<input type="checkbox"/> Organic Bodies (A6) (LRR P, T, U)	<input type="checkbox"/> Redox Dark Surface (F6)	<input type="checkbox"/> (MLRA 153B)
<input type="checkbox"/> 5 cm Mucky Mineral (A7) (LRR P, T, U)	<input type="checkbox"/> Depleted Dark Surface (F7)	<input type="checkbox"/> Red Parent Material (TF2)
<input type="checkbox"/> Muck Presence (A8) (LRR U)	<input type="checkbox"/> Redox Depressions (F8)	<input type="checkbox"/> Very Shallow Dark Surface (TF12)
<input type="checkbox"/> 1 cm Muck (A9) (LRR P, T)	<input type="checkbox"/> Marl (F10) (LRR U)	<input type="checkbox"/> Other (Explain in Remarks)
<input type="checkbox"/> Depleted Below Dark Surface (A11)	<input type="checkbox"/> Depleted Ochric (F11) (MLRA 151)	
<input type="checkbox"/> Thick Dark Surface (A12)	<input type="checkbox"/> Iron-Manganese Masses (F12) (LRR O, P, T)	
<input type="checkbox"/> Coast Prairie Redox (A16) (MLRA 150A)	<input type="checkbox"/> Umbric Surface (F13) (LRR P, T, U)	
<input type="checkbox"/> Sandy Mucky Mineral (S1) (LRR O, S)	<input type="checkbox"/> Delta Ochric (F17) (MLRA 151)	
<input type="checkbox"/> Sandy Gleyed Matrix (S4)	<input type="checkbox"/> Reduced Vertic (F18) (MLRA 150A, 150B)	
<input type="checkbox"/> Sandy Redox (S5)	<input type="checkbox"/> Piedmont Floodplain Soils (F19) (MLRA 149A)	
<input type="checkbox"/> Stripped Matrix (S6)	<input type="checkbox"/> Anomalous Bright Loamy Soils (F20) (MLRA 149A, 153C, 153D)	
<input type="checkbox"/> Dark Surface (S7) (LRR P, S, T, U)		

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed): Type: _____ Depth (inches): _____	Hydric Soil Present? Yes _____ No <u>X</u>
---	--

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Denbury Pipeline, Trace Crossing City/County: Madison County Sampling Date: 5-25-2012
 Applicant/Owner: Denbury/United States of America State: MS Sampling Point: OP-2
 Investigator(s): James Hall, Engineering Service Section, Township, Range: Section 28, T 8N, R 3E
 Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): nearly level Slope (%): 12-17%
 Subregion (LRR or MLRA): LRR-P Lat: 32.508079345°N Long: 89.994665830°W Datum: WGS 1984
 Soil Map Unit Name: Smithdale-Providence complex, 12-17% slopes, eroded NWI classification: Upland
 Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)
 Are Vegetation , Soil , or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes X No
 Are Vegetation , Soil , or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <u> </u> No <u>X</u>	Is the Sampled Area within a Wetland? Yes <u> </u> No <u>X</u>
Hydric Soil Present? Yes <u> </u> No <u>X</u>	
Wetland Hydrology Present? Yes <u> </u> No <u>X</u>	
Remarks:	

HYDROLOGY

Wetland Hydrology Indicators:		<u>Secondary Indicators (minimum of two required)</u>
<u>Primary Indicators (minimum of one is required; check all that apply)</u>		<u> </u> Surface Soil Cracks (B6)
<u> </u> Surface Water (A1)	<u> </u> Aquatic Fauna (B13)	<u> </u> Sparsely Vegetated Concave Surface (B8)
<u> </u> High Water Table (A2)	<u> </u> Marl Deposits (B15) (LRR U)	<u> </u> Drainage Patterns (B10)
<u> </u> Saturation (A3)	<u> </u> Hydrogen Sulfide Odor (C1)	<u> </u> Moss Trim Lines (B16)
<u> </u> Water Marks (B1)	<u> </u> Oxidized Rhizospheres along Living Roots (C3)	<u> </u> Dry-Season Water Table (C2)
<u> </u> Sediment Deposits (B2)	<u> </u> Presence of Reduced Iron (C4)	<u> </u> Crayfish Burrows (C8)
<u> </u> Drift Deposits (B3)	<u> </u> Recent Iron Reduction in Tilled Soils (C6)	<u> </u> Saturation Visible on Aerial Imagery (C9)
<u> </u> Algal Mat or Crust (B4)	<u> </u> Thin Muck Surface (C7)	<u> </u> Geomorphic Position (D2)
<u> </u> Iron Deposits (B5)	<u> </u> Other (Explain in Remarks)	<u> </u> Shallow Aquitard (D3)
<u> </u> Inundation Visible on Aerial Imagery (B7)		<u> </u> FAC-Neutral Test (D5)
<u> </u> Water-Stained Leaves (B9)		<u> </u> Sphagnum moss (D8) (LRR T, U)
Field Observations:		Wetland Hydrology Present? Yes <u> </u> No <u>X</u>
Surface Water Present? Yes <u> </u> No <u>X</u> Depth (inches): <u> </u>		
Water Table Present? Yes <u> </u> No <u>X</u> Depth (inches): <u> </u>		
Saturation Present? Yes <u> </u> No <u>X</u> Depth (inches): <u> </u> (includes capillary fringe)		
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:		
Remarks:		

VEGETATION (Four Strata) – Use scientific names of plants.

 Sampling Point: OP-2

Tree Stratum (Plot size: <u>30'</u>)	Absolute % Cover	Dominant Species?	Indicator Status	
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
_____ = Total Cover				
50% of total cover: _____ 20% of total cover: _____				
Sapling/Shrub Stratum (Plot size: <u>30'</u>)				
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
_____ = Total Cover				
50% of total cover: _____ 20% of total cover: _____				
Herb Stratum (Plot size: <u>30'</u>)				
1. <u>Paspalum notatum</u>	<u>70%</u>	<u>yes</u>	<u>FACU</u>	
2. <u>Lolium perenne</u>	<u>20%</u>	<u>yes</u>	<u>FACU</u>	
3. <u>Festuca arundinacea</u>	<u>5%</u>	<u>no</u>	<u>FAC</u>	
4. <u>Paspalum urvillei</u>	<u>3%</u>	<u>no</u>	<u>FAC</u>	
5. <u>Rumex crispus</u>	<u>2%</u>	<u>no</u>	<u>FAC</u>	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
11. _____	_____	_____	_____	
12. _____	_____	_____	_____	
<u>100%</u> = Total Cover				
50% of total cover: _____ 20% of total cover: _____				
Woody Vine Stratum (Plot size: <u>30'</u>)				
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
_____ = Total Cover				
50% of total cover: _____ 20% of total cover: _____				

Remarks: (If observed, list morphological adaptations below).
Point in open field near Barnett Reservoir along proposed pipeline ROW.

Dominance Test worksheet:
 Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)
 Total Number of Dominant Species Across All Strata: 2 (B)
 Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species <u>0</u>	x 1 = <u>0</u>
FACW species <u>0</u>	x 2 = <u>0</u>
FAC species <u>10</u>	x 3 = <u>30</u>
FACU species <u>90</u>	x 4 = <u>360</u>
UPL species <u>0</u>	x 5 = <u>0</u>
Column Totals: <u>100</u> (A)	<u>390</u> (B)

 Prevalence Index = B/A = 3.9

Hydrophytic Vegetation Indicators:
1 - Rapid Test for Hydrophytic Vegetation
2 - Dominance Test is >50%
3 - Prevalence Index is ≤3.0¹
 Problematic Hydrophytic Vegetation¹ (Explain)

Definitions of Four Vegetation Strata:
Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.
Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.
Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.
Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes No X

SOIL

Sampling Point: OP-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-4 "	2.5Y, 3/2		none				silt loam	
4>20 "	2.5Y, 5/3		5YR, 3/3	5%	C	M	silt loam, mottling moderate	
¹ Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.						² Location: PL=Pore Lining, M=Matrix.		
Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)							Indicators for Problematic Hydric Soils³:	
<input type="checkbox"/> Histosol (A1)			<input type="checkbox"/> Polyvalue Below Surface (S8) (LRR S, T, U)				<input type="checkbox"/> 1 cm Muck (A9) (LRR O)	
<input type="checkbox"/> Histic Epipedon (A2)			<input type="checkbox"/> Thin Dark Surface (S9) (LRR S, T, U)				<input type="checkbox"/> 2 cm Muck (A10) (LRR S)	
<input type="checkbox"/> Black Histic (A3)			<input type="checkbox"/> Loamy Mucky Mineral (F1) (LRR O)				<input type="checkbox"/> Reduced Vertic (F18) (outside MLRA 150A,B)	
<input type="checkbox"/> Hydrogen Sulfide (A4)			<input type="checkbox"/> Loamy Gleyed Matrix (F2)				<input type="checkbox"/> Piedmont Floodplain Soils (F19) (LRR P, S, T)	
<input type="checkbox"/> Stratified Layers (A5)			<input type="checkbox"/> Depleted Matrix (F3)				<input type="checkbox"/> Anomalous Bright Loamy Soils (F20) (MLRA 153B)	
<input type="checkbox"/> Organic Bodies (A6) (LRR P, T, U)			<input type="checkbox"/> Redox Dark Surface (F6)				<input type="checkbox"/> Red Parent Material (TF2)	
<input type="checkbox"/> 5 cm Mucky Mineral (A7) (LRR P, T, U)			<input type="checkbox"/> Depleted Dark Surface (F7)				<input type="checkbox"/> Very Shallow Dark Surface (TF12)	
<input type="checkbox"/> Muck Presence (A8) (LRR U)			<input type="checkbox"/> Redox Depressions (F8)				<input type="checkbox"/> Other (Explain in Remarks)	
<input type="checkbox"/> 1 cm Muck (A9) (LRR P, T)			<input type="checkbox"/> Marl (F10) (LRR U)					
<input type="checkbox"/> Depleted Below Dark Surface (A11)			<input type="checkbox"/> Depleted Ochric (F11) (MLRA 151)					
<input type="checkbox"/> Thick Dark Surface (A12)			<input type="checkbox"/> Iron-Manganese Masses (F12) (LRR O, P, T)					
<input type="checkbox"/> Coast Prairie Redox (A16) (MLRA 150A)			<input type="checkbox"/> Umbric Surface (F13) (LRR P, T, U)					
<input type="checkbox"/> Sandy Mucky Mineral (S1) (LRR O, S)			<input type="checkbox"/> Delta Ochric (F17) (MLRA 151)					
<input type="checkbox"/> Sandy Gleyed Matrix (S4)			<input type="checkbox"/> Reduced Vertic (F18) (MLRA 150A, 150B)					
<input type="checkbox"/> Sandy Redox (S5)			<input type="checkbox"/> Piedmont Floodplain Soils (F19) (MLRA 149A)					
<input type="checkbox"/> Stripped Matrix (S6)			<input type="checkbox"/> Anomalous Bright Loamy Soils (F20) (MLRA 149A, 153C, 153D)					
<input type="checkbox"/> Dark Surface (S7) (LRR P, S, T, U)								
Restrictive Layer (if observed):								
Type: _____								
Depth (inches): _____						Hydric Soil Present? Yes ____ No <input checked="" type="checkbox"/>		
Remarks: Drainage appears influenced by artificial high water table due to pool elevation of nearby Barnett Reservoir.								

APPENDIX B

Photographs of Site Conditions

Photographs Taken During Site Investigation

May 25, 2012

Denbury Onshore, LLC

Natchez Trace Pipeline Crossing, Mile Post 114

Madison County, Mississippi



Photo 1

View of area to be cleared on south (left-hand) side of existing cleared ROW looking towards location of OP-1.



Photo 2

View of area at OP-1 showing typical conditions of poison ivy and small trees.



Photo 3

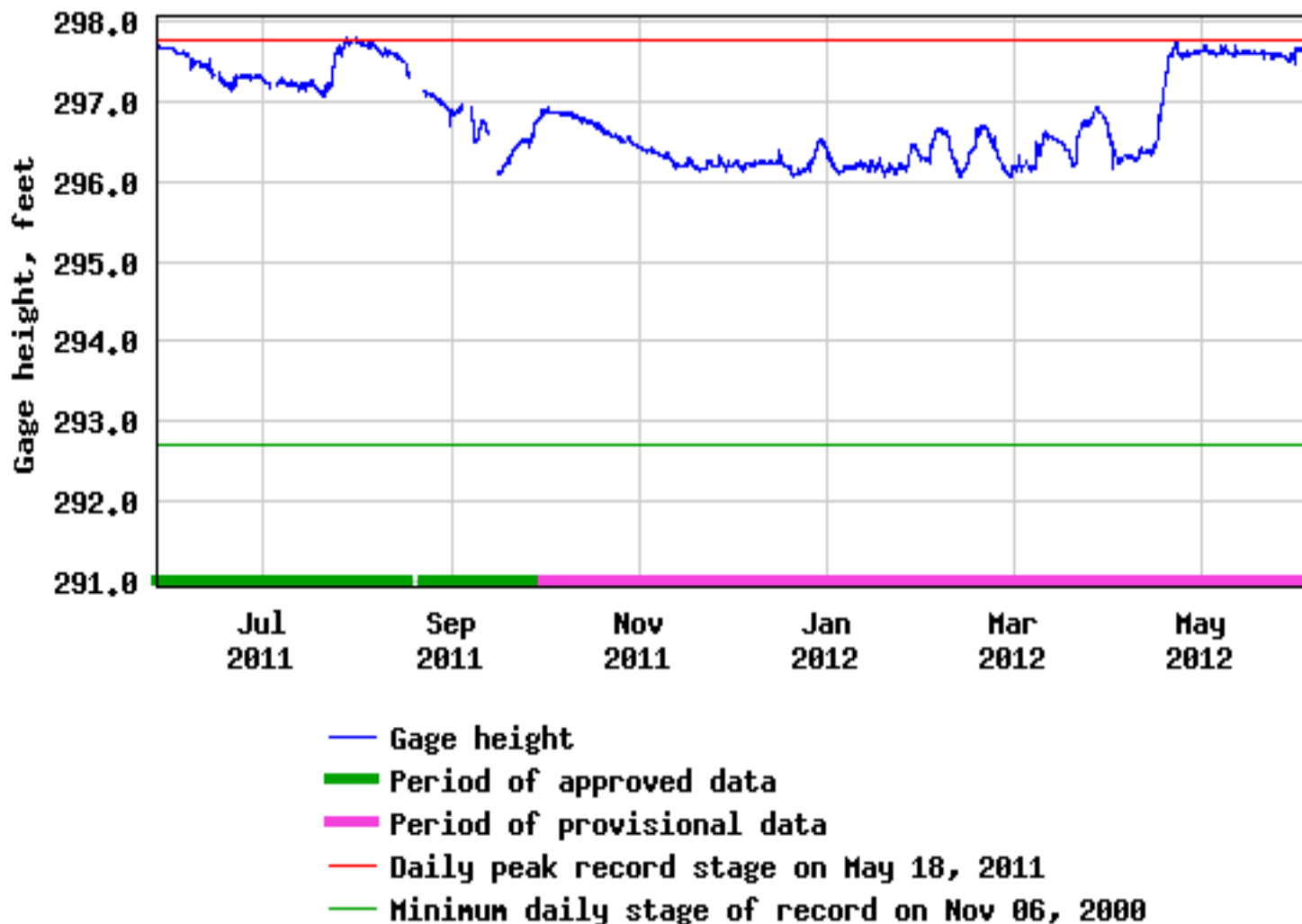
View of area east of Trace roadway showing open field of grasses and typical conditions recorded at OP-2.

APPENDIX C

River Gage Chart (USGS 02485600)



USGS 02485600 ROSS BARNETT RESERVOIR NR JACKSON, MS



Point recorded at OP-2 approximately 298 feet MSL

APPENDIX D

National Wetland Inventory Map



U.S. Fish and Wildlife Service

National Wetlands Inventory

NWI

Aug 3, 2011



Wetlands

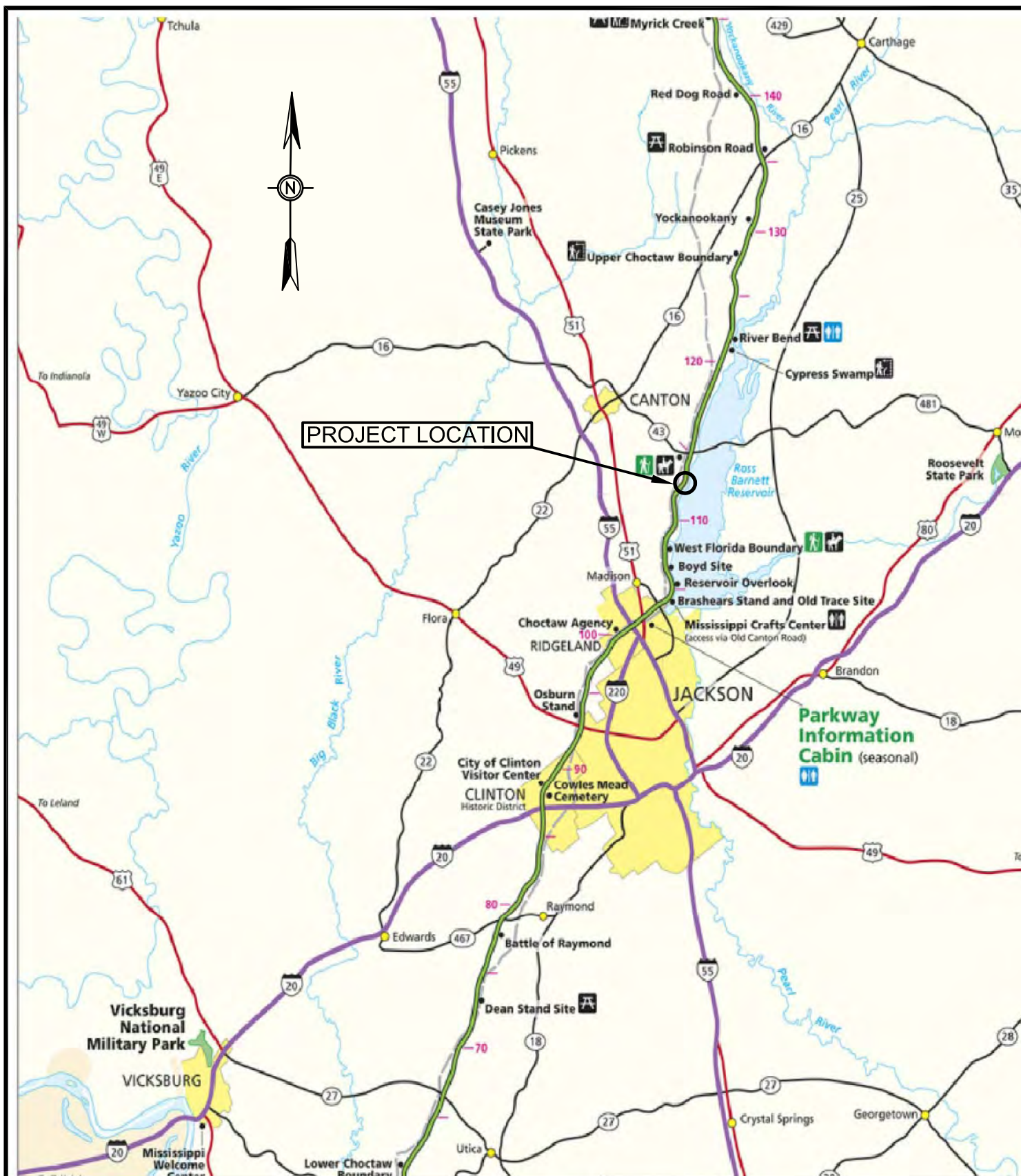
-  Freshwater Emergent
-  Freshwater Forested/Shrub
-  Estuarine and Marine Deepwater
-  Estuarine and Marine
-  Freshwater Pond
-  Lake
-  Riverine
-  Other

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

User Remarks:

EXHIBITS

Site Maps and Diagrams



ENGINEERING SERVICE



CONSULTING ENGINEERS
RICHLAND - JACKSON - PHILADELPHIA - MOBILE

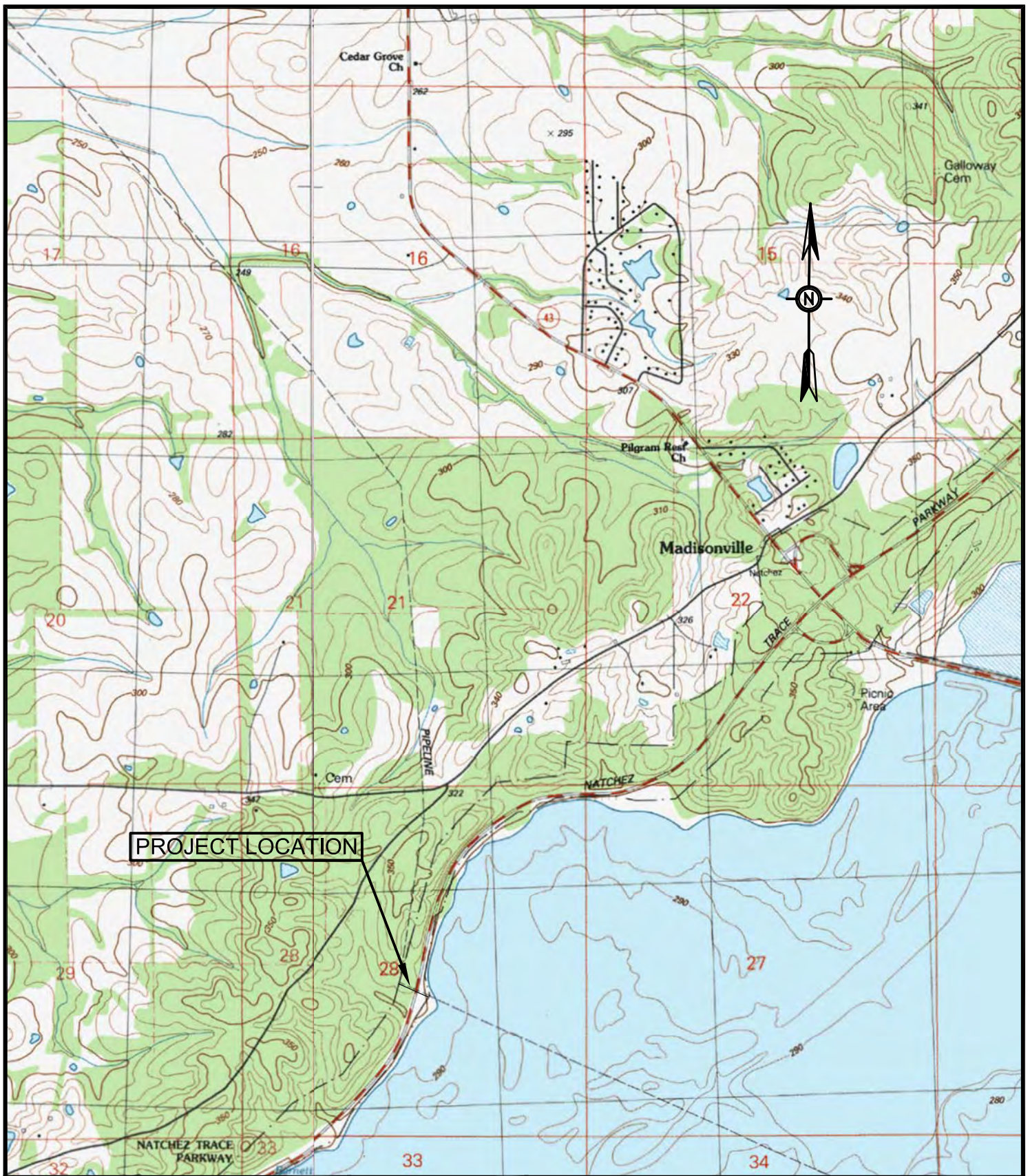
DESIGNED BY
J.A.H.

DRAWN BY
H.M.M.

DATE
8/2011

DRAWING SCALE
N.T.S.

FIGURE 1
DENBURY ONSHORE, LLC
PIPELINE CROSSING
NATCHEZ TRACE PARKWAY
MADISON COUNTY, MISSISSIPPI
SECTION 28, T8N-R3E



ENGINEERING SERVICE



CONSULTING ENGINEERS
RICHLAND - JACKSON - PHILADELPHIA - MOBILE

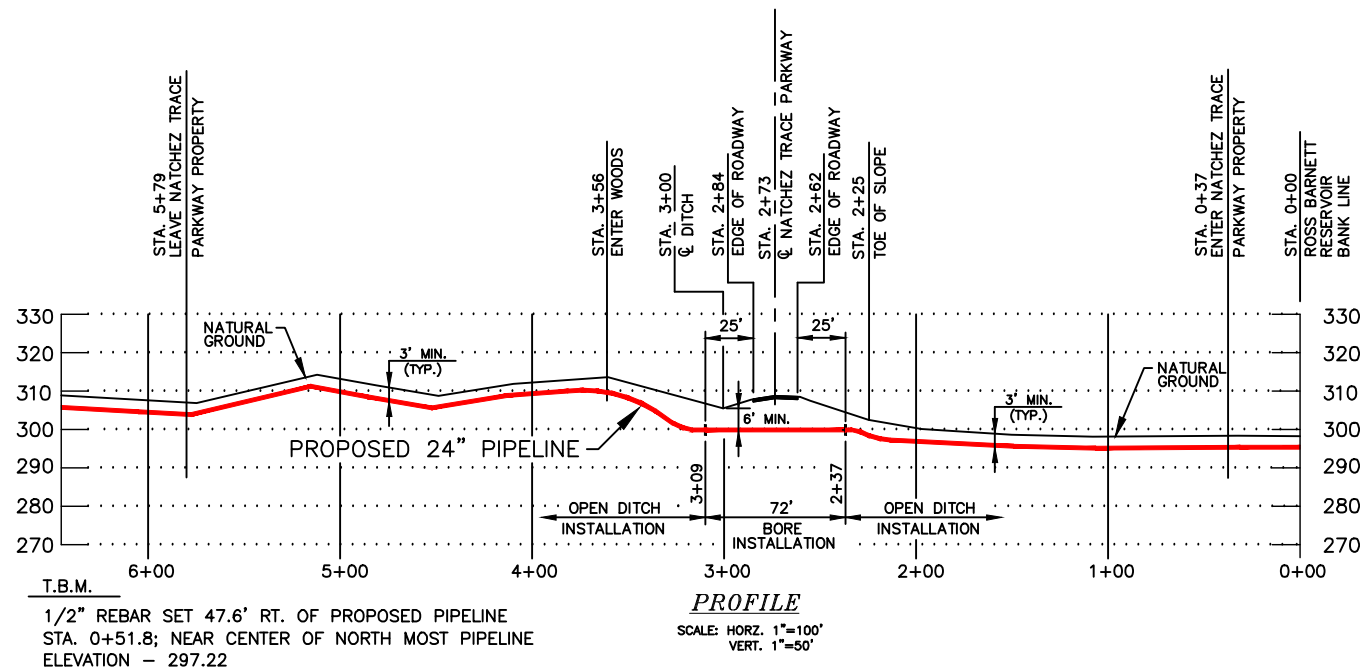
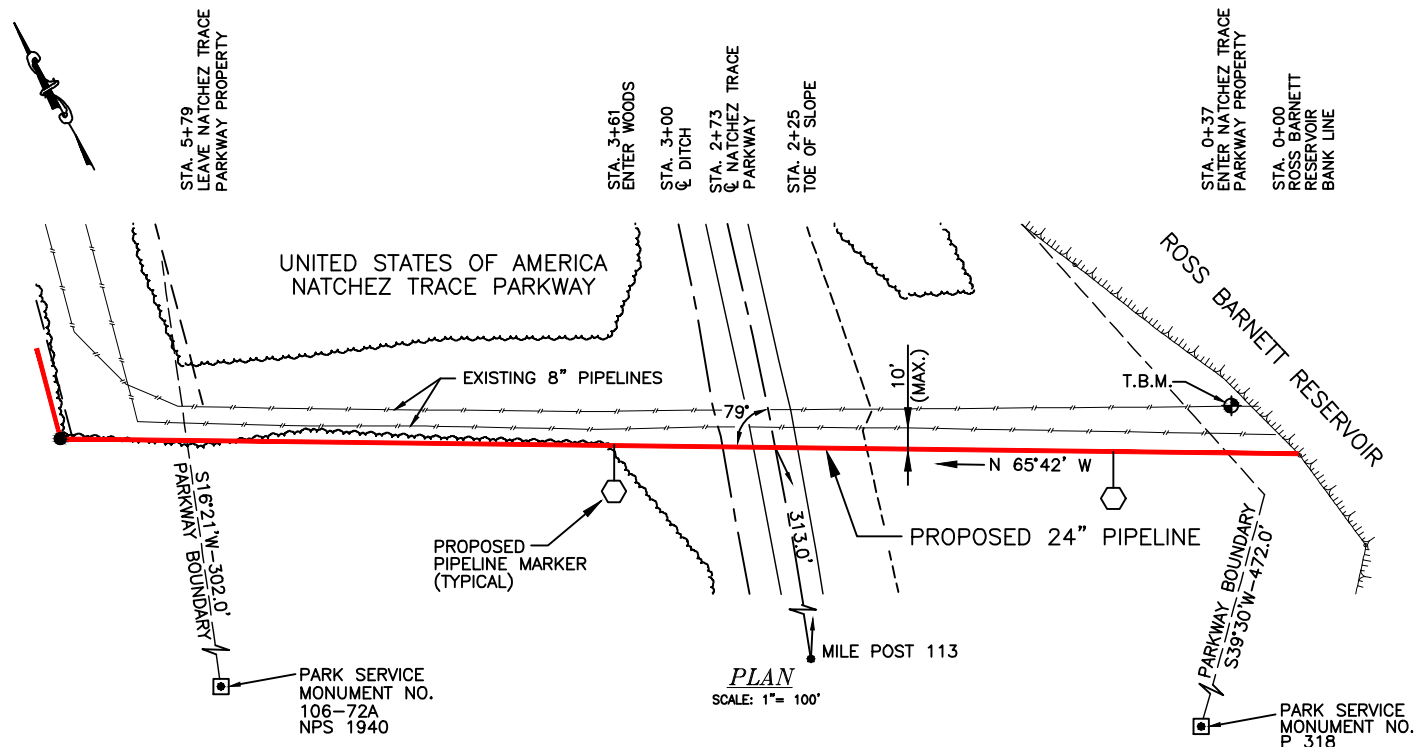
DESIGNED BY
J.A.H.

DRAWN BY
H.M.M.

DATE
8/2011

DRAWING SCALE
1"=2000'

FIGURE 2
DENBURY ONSHORE, LLC
PIPELINE CROSSING
NATCHEZ TRACE PARKWAY
MADISON COUNTY, MISSISSIPPI
SECTION 28, T8N-R3E



ROSS BARNETT RESERVOIR 24" CO₂ PIPELINE DATA

1.0 GENERAL INFORMATION

- 1.1 APPLICANT: DENBURY ONSHORE, LLC
5320 LEGACY DRIVE
PLANO, TEXAS 75024
TELEPHONE (972) 673-2000
- 1.2 PRODUCT: CARBON DIOXIDE
- 1.3 PROJECT NAME: ROSS BARNETT RESERVOIR
24-INCH CO₂ PIPELINE

2.0 PIPELINE DESIGN DATA

- 2.1 DESIGN CODE: CODE OF FEDERAL REGULATIONS
TITLE 49, PART 195
TRANSPORTATION OF HAZARDOUS LIQUIDS
BY PIPELINE
- 2.2 DESIGN PRESSURE: 1797 psig
- 2.3 TEST PRESSURE: 2250 psig (minimum)
- 2.4 WORKING PRESSURE: 1797 psig (maximum)

3.0 LINE PIPE AND CASING PIPE DATA

- | | CARRIER PIPE | CASING PIPE |
|---------------------------------------|--|-------------|
| 3.1 OUTSIDE DIAMETER: | 24" | NONE |
| 3.2 WALL THICKNESS: | 0.562" | |
| 3.3 SPECIFICATION: | API 5L GRADE X80 | |
| 3.4 SPECIFIED MINIMUM YIELD STRENGTH: | 80,000 psi | |
| 3.5 MATERIAL: | CARBON STEEL | |
| 3.6 PROCESS OF MANUFACTURE: | ELECTRIC RESISTANCE WELD | |
| 3.7 COATING: | 12 TO 20 MIL FUSION BONDED EPOXY
40 MIL THICK ABRASION RESISTANT OVERCOAT | |

4.0 CATHODIC PROTECTION

- 4.1 LINE PIPE: RECTIFIER IMPRESSED CURRENT

5.0 CONSTRUCTION METHOD

- 5.1 INSTALLATION: BORE

PROPOSED 24" CO₂ PIPELINE
DENBURY ONSHORE, LLC
NATCHEZ TRACE PARKWAY CROSSING
SECTION 28, TOWNSHIP 8 NORTH, RANGE 3 EAST
MADISON COUNTY, MISSISSIPPI

BY
ENERTEQ ENGINEERING COMPANY — HOUSTON, TEXAS
AUGUST 24, 2010

DWG. NO. 51473001

REV. 1

REVISIONS		
NO.	DATE	DESCRIPTION
0	08/31/11	ISSUED FOR CLIENT REVIEW
1	09/15/11	ISSUED FOR EA & PERMIT

APPROVED
7/16/05

Black
on
Yellow

Black
on
Red

Black
on
Yellow

WARNING
HIGH PRESSURE PIPELINE
CARBON DIOXIDE
PIPELINE

! BEFORE EXCAVATING OR IN EMERGENCY !
CALL 1-888-651-7647
DENBURY
ONSHORE, LLC.

Date	Customer	Scale	Material	Size	C.R.	Holes	Part #
11/3/01	Denbury Resources	1/2"x1"	.050 Aluminum	11 3/4" Rdn	n/a	4-5/16", 11" C	0802515