Appendix B
Floodplains and Wetlands Assessment

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Appendix B
Floodplains and Wetlands Assessment

B.1 INTRODUCTION

The Department of Energy's (DOE) proposed action is to develop one or two new strategic petroleum reserve (SPR) sites and to expand petroleum storage capacity at two or three existing SPR sites in accordance with section 303 of the Energy Policy Act (EPACT). Under the proposed action, DOE would develop one new site at either Chacahoula in Louisiana; Richton or Bruinsburg in Mississippi; Stratton Ridge in Texas. In addition to developing a new site or a combination of two new sites, DOE would expand two or three of the existing SPR sites at West Hackberry and Bayou Choctaw in Louisiana and Big Hill in Texas. For a more detailed discussion of the proposed action and candidate alternatives, see chapter 2.

DOE has prepared this floodplain and wetlands assessment in compliance with DOE requirements as codified in 10 CFR Part 1022. Executive Order (E.O.) 11988—Floodplain Management (May 24, 1977; 10 CFR Part 10221)—requires Federal agencies to ensure that the potential effects of any action that may be taken in a floodplain are evaluated and that agency planning programs and budget requests reflect consideration of flood hazards and floodplain management. The E.O. further requires Federal agencies to "consider alternatives to avoid adverse effects and incompatible development in the floodplain." If no "practicable alternative" exists to locating a project in a floodplain, an agency must "design or modify its action in order to minimize potential harm to or within the floodplain..." Similarly, E.O. 11990 (May 24, 1977) requires Federal agencies to avoid construction in wetlands unless "there is no practicable alternative" and "all practicable measures to minimize harm" are included. Thus, both Executive Orders require that the Federal agency proposing an action go through a process of selection that compares the proposed action's potential impact on floodplains and wetlands to other practicable alternatives that may exist. It is important to note that the term "floodplain action" "…means any DOE action that takes place in a floodplain, including any DOE action in a wetland that is also within the floodplain…" (DOE 2003). Conversely, "wetland action means any DOE action related to new construction that takes place in a wetland not located in a floodplain…"

This EIS considers potential impacts at four possible new SPR sites of which one would be developed and at three existing SPR sites where existing capacity would be expanded.

B.2 DEFINITIONS

In 10 CFR 1022.4, a floodplain is defined as "lowlands adjoining inland or coastal waters…and relatively flat areas and floodprone areas of offshore islands." The "base floodplain" means "the 100-year floodplain, that is, a floodplain with a 1.0 percent chance of flooding in any given year." The "critical action floodplain" means, "at a minimum, the 500-year, that is, a floodplain with a 0.2 percent chance of flooding in any given year." A "critical action" means a "DOE action for which even a slight chance of flooding would be too great. Such actions may include, but are not limited to, the storage of highly volatile, toxic, or water reactive materials." Because petroleum, lubricants, and hazardous materials would be used during the construction phase of this proposed project, both the base floodplain and the critical action floodplain are considered in this assessment.

[1] See http://www.eh.doe.gov/nepa/

Natural and beneficial floodplain values to be protected include moderation of floods, groundwater recharge, water quality maintenance, support of biological resources (marshes, fish, and wildlife), cultural richness (archeological, historical, recreational, and scientific), and agricultural and forestry production.

A wetland is defined in 10 CFR 1022.4 as "an area that is inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted to life in saturated soil conditions, including swamps, marshes, bogs, and other similar areas." Wetlands serve a variety of functions in an ecosystem, such as water quality preservation, flood protection, erosion control, biological productivity, and wildlife habitat, including nesting, spawning, and rearing sites for many sensitive and other species. The primary functions and values of wetlands are summarized below:

- **Water Quality.** Wetlands help maintain and improve the water quality of rivers, lakes, and estuaries. Because wetlands are located between uplands and water resources, many wetlands can intercept runoff from the land before it reaches open water. Wetlands remove or transform pollutants through physical, chemical, and biological processes associated with stormwater runoff.

- **Flood Protection.** Wetlands help protect adjacent and downstream properties from potential flood damage by receiving and temporarily storing water during periods of high runoff or high flows in adjacent streams. Wetlands within and upstream of urban areas are particularly valuable for flood protection because the impervious surface in urban areas greatly increases the rate and volume of runoff, thereby increasing the risk of flood damage on human safety, health, and welfare. In addition, wetlands provide protection from ocean wave and tidal surges associated with strong storms and hurricanes.

- **Erosion Control.** Riparian wetlands, salt marshes, and marshes located at the margin of oceans, lakes, and rivers protect shorelines and streambanks against erosion. Wetland plants hold the soil in place with their roots, absorb wave energy, and reduce the velocity of stream or river currents.

- **Biological Productivity.** The dynamic nature of many wetlands produces a great diversity of habitat that, in turn, supports a great diversity of plant and animal species. Numerous species of microorganisms, plants, insects, amphibians, reptiles, birds, fish, and other wildlife depend in some way on wetlands for at least part of their life cycles. Wetland plants play an integral role in the ecology of the watershed by providing breeding and nursery sites, resting areas for migratory species, and refuge from predators.

- **Fish and Wildlife Habitat.** Diverse species of plants, insects, amphibians, reptiles, birds, fish, and mammals depend on wetlands for food, habitat, or temporary shelter. Many bird species use wetlands as a source of food, water, nesting material, or shelter. Migratory waterbirds rely on wetlands for staging areas, resting, feeding, breeding, or nesting grounds.

- **Cultural Value.** Wetlands often have diverse archaeological, historical, and cultural values. Societies have traditionally formed along bodies of water, and artifacts found in wetlands provide information about these societies.

- **Aesthetic Value.** Many people enjoy the scenic, pastoral, and aesthetically pleasing properties of wetlands. Historically, painters and writers have used wetlands as subject matter.

- **Economic Value.** More than half of all adults in the United States hunt, fish, birdwatch, or photograph wildlife in wetlands.

Floodplain and wetland protection is of particular concern in the Gulf Coast region because of recent hurricane activity and the resulting devastation caused by flooding.

B.3 METHODOLOGY

Several information sources were used in this assessment to identify the floodplains and wetlands in the project area and characterize the existing environmental conditions, including the U.S. Geological Survey (USGS) topographic maps, Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps, National Wetlands Inventory (NWI) data, aerial photographs, limited field investigations, and consultations with several state and Federal agencies.

Based on conceptual designs, DOE identified the wetland areas and floodplains within the proposed footprint of the development or expansion of storage sites and their associated infrastructure. These are wetlands and floodplains that could be temporarily disturbed or permanently removed by proposed construction activities. The areas examined for this analysis include all construction-related areas, including the proposed storage sites and associated facilities, such as terminals, raw water intake (RWI), brine injection well fields, pipeline and power line rights-of-way (ROWs), equipment laydown, staging areas, and access roads.

Wetlands were identified initially by NWI data. DOE performed a site walk-over for each proposed new storage site to verify and directly observe the wetland and floodplain conditions. DOE consulted with Federal and state agencies to identify unique or sensitive wetlands. Once DOE selects an alternative, other than the no-action alternative, DOE would conduct a field delineation of jurisdictional wetlands and waters of the United States as part of the Section 404/401 permit application of the Clean Water Act. DOE would conduct the delineation in accordance with the U.S. Army Corps of Engineers (USACE) 1987 Wetland Delineation Manual (USACE 1987) and would submit the wetland delineation to the appropriate USACE District (New Orleans, LA; Galveston, TX; Mobile, AL; and Vicksburg, MS) for review and jurisdictional determination.

For this assessment, DOE calculated the area of each wetland type and the 100-year and 500-year floodplain area that would be affected by construction activities and operations and maintenance after the proposed new or expansion storage site and associated infrastructure are built. For ROWs, DOE estimated the potential permanent and temporary wetland impacts by distinguishing between the permanent easement and the temporary construction easement. The type and nature of the impact to plant communities and wetlands would depend on whether the affected area is located within a permanently maintained easement (about 50 feet [13 meters] wide per pipeline) or within a temporary construction easement. Additional detail on the width and purpose of the permanently maintained easements and temporary construction easements is provided in section 2.3.9. Section 3.7.2.1.2 provides further information on how construction would be completed in the different types of wetlands.

Three types of wetland impacts were calculated for this assessment. First, the filling of wetlands for storage site or other associated facilities during construction would constitute a permanent removal of wetlands, which would destroy the functions and values of the wetland. Second, forested and scrub-shrub wetlands within the permanently maintained ROW easements and storage site security buffers would be permanently converted to emergent wetlands. This type of impact would destroy some wetland functions and values, but others such as flood attenuation, groundwater recharge, and erosion control would not be lost. The last category of wetland impact is the temporary impact to wetlands within the construction easement portion of the ROW and security buffer impacts to emergent wetlands. Preconstruction contours within the ROWs and security buffers would be re-established to restore hydrology and allow emergent wetlands to revegetate within the permanent and temporary construction easements within the ROW and the site security buffers. Forested and scrub-shrub wetlands would be allowed to revegetate

within the temporary construction easements; however, re-establishment of the plant community would take at least 5 to 25 years depending on the type of community affected.

For floodplain impacts from the proposed ROWs, DOE calculated the total length of the impact in miles (kilometers) because there would be no permanent impact area. The area would be regraded and no aboveground structures would exist; therefore, floodplain storage capacity and floodplain benefits would not be permanently impacted.

The 100-year and 500-year floodplain impacts were evaluated. The placement of fill or construction of structures in a floodplain would potentially affect the flood storage capacity and destroy most of the benefits of floodplains.

Acreage calculations for the wetland and floodplain acreages were based primarily on NWI data and FEMA Flood Insurance Rate Maps. Wetland acreages for each proposed storage sites were modified based on DOE's site walk-over. Acreages presented in this assessment are estimates only as no formal wetland delineations of these areas have been conducted. For each site, DOE used the construction footprint and ROW for the pipelines, power lines, and access roads presented in chapter 2 to calculate the acreage of wetland types and floodplains associated with each proposed SPR alternative. Five hundred year floodplain areas are reported as the area outside the 100-year floodplain per the Flood Insurance Rate Maps. A 500-year flood event would flood both the 100-year and 500-year floodplain.

This process may have overestimated the impacts on wetlands and floodplains from the pipeline and power line corridors because specific construction measures that would be used to avoid wetlands were not addressed by this approach. For example, as described in section 2.3.9, DOE would use directional drilling for pipeline installation under larger streams and wetlands, which would avoid surface disturbance to the resources. In addition, many proposed ROWs would follow existing utility and road corridors and canals to minimize the impact to high quality, undisturbed wetlands. NWI data, used for the Geographic Information System (GIS) analysis, may have also overestimated wetlands in some areas and underestimated wetlands in other areas. The best NWI data available are over 20 years old for some regions. Wetlands accounted for in these regions may no longer exist or may have been misidentified. Alternatively, because NWI data are created from satellite images, some forested wetlands may have been misidentified as upland forests and therefore not accounted for in this analysis. These data, however, do provide a good general estimate and a basis for comparing the construction and operations and maintenance impacts associated with the proposed alternatives.

To summarize the major types of wetland systems, DOE consolidated the categories of the NWI data into the categories presented in table B.3-1 below.

Table B.3-1: Wetland Types and Description

Wetlands Type	Description
Palustrine – forested	Tidal and nontidal wetlands dominated by woody vegetation greater than or equal to 16 feet in height, and wetlands that occur in tidal areas in which salinity due to ocean-derived salts is below 5 parts per thousand. Total vegetation coverage is greater than 20 percent. This wetland category includes fresh-water swamps and bottomland hardwood forest.
Palustrine – scrub-shrub	Tidal and nontidal wetlands dominated by woody vegetation less than 16 feet in height, and wetlands that occur in tidal areas in which salinity due to ocean-derived salts is below 5 parts per thousand. Total vegetation coverage is greater than 20 percent. The species present could be true shrubs, young trees and shrubs, or trees that are small or stunted due to environmental conditions.

Table B.3-1: Wetland Types and Description

Wetlands Type	Description
Palustrine – emergent	Tidal and nontidal wetlands dominated by persistent emergent vascular plants, emergent mosses or lichens, and wetlands that occur in tidal areas in which salinity due to ocean-derived salts is below 5 parts per thousand. Plants generally remain standing until the next growing season. Total vegetation cover is greater than 80 percent. This category is also referred to as fresh-water marsh.
Estuarine – forested	Tidal wetlands dominated by woody vegetation greater than or equal to 16 feet in height, and wetlands that occur in tidal areas in which salinity due to ocean-derived salts is equal to or greater than 5 parts per thousand. Total vegetation coverage is greater than 20 percent.
Estuarine – scrub-shrub	Tidal wetlands dominated by woody vegetation less than 16 feet in height, and wetlands that occur in tidal areas in which salinity due to ocean-derived salts is equal to or greater than 5 parts per thousand. Total vegetation coverage is greater than 20 percent.
Estuarine – emergent	Tidal wetlands dominated by erect and rooted plants that can live in water, excluding mosses and lichens. Wetlands that occur in tidal areas where salinity due to ocean-derived salts is equal to or greater than 5 parts per thousand and that are present for most of the growing season in most years. Perennial plants usually dominate these wetlands. Total vegetation cover is greater than 80 percent. This wetland category includes saltwater marsh.
Palustrine – aquatic bed	Tidal and nontidal wetlands and deepwater habitats in which salinity due to ocean-derived salts is below 5 parts per thousand and that are dominated by plants that grow and form a continuous cover principally on or at the surface of the water. These include algal mats, detached floating mats, and rooted vascular plant assemblages. Total vegetation cover is greater than 80 percent.
Lacustrine	These include wetlands and deepwater habitats with all of the following characteristics: (1) situated in a topographic depression or a dammed river channel; (2) lacking trees, shrubs, persistent emergents, emergent mosses, or lichens with greater than 30 percent areal coverage; and (3) total area exceeds 20 acres.
Riverine	These include all wetlands and deepwater habitats contained in natural or artificial channels periodically or continuously containing flowing water or water that forms a connecting link between the two bodies of standing water. Upland islands or palustrine wetlands may occur in the channel, but they are not part of the riverine system.
Marine	Open ocean and high energy coastlines with salinities exceeding 30 parts per thousand and little or no dilution except outside the mouths of estuaries.
Palustrine – unconsolidated bottom	These include wetlands and deepwater habitats with at least 25 percent cover of substrate particles smaller than stones and a vegetative cover less than 30 percent. Water regimes are restricted to permanently flooded, intermittently exposed, and semi-permanently flooded. Characterized by the lack of large stable surfaces for plant and animal attachment. Salinity is below 5 parts per thousand.
Palustrine – open water	Small, shallow bodies of open fresh water lacking significant emergent vegetative cover.

1 foot = 0.305 meters; 1 acre = 0.405 hectares

B.4 REGULATORY AND PERMITTING REQUIREMENTS

For the selected alternative, other than the no-action alternative, DOE would conduct a delineation of waters of the United States, including wetlands in accordance with the USACE Wetland Delineation Manual (1987) and subsequent regulatory guidance. A wetland delineation is a survey conducted by a qualified person to determine the extent of a jurisdictional wetland and the types of wetland that would be affected by a project. A jurisdictional wetland must exhibit water tolerant vegetation, hydric soils, and wetland hydrology. Wetlands would be delineated on the selected new and expansion sites, along all ROWs, and at all locations for proposed ancillary facilities such as storage terminals and brine disposal well fields. Only wetlands that are regulated under Sections 404 and 401 of the Clean Water Act would be delineated. Isolated wetlands are generally not considered within the jurisdiction of the USACE. DOE would coordinate with the appropriate USACE District to secure a jurisdictional determination (or confirmation) of the delineation.

DOE would prepare the appropriate permit application for a Section 404 Permit from the USACE and the 401 Water Quality Certificate from the relevant state agency. This permit process requires a comprehensive analysis of alternatives to avoid impacts to wetlands and waters of the United States, an analysis of measures taken to minimize impacts, and a compensation plan to mitigate for unavoidable impacts to waters of the United States, including wetlands. Avoidance and minimization strategies could include measures such as refinement or modification of facility footprints to avoid wetlands, minimization of slopes in fill areas, use of geotechnical fabric under wetland fills to minimize mudwave potential, and restoration of the disturbed wetlands outside the permanent footprint of the SPR facility. DOE would prepare the compensation plan and submit it with the permit application. Compensation for unavoidable impacts to wetlands could take the form of preservation, restoration, or creation of wetlands in the project area or within the affected watersheds. DOE could also use payment of an lieu-of fee where the USACE and state would allow such payment or the purchase of mitigation credits from an approved wetland mitigation bank in the appropriate service area (region or watershed). The compensation plan would include provisions for protecting the mitigation site through a conservation easement or similar mechanism and postconstruction mitigation monitoring to evaluate the success of the mitigation. Additional detail on the compensation plan is included in section 3.7.2.1.3 and Appendix O.

The USACE state agency and other resource agencies would review and approve the wetland compensation plan through the Section 404/401 permit process. DOE's mitigation plan would be consistent with the Environmental Protection Agency (EPA) and USACE proposed rulemaking on wetland mitigation entitled *Compensatory Mitigation for Losses of Aquatic Resources, Proposed Rule* (33 CFR Parts 325 and 332). DOE's mitigation actions would partially fulfill the compliance requirements of E.O. 11990 on Wetlands Protection and 10 CFR Part 1022, which are DOE's implementing regulations for the E.O. Dredge spoils, if generated, would be disposed of in a manner approved by the USACE. DOE would identify beneficial uses for the dredge spoil, (such as wetland restoration) as appropriate. In addition, DOE would secure Section 10 permits wherever required for proposed obstructions in navigable waterways that are regulated by the U.S. Coast Guard and USACE under the Rivers and Harbors Act.

For the selected alternative, DOE would comply with all Federal, state, and local regulations for floodplain protection. In most cases, floodplain regulations have been delegated to the local government through adoption of an ordinance that is consistent with the National Flood Insurance Program (NFIP). In most cases, the floodplain regulations apply only to the 100-year floodplain. The floodplain protection compliance requirements would be initiated during the design process for the selected alternative. DOE would prepare a site plan or engineering drawings that would be submitted to the appropriate state agency (e.g., Mississippi Floodplain Management Bureau of the Mississippi Emergency Management Agency) responsible for the NFIP. The floodplain protection requirements typically require floodproofing of buildings or raising the base of the building above the base flood elevation. In most cases, DOE would

have to complete hydrologic modeling or calculations to demonstrate that fill or aboveground structures placed in a 100-year floodplain would not increase the base flood elevation downstream.

B.5 PROJECT DESCRIPTION

This section is an overview of the proposed project development in floodplains and wetlands. It assesses several elements that are common to developing each proposed new and expansion site, including the following:

- Storage caverns, each of which involves construction of a well pad on the ground surface above the cavern site, short onsite pipelines from the wellhead to onsite pumping facilities, onsite pumping capacity for water and brine management during cavern excavation, and oil management during facility operation;
- RWI facilities, including pumps located near the raw water source (generally offsite), and pipelines running from the source location to the storage facility;
- Crude oil intake and distribution facilities, including a series of onsite pipelines and pumps and offsite pipelines connecting to an existing oil distribution network;
- Brine disposal facilities, including onsite brine pumps, brine pipelines from the storage facilities to offsite brine disposal points, and offsite brine disposal facilities (either offshore diffusers in the Gulf of Mexico or underground injection wells);
- Support facilities including offices, control facilities, roads, platforms, and other related infrastructure, which typically would occupy a 35,000 square foot (3,300 square meter) area;
- Storage site and RWI access roads;
- Onsite package wastewater treatment plant; and
- Power lines.

B.6 SITE-SPECIFIC PROJECT DESCRIPTIONS AND FLOODPLAIN AND WETLAND IMPACTS

This section describes the effects to floodplains and wetlands at each proposed new site and expansion site.

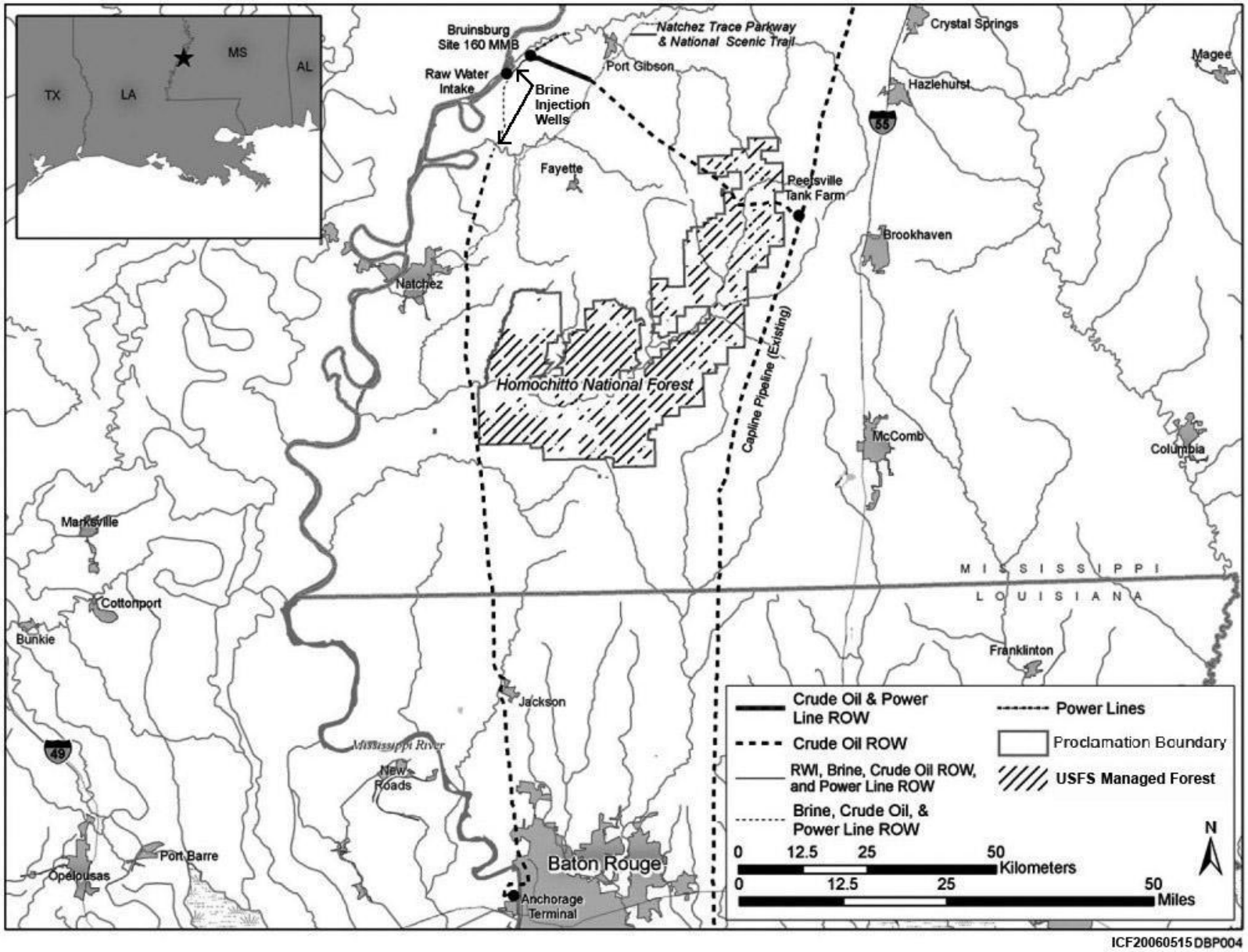
B.6.1 Bruinsburg Storage Site and Associated Infrastructure

The Bruinsburg site would be located 10 miles (16 kilometers) east of Port Gibson, MS (40 miles [64 kilometers] southwest of Vicksburg) in Claiborne County, MS (see figure B.6.1-1). This proposed new site would consist of 16 new caverns with a total capacity of 160 million barrels (MMB). A security buffer would be cleared extending 300 feet (91 meters) from the perimeter fence. The first six maps in an attachment to this appendix, which is a separate volume, show the NWI mapped wetlands for the proposed Bruinsburg storage site and associated infrastructure.

The Bruinsburg site and associated facilities would consist of the following:

- Sixteen new caverns and associated storage site infrastructure,
- New RWI structure and associated pipeline,
- Two new terminals at Peetsville, MS, and Anchorage, LA,

Figure B.6.1-1: Proposed Bruinsburg Storage Site and Associated Facilities



Note: A 15-mile (24-kilometer) brine disposal pipeline with brine injection wells spaced 1,000 feet (305 meters) apart would be located along the crude oil pipeline to Baton Rouge, LA.

- 60 injection wells spaced at 1,000 feet intervals and an associated pipeline parallel to the ROW to Anchorage,
- Power lines, and
- New access roads to the facility and to the brine injection wells.

B.6.1.1 Floodplain Impacts

The extent of 100-year and 500-year floodplain was determined based on the FEMA Flood Insurance Rate Maps covering the project area. The Bruinsburg site would be located in a predominantly undeveloped area that has numerous floodplains associated with the Mississippi River and Bayou Pierre and their tributaries. Drainage is generally to the west toward the Mississippi River. Table B.6.1-1 summarizes the floodplain area that would be affected by this site and its associated facilities.

Table B.6.1-1: Potential Floodplain Impacts for the Proposed Bruinsburg Storage Site and Associated Facilities

Description	100-Year Floodplain (acres)	500-Year Floodplain (acres)
Storage site/access road	174	18
RWI structure/access road	16	0
Anchorage terminal	0	0
Peetsville terminal	0	0
Brine injection well pads/access road	82	4
Total	**272**	**22**

1 acre = 0.405 hectares

The Bruinsburg site storage area and associated facilities would affect approximately 272 acres (110 hectares) of 100-year floodplain and 22 acres (9 hectares) of 500-year floodplain and would include fill and construction of some aboveground structures (figure B.6.1-2). The Peetsville and Anchorage terminals would not affect 100-year or 500-year floodplains (figures B.6.1-3 and B.6.1-4).

The Bruinsburg storage site and associated facilities would have the potential to increase future downstream flooding due to proposed fill and construction of the Bruinsburg site within the floodplain. The entire Bruinsburg site would be cut and filled to an elevation of 110-feet above mean sea level, which would require 30 feet of fill in the western portion of the site and 90 feet of cut in the eastern portion of the site. The slopes surrounding the site would have a 3:1 ratio (figure B.6.1-2). The fill in the floodplain may have the potential to increase downstream flooding; however, the impacts would be minimal due to the overall size of the floodplain system and compliance with the flood protection requirements of local, state, and Federal floodplain regulations. After selection of an alternative other than no-action and prior to construction, hydrological modeling would be conducted to ensure that base flood elevations would not increase from the proposed fill/structures. No floodplains would be affected by the Peetsville or Anchorage terminals (figures B.6.1-3 and B.6.1-4).

Any structures located within the floodplain would be designed in accordance with the NFIP requirements for nonresidential buildings and structures located in special flood hazard areas. The NFIP regulations require vulnerable structures to be elevated above the 100-year flood elevation or to be watertight. DOE would coordinate with and secure approval from the Mississippi Floodplain Management Bureau of the Mississippi Emergency Management Agency or the local government, if it has adopted the NFIP program, during the design stage/site plan process.

Figure B.6.1-2: Floodplain Map for Proposed Bruinsburg Storage Site

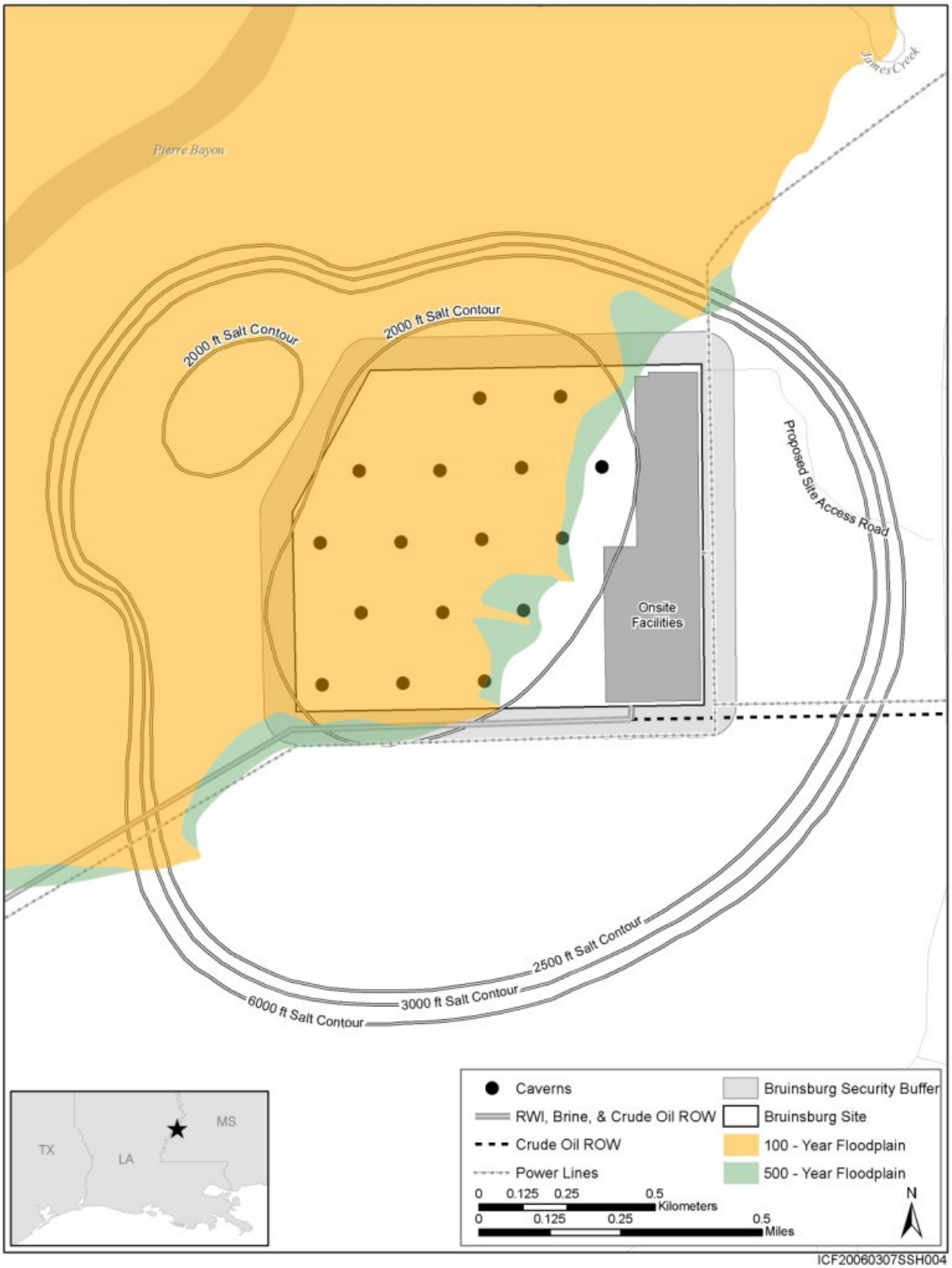
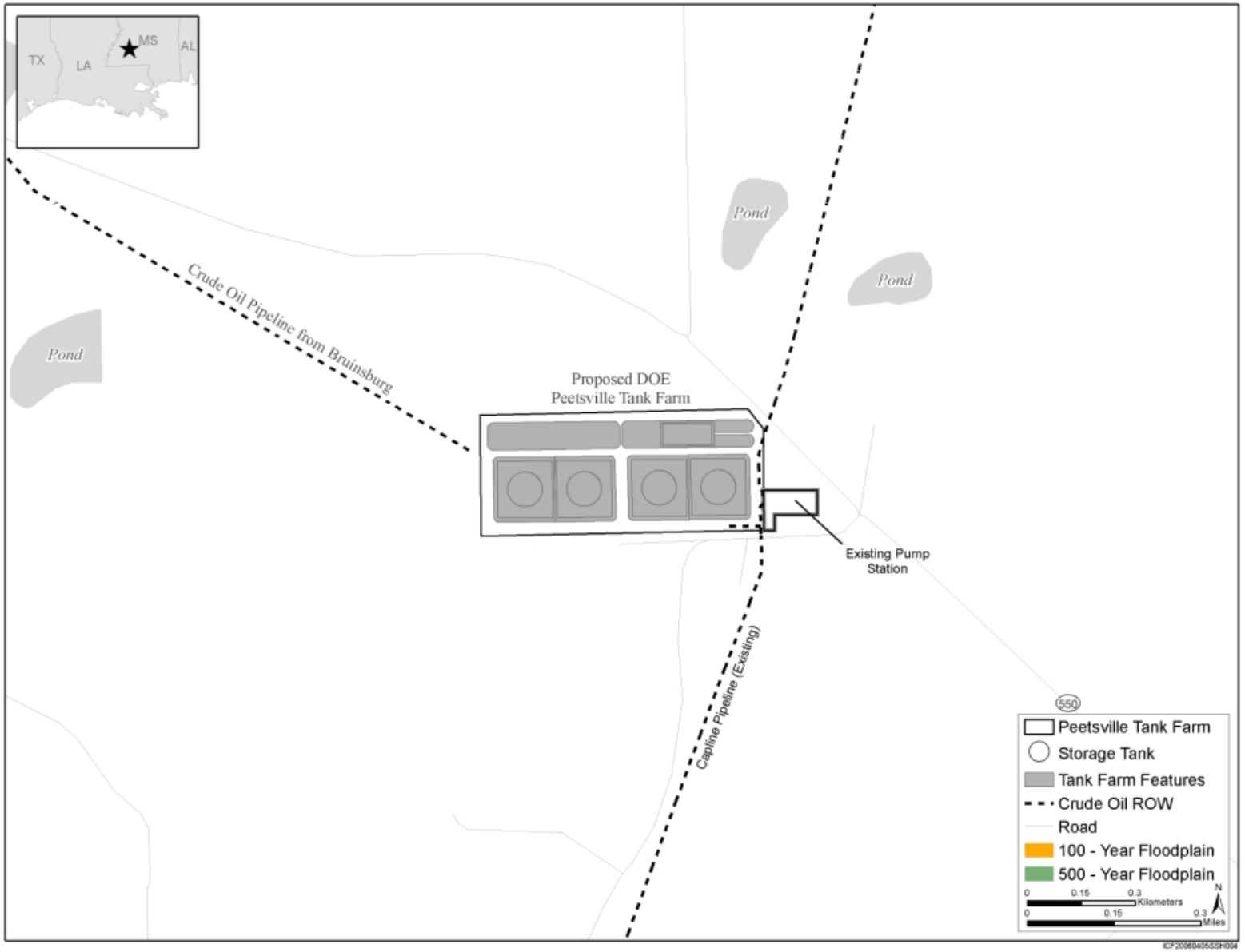


Figure B.6.1-3: Floodplain Map for Anchorage Terminal

Figure B.6.1-4: Floodplain Map for Peetsville Terminal



The Bruinsburg pipeline and power line ROWs would cross and temporarily affect about 30 miles (48 kilometers) of 100-year floodplain and 4 miles (6 kilometers) of 500-year floodplain. The impacts to floodplains associated with the construction of the ROWs would be temporary because the preconstruction contours would be re-established and no aboveground fill or structures would exist following the completion of the construction activities. Therefore, no significant increased risk of flooding or change in base flood elevation would be expected from ROW construction because there would be no net loss of flood attenuation capacity compared to the existing conditions. There would be a minor increase in flood stage during the construction activities because some staging materials and construction equipment may be located in the floodplain. Power poles and other associated fill would be located outside of floodplain areas to the maximum extent practical. These structures would not be expected to significantly increase base flood elevations.

Due to the unique geology and location of the salt dome, the water dependency of the RWI, and the long ROWs for the site, floodplains could not be completely avoided. DOE has considered the practicable alternatives to siting in a floodplain and has prepared a conceptual design to minimize the potential impacts to floodplains. DOE shifted the administrative buildings and other vulnerable structures where practicable to a location outside of the floodplain at the proposed Bruinsburg storage site. Proper design and compliance with the required regulatory programs would reduce the impacts of the structures on floodplains to a level where they would not significantly change the base flood elevation. Section B.7 discusses in more detail the avoidance and minimization measures that DOE would use to reduce the effects to floodplains located in the project area.

B.6.1.2 Wetland Impacts

The construction and operations and maintenance associated with the proposed Bruinsburg storage site and related facilities would have temporary and permanent impacts on wetlands as described in the methodology. Table B.6.1-2 identifies the wetlands that would be affected by the proposed ROWs and table B.6.1-3 summarizes the wetlands that would be affected by the new storage site, ROWs, and ancillary facilities.

The wetlands at the Bruinsburg storage site are predominantly palustrine forested wetlands comprised of mature cypress trees (see figure B.6.1-5). Although the forested wetlands are adjacent to actively managed cotton fields, they contain large cypress trees that indicate that the wetlands have been relatively undisturbed for several decades. This important type of fresh-water ecosystem generally provides functions that include nutrient transformation, flood storage, wildlife habitat, and timber production. Construction of the permanent structures such as the storage site, RWI, and brine injection wells would permanently fill approximately 123 acres (50 hectares) of palustrine forested wetlands. The NWI data did not identify wetlands at the proposed Peetsville terminal, or the Anchorage terminal. The maintenance of the security buffer around the 300-foot (91-meter) storage facility would permanently convert 12 acres (5 hectares) forested and scrub-shrub wetlands to emergent wetlands or open water. The security buffer would require the clearing of woody vegetation and periodic maintenance to suppress or clear woody species.

The power line and pipeline ROWs associated with the Bruinsburg storage site would cross and permanently or temporarily affect 335 acres (136 hectares) of wetlands. Table B.6.1-2 summarizes the wetland impacts per ROW that would result from this proposed development. Construction of all the ROWs would affect 151 acres (61 hectares) of wetlands within the permanent easement and 184 acres (75 hectares) of wetlands within the temporary easement (see table B.6.1-3). Pre-existing hydrology and elevations would be restored and the affected plant communities would be allowed to re-establish depending on location within the temporary and permanent easement. DOE would promote the growth of

Table B.6.1-2: Potential Wetland Impacts for the Proposed Bruinsburg Storage Site ROWs[a]

Cowardin Wetland Classification	ROW from Site to Anchorage (acres)		ROW from Anchorage ROW to RWI (acres)		ROW from Site to Peetsville (acres)		Power Line ROWs (acres)	
	Temporary easement	Permanent easement	Temporary easement	Permanent easement	Temporary easement	Permanent easement	Temporary easement	Permanent easement
Palustrine – forested[b]	100	63	3	2	6	3	NA	39
Palustrine – scrub-shrub[b]	25	15	0	0	0	0	NA	4
Palustrine – unconsolidated bottom[c]	2	1	0	0	2	1	NA	0
Riverine[c]	45	22	1	1	0	0	NA	0
Totals	**172**	**101**	**4**	**3**	**8**	**4**	**NA**	**43**

Notes:

[a] This table presents only the wetland types that are present within the proposed ROW according to NWI data.

[b] Forested and scrub-shrub wetlands would be cleared of woody vegetation and permanently converted to and maintained as emergent wetlands within the permanent easement of all ROWs. Within the temporary construction easement, woody vegetation would be cleared but would be allowed to re-establish within the easement. DOE would follow any required wetland compensation for these temporary impacts that is required by the Section 404/401 permit. At a minimum, DOE would restore original contours, replace the original hydric topsoil back in the disturbed area (where practical), and seed with native species. Re-establishment of the scrub-shrub or forested wetland may take 5-25 years depending on the type of community affected.

[c] Impacts to these wetlands would be temporary and they would return to the pre-existing conditions shortly after construction is completed.

1 acre = 0.405 hectares; NA means no temporary easement

Table B.6.1-3: Summary of Potential Wetland Impacts for the Proposed Bruinsburg Storage Site and Associated Facilities[a]

Cowardin Wetland Classification	Storage Site (acres)		ROWs[b] (acres)		Brine Injection Wells (acres)	RWI (acres)	Totals (acres)
	Filled wetlands	Permanent conversion	Temporary easement	Permanent easement	Filled wetlands	Filled Wetlands	All affected wetlands
Palustrine – forested	91	12	109	107	17	15	**351**
Palustrine – scrub-shrub	0	0	25	19	9	0	**53**
Palustrine – unconsolidated bottom	0	0	4	2	0	0	**6**
Riverine	0	0	46	23	0	1	**69**
Total	**91**	**12**	**184**	**151**	**26**	**16**	**480**

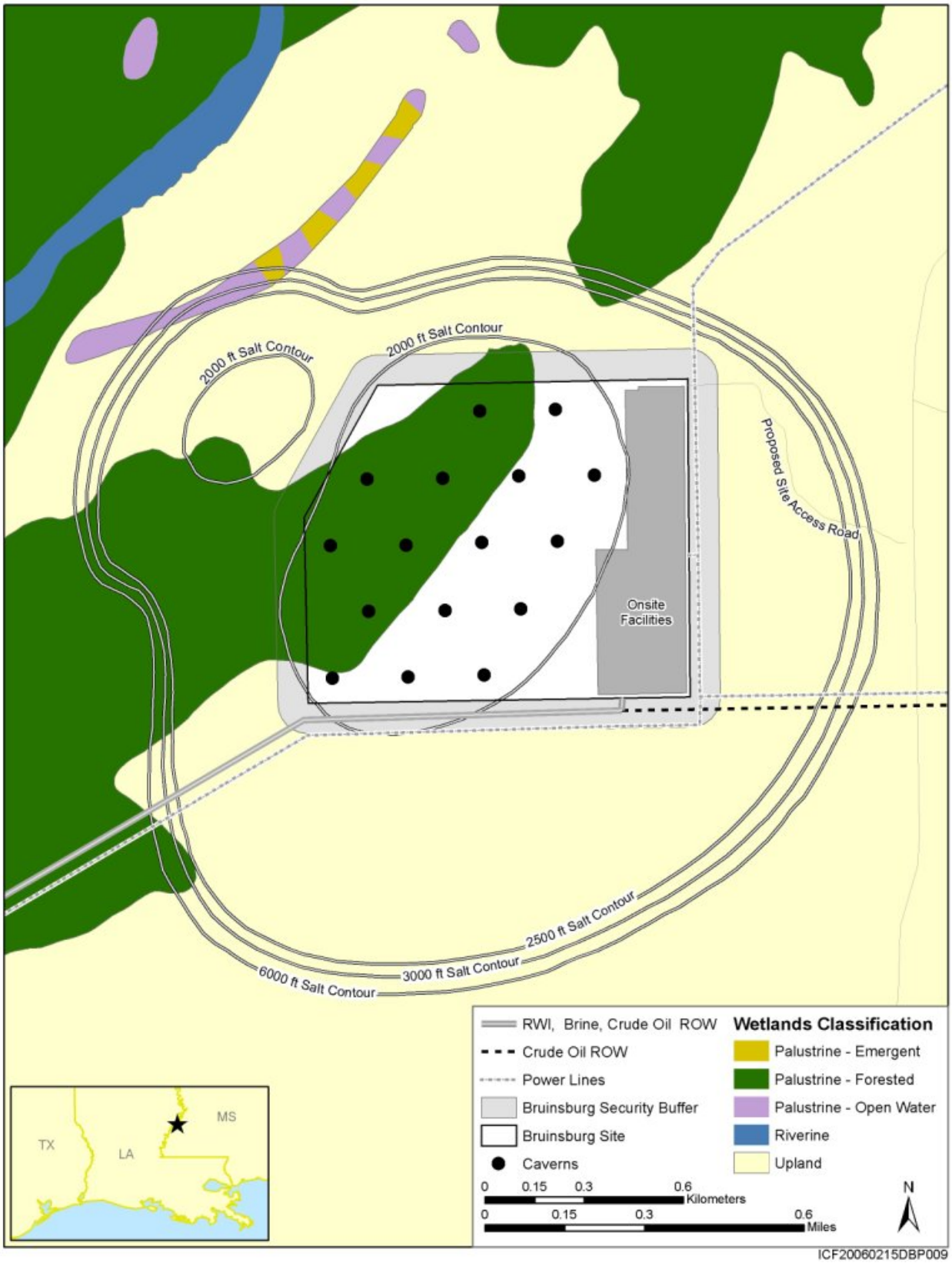
Notes:

[a] This table presents only the wetland types that are present within the proposed footprint according to NWI data. Facilities were omitted if no wetlands were present within the footprint.

[b] Forested and scrub-shrub wetlands would be cleared of woody vegetation and permanently converted to and maintained as emergent wetlands within the permanent easement of all ROWs. Within the temporary construction easement, woody vegetation would be cleared but would be allowed to re-establish within the easement. DOE would follow any required wetland compensation for these temporary impacts that is required by the Section 404/401 permit. At a minimum, DOE would restore original contours, replace the original hydric topsoil back in the disturbed area (where practical), and seed with native species. Re-establishment of the scrub-shrub or forested wetland may take 5-25 years depending on the type of community affected. Impacts to all other wetlands would be temporary and they would return to the pre-existing conditions shortly after construction is completed.

1 acre = 0.405 hectares

Figure B.6.1-5: NWI Wetlands at the Proposed Bruinsburg Storage Site



emergent or forested vegetation in the temporary construction easement. The impacts to wetlands within the temporary easement would last between 2 to 3 years for emergent wetlands and at least 10 to 25 years for forested wetlands. DOE would prohibit the regrowth of woody vegetation within the permanent easement to protect pipelines and to allow overflight inspections. Therefore, forested and scrub-shrub wetlands in the permanent easement would be permanently converted to emergent wetlands. Although the converted wetlands would provide different habitat than before construction, other important wetland functions, such as flood storage and nutrient filtration, would be maintained within the emergent wetlands.

According to available NWI data, the proposed Peetsville tank farm and Anchorage terminal would not affect wetlands (figures B.6.1-6 and B.6.1-7).

The entire Bruinsburg development, which includes the site, the associated facilities, and ROWs, would affect approximately 480 acres (192 hectares) of wetlands associated with the filling activities required for new structures and facilities and temporary and permanent clearing for new power lines and pipelines. The construction activities would permanently fill approximately 123 acres (50 hectares) of forested wetlands associated with the storage site, RWI, and brine injection wells (see table B.6.1-3). The storage site would permanently destroy about 91 acres (37 hectares) of palustrine forested wetlands characterized as bald cypress forest. The impact to this relatively rare and important type of forested wetland would be a potential adverse effect, which would be mitigated by the compensation plan for wetland impacts (see Appendix O).

Due to the geology and location of the salt dome, the water dependency of the RWI, and the long ROWs, impacts to wetlands and waters of the United States could not be avoided by this site development. All filling of and discharges to jurisdictional wetlands would require a Section 404/401 permit from the USACE and the Mississippi Department of Environmental Quality. The permit application would require a comprehensive alternatives analysis that demonstrates avoidance and minimization of wetland impacts. The permit would contain conditions to minimize the impact on wetlands during construction and would require compensation for unavoidable impacts to wetlands. Section B.7 discusses in more detail the avoidance, minimization, and mitigation measures that would be used to reduce, avoid, and compensate for the impacts to wetlands. Appendix O describes a conceptual compensation plan for impacts to wetlands.

B.6.2 Chacahoula Storage Site and Associated Infrastructure

The Chacahoula salt dome site is located in Lafourche Parish, southwest of Thibodaux, LA, as illustrated in figure B.6.2-1. This proposed new site would consist of 16 new caverns with a total capacity of 160 MMB. A security buffer zone would be cleared extending 300 feet (91 meters) from the perimeter fence. Five maps in the attachment to this appendix show the NWI mapped wetlands and the proposed Chacahoula site storage, ROWs, and associated facilities.

The Chacahoula site and associated facilities would consist of the following:

- Sixteen new caverns, associated storage site infrastructure, and two access roads
- New RWI structure, associated pipeline, and access road,
- Crude oil pipelines to Clovelly, LA, and to St. James Terminal, LA,
- Brine disposal pipeline to the Gulf of Mexico,
- Power lines.

Figure B.6.1-6: NWI Wetlands at the Proposed Peetsville Terminal

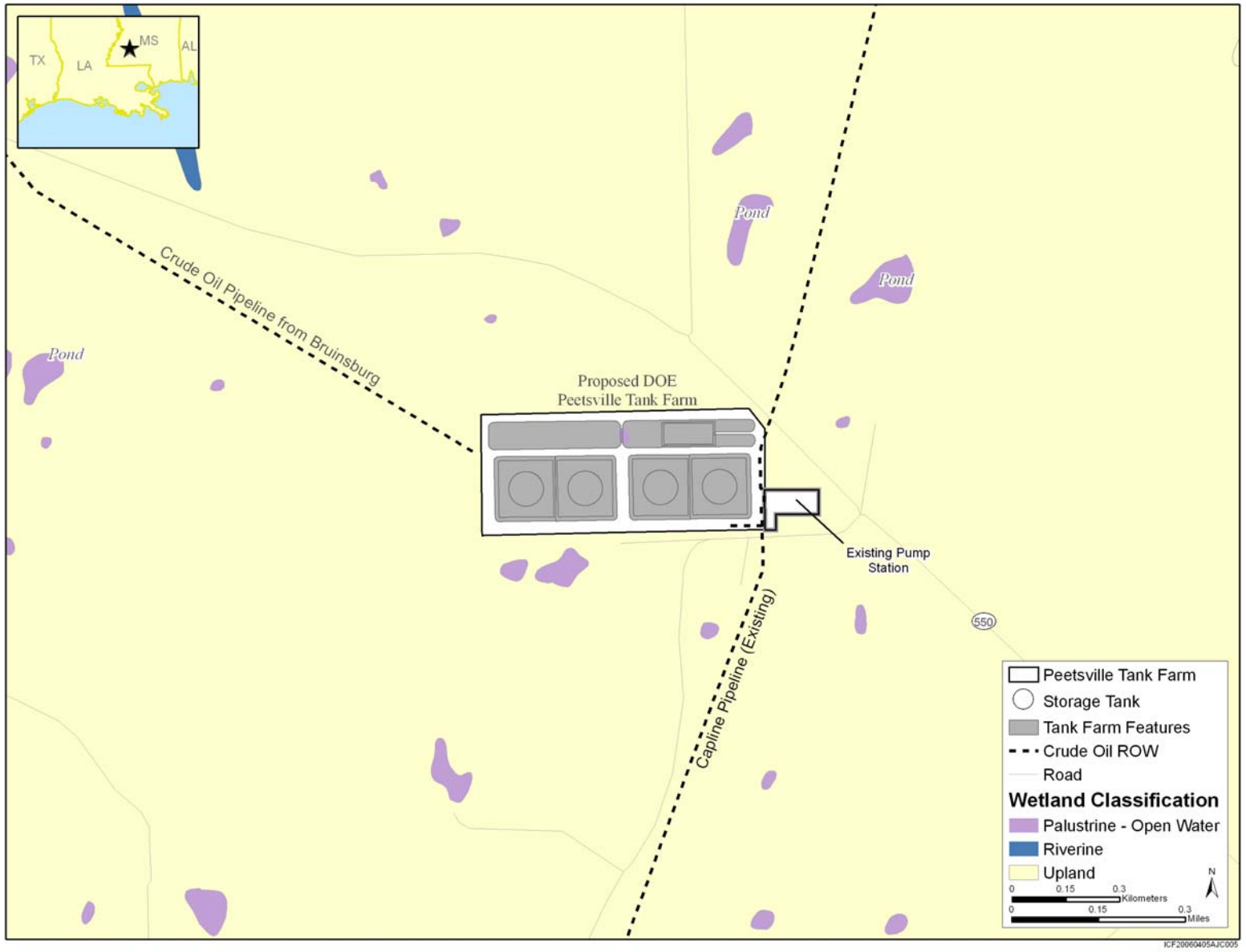
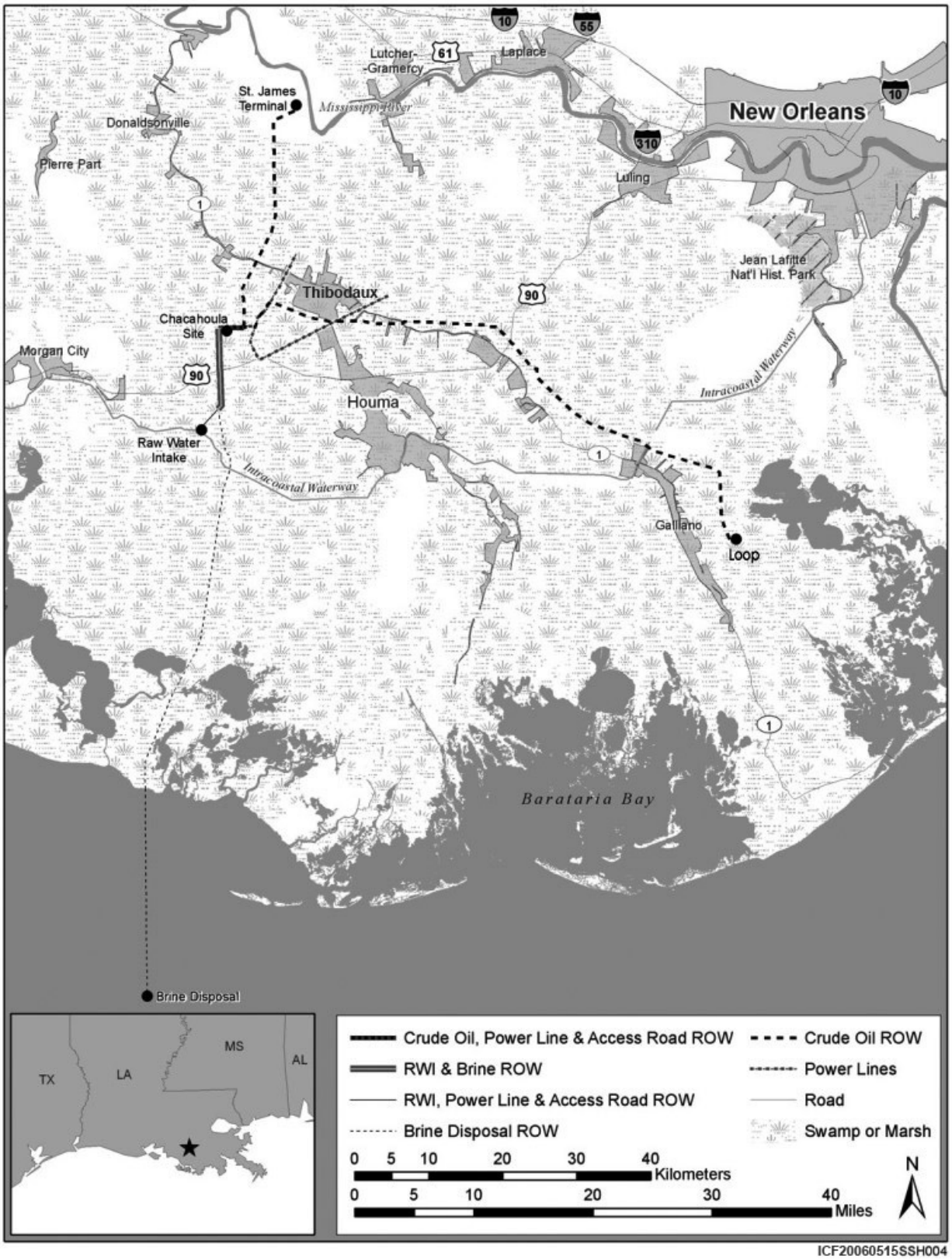


Figure B.6.1-7: NWI Wetlands at the Proposed Anchorage Tank Farm

Figure B.6.2-1: Proposed Chacahoula Storage Site and Associated Facilities



B.6.2.1 Floodplain Impacts

The extent of 100-year and 500-year floodplain was determined based on the FEMA Flood Insurance Rate Maps covering the project area. The Chacahoula storage site would be located in a predominantly undeveloped, flooded wetland. The entire proposed site is within the 100-year floodplain (see figures B.6.2-2 and B.6.2-3). Table B.6.2-1 summarizes the floodplain area that would be affected at this site.

Table B.6.2-1: Potential Floodplain Impacts for the Proposed Chacahoula and Associated Facilities

Description	100-Year Floodplain (acres)	500-Year Floodplain (acres)
Storage site/access road	126	0
RWI structure/access road	24	0
Total	**150**	**0**

1 acre = 0.405 hectares

The floodplain where the proposed Chacahoula storage site would be located extends over hundreds of square miles (square kilometers) and is part of the Louisiana Western Gulf Coastal Plain Province. The Chacahoula storage site and RWI would disturb about 150 acres (61 hectares) of 100-year floodplain, which would include fill and construction of aboveground structures such as well pads, roads, administrative buildings, and the RWI structure itself.

Because the proposed Chacahoula storage site is located entirely within the 100-year floodplain, it would have the potential to increase future flooding due to the proposed fill and construction of aboveground structures within the floodplain, including buildings, well pads, roads, and wellheads. Portions of inundated forested wetlands would be filled for administrative buildings, pump stations, and other structures. A berm would be placed around the facility boundary to support a security fence and road. Although the proposed site is 227 acres (92 hectares), only 126 acres (51 hectares) would be filled. The berm would contain culverts to maintain hydrological functions and reduce flooding in nearby upland areas. Potential floodplain impacts are expected to be moderate due to the overall size of the floodplain system and compliance with the flood protection requirements of local, state, and Federal floodplain regulations. After selection of an alternative other than no-action and prior to construction, hydrological modeling would be conducted to ensure that base flood elevations would not be increased by the proposed fill/structures.

All structures would be designed in accordance with the NFIP requirements for nonresidential buildings and structures located in special flood hazard areas. The NFIP regulations are designed to require vulnerable structures to be constructed above the 100-year flood elevation or to be as watertight. DOE would coordinate with and secure approval from the floodplain coordinator at the Louisiana Department of Transportation and Development or the local government, if it has adopted the NFIP program, during the design stage/site plan process.

The associated power line and pipeline ROW would temporarily affect approximately 91 miles (147 km) of 100-year floodplain and less than 1 mile (2 kilometers) of 500-year floodplain (see figure B.6.2-2). The impacts on floodplains associated with the pipeline and power line ROWs would be temporary because no aboveground fill or structures would be built, the preconstruction contours would be re-established, and all disturbed areas would be allowed to revegetate following the completion of the construction activities. Therefore, no significant increased risk of flooding or change in base flood elevation would be expected from the pipeline and power line ROWs because there would be no net loss of floodplain attenuation capacity compared to the existing conditions. There would be a minor increase

Figure B.6.2-2: Floodplain Map for Proposed Chacahoula Site and Proposed Facilities

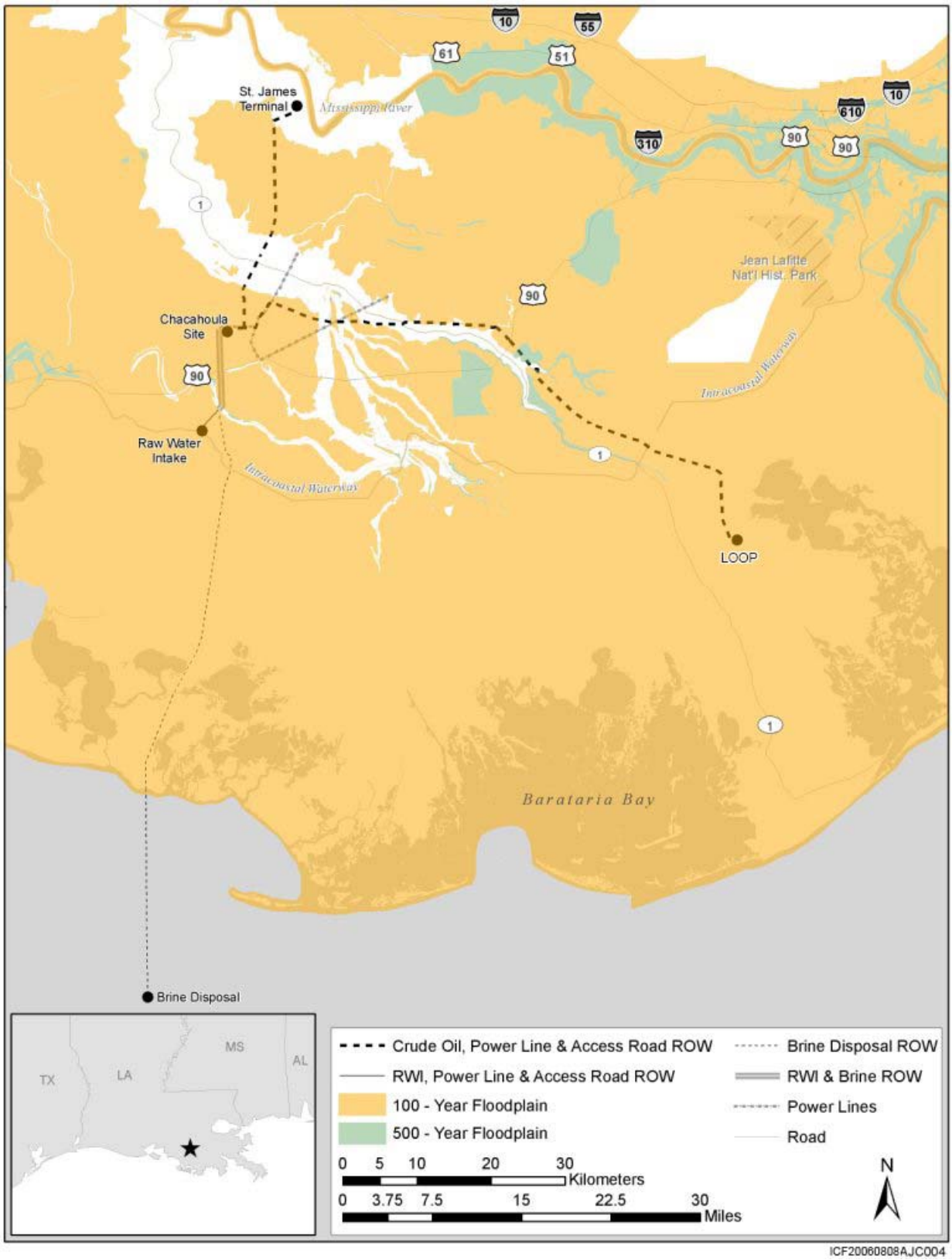
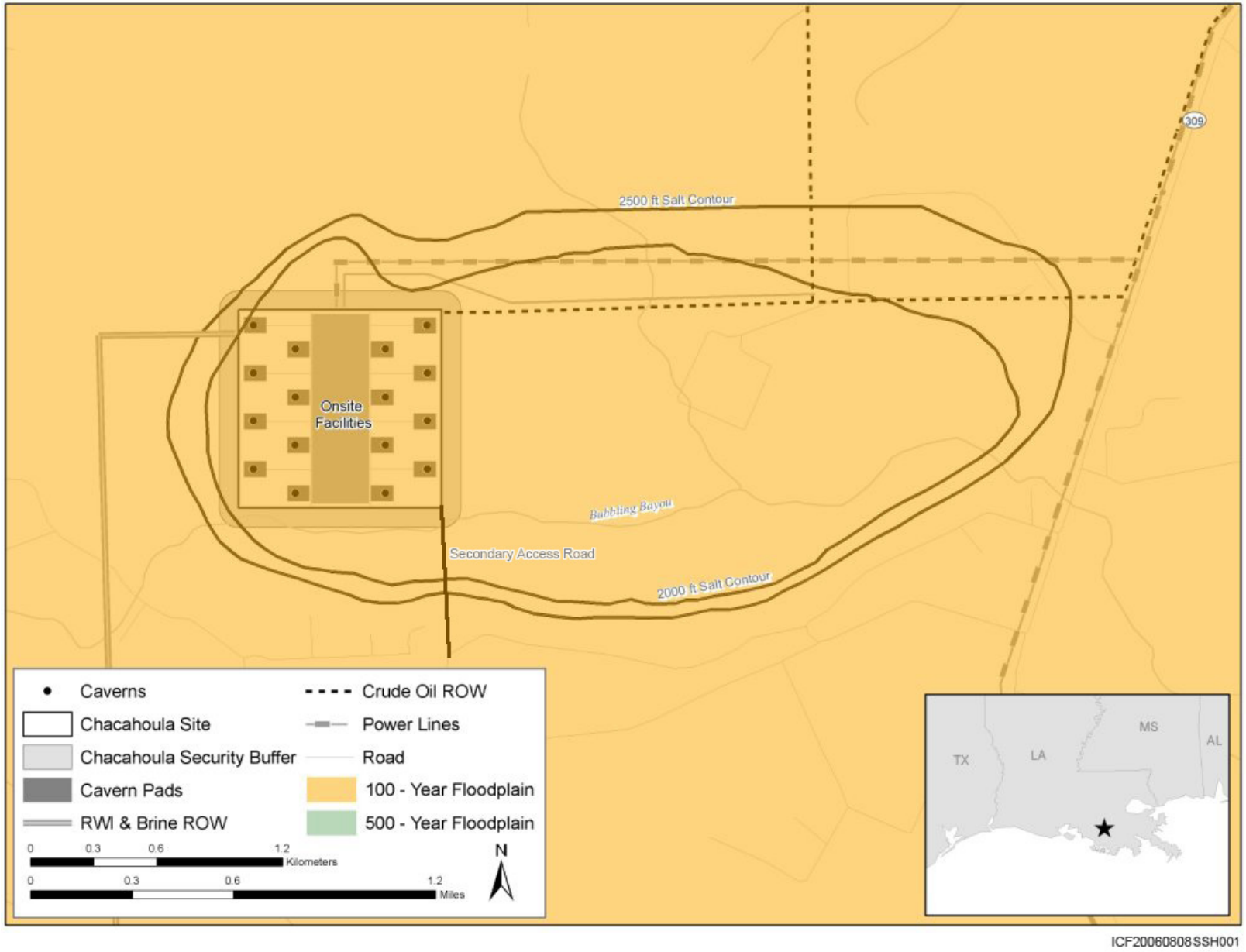


Figure B.6.2-3: Floodplain Map for Proposed Chacahoula Storage Site



in flood stage during the construction activities because some staging materials and construction equipment may be located in the floodplain. Power poles and other associated fill would be located outside of floodplain areas to the maximum extent practical. These structures would not be expected to significantly increase flood stage levels.

Due to the area geology and location of the salt dome, water dependency of the RWI, and the long ROWs, floodplains could not be avoided by this site development. DOE has considered the practicable alternatives to placing the storage site in a floodplain and has prepared a conceptual design to minimize the impact to floodplains. Proper design and compliance with the required regulatory programs would reduce the potential impacts of these structures on floodplains to such an extent that there would be no significant change in the base flood elevation. Section B.7 discusses in more detail the avoidance and minimization measures that would be used to reduce the effects to floodplains located in the project area.

B.6.2.2 Wetland Impacts

The construction and operations and maintenance associated with the proposed Chacahoula storage site and associated facilities would have temporary and permanent impacts on wetlands as described in the methodology. Table B.6.2-2 presents the wetlands that would be affected by ROW and table B.6.2-3 summarizes the wetlands that would be affected by this alternative.

The proposed Chacahoula storage site would be located in a relatively large contiguous patch of inundated palustrine forested wetlands comprised of cypress and tupelo trees (figure B.6.2-4). This swamp has areas of oil and gas development, but it is largely undisturbed. This important type of fresh-water ecosystem generally provides functions that include nutrient transformation, flood storage, wildlife habitat, and timber production.

Construction of the Chacahoula storage site and RWI would affect about 375 acres (152 hectares) of palustrine forested and emergent wetlands. The permanent fill and conversion of wetlands would be associated with the construction of the storage site and RWI and the clearing and maintenance of a 300-foot (91-meter) security buffer around the new storage site (see figure B.6.2-4). Approximately 126 acres (50 hectares) of the proposed storage site would be filled for administrative buildings, well heads, pumps, and other facilities. The remaining portion of the enclosed site and the 300-foot (91-meter) security buffer would be cleared of woody vegetation and converted into emergent wetlands or open-water. Periodic maintenance would take place to suppress or clear woody vegetation regrowth within these areas.

The power line and pipeline ROWs associated with the Chacahoula storage site would cross and permanently or temporarily affect approximately 1,907 acres (770 hectares) of wetlands. Table B.6.2-3 provides a summary of the wetland impacts per ROW that would result from this alternative. Construction of the ROWs would affect 1,100 acres (445 hectares) of wetlands within the permanent easement and 807 acres (327 hectares) within the temporary easement. Pre-existing hydrology and elevations would be restored and the affected plant communities would be allowed to re-establish depending on location within the temporary and permanent easement. DOE would promote the growth of emergent or forested vegetation in the temporary construction easement. The impacts to wetlands within the temporary easement would last between 2 to 3 years for emergent wetlands and at least 10 to 25 years for forested wetlands. DOE would prohibit the regrowth of woody vegetation within the permanent easement to protect pipelines and to allow weekly overflight inspections. Therefore, forested and scrub-shrub wetlands in these areas would be permanently converted to emergent wetlands.

Table B.6.2-2: Potential Wetland Impacts for the Proposed Chacahoula Storage Site ROWs[a]

Cowardin Wetland Classification	ROW from Site to Clovelly (acres)		ROW from Clovelly ROW to St. James (acres)		ROW from Site to Gulf of Mexico (acres)		ROW from Gulf of Mexico ROW to RWI Structure (acres)		Power Line ROWs (acres)	
	Temporary easement	Permanent easement	Temporary easement	Permanent easement	Temporary easement	Permanent easement	Temporary easement	Permanent easement	Temporary easement	Permanent easement
Estuarine	104	51	0	0	171	84	0	0	NA	0
Lacustrine[c]	6	3	0	0	33	17	0	0	NA	0
Marine[c]	0	0	0	0	2	1	0	0	NA	0
Palustrine – aquatic bed	2	1	0	0	2	1	0	0	NA	0
Palustrine – emergent	69	34	1	1	157	78	10	5	NA	16
Palustrine – forested[b]	178	91	152	75	148	94	18	9	NA	213
Palustrine – scrub-shrub[b]	24	12	0	0	7	3	0	0	NA	0
Palustrine – unconsolidated bottom[c]	0	0	0	0	3	2	0	0	NA	8
Riverine[c]	4	2	0	0	6	3	0	0	NA	0
Other	0	0	0	0	3	1	0	0	NA	2
Totals	**387**	**194**	**153**	**76**	**532**	**284**	**28**	**14**	**NA**	**239**

Notes:

[a] This table presents only the wetland types that are present within the proposed ROW according to NWI data.

[b] Forested and scrub-shrub wetlands would be cleared of woody vegetation and permanently converted to and maintained as emergent wetlands within the permanent easement of all ROWs. Within the temporary construction easement, woody vegetation would be cleared but would be allowed to re-establish within the easement. DOE would follow any required wetland compensation for these temporary impacts that is required by the Section 404/401 permit. At a minimum, DOE would restore original contours, replace the original hydric topsoil back in the disturbed area, and seed with native species. Re-establishment of the scrub-shrub or forested wetland may take 5-25 years depending on the type of community affected.

[c] Impacts to these wetlands would be temporary and they would return to the pre-existing conditions shortly after construction is completed.

1 acre = 0.405 hectares; NA means no temporary easement

Figure B.6.2-4: NWI Wetlands at the Proposed Chacahoula Storage Site

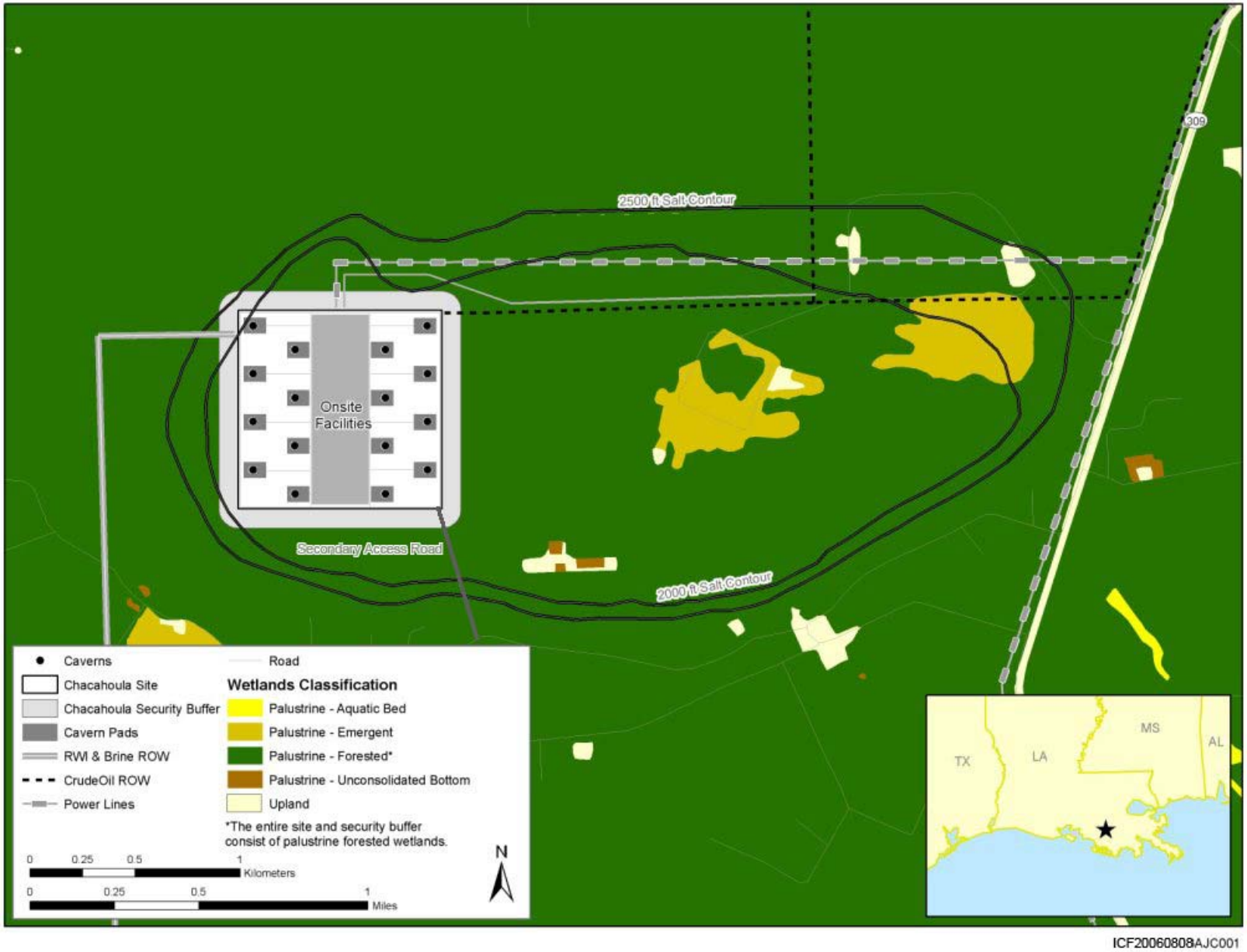


Table B.6.2-3: Summary of Potential Wetland Impacts for the Proposed Chacahoula Storage Site[a]

Cowardin Wetland Classification	Storage Site/Access Road (acres)		ROWs[b] (acres)		RWI Structure/ Access Road (acres)	Totals (acres)
	Filled wetlands	Permanent conversion	Temporary easement	Permanent easement	Filled wetlands	All affected wetlands
Estuarine	0	0	275	135	0	**410**
Lacustrine	0	0	39	20	0	**59**
Marine	0	0	2	1	0	**3**
Palustrine – aquatic bed	0	0	4	2	0	**6**
Palustrine - emergent	0	0	237	134	3	**374**
Palustrine – forested	128	213	496	482	21	**1,340**
Palustrine – scrub-shrub	0	0	31	15	0	**46**
Palustrine – unconsolidated bottom	0	0	3	10	0	**13**
Riverine	0	0	10	5	1	**16**
Other	0	0	3	3	1	**7**
Totals	**128**	**213**	**1,100**	**807**	**26**	**2,274**

Notes:

[a] This table presents only the wetland types that are present within the proposed footprint according to NWI data. Facilities were omitted if no wetlands were present within the footprint.

[b] Forested and scrub-shrub wetlands would be cleared of woody vegetation and permanently converted to and maintained as emergent wetlands within the permanent easement of all ROWs. Within the temporary construction easement, woody vegetation would be cleared but would be allowed to re-establish within the easement. DOE would follow any required wetland compensation for these temporary impacts that is required by the Section 404/401 permit. At a minimum, DOE would restore original contours, replace the original hydric topsoil back in the disturbed area, and seed with native species. Re-establishment of the scrub-shrub or forested wetland may take 5-25 years depending on the type of community affected. Impacts to these wetlands would be temporary and they would return to the pre-existing conditions shortly after construction is completed.

1 acre = 0.405 hectares

Although the converted wetlands would provide different habitat than before construction, other important wetland functions, such as flood storage and nutrient filtration, would be maintained within the emergent wetland. DOE would compensate for the permanent impacts on jurisdictional wetlands that are unavoidable by this alternative. DOE would monitor the ROW areas of temporary and permanently impacts to wetlands to ensure that wetland hydrology and plants are re-established.

The entire Chacahoula storage site and associated facilities, which includes the site, RWI, and ROWs, would affect approximately 2,274 acres (921 hectares) of wetlands associated with the filling activities required for new structures and facilities and temporary and permanent clearing for new power lines and pipelines (see table B.6.2-3). The construction activities would permanently fill approximately 152 acres (62 hectares) of forested wetlands, including cypress-tupelo dominated wetlands, associated with the storage site, RWI, and access roads. The impact to this relatively rare and important type of forested wetlands would be a potential adverse effect, which would be mitigated by the compensation plan for jurisdictional wetland impacts.

Due to the geology and location of the salt dome, the water dependency of the RWI, and the long ROWs, impacts to wetlands and waters of the United States would be unavoidable for this site and its infrastructure. All filling of and discharge to jurisdictional wetlands would require a Section 404/401 permit from the USACE and the Louisiana Coastal Management Division of the Department of Natural Resources. The permit application would require a comprehensive alternatives analysis that demonstrates avoidance and minimization of wetland impacts. The permit would contain conditions to minimize the impact to wetlands during construction and would require compensation for unavoidable impacts on

wetlands. Section B.7 discusses in more detail the avoidance, minimization, and mitigation measures that would be used to reduce, avoid, and compensate for the potential impacts to wetlands and waters of the United States. Appendix O describes a conceptual compensation plan.

B.6.3 Richton Storage Site and Associated Infrastructure

The Richton salt dome is located in Perry County, MS, 18 miles (29 kilometers) east of Hattiesburg and 3 miles (4.8 kilometers) northwest of the town of Richton (figure B.6.3-1). This proposed new site would consist of 16 new caverns with a combined capacity of 160 MMB. The Richton storage site and associated facilities would consist of the following:

- Sixteen new caverns,
- New RWI on the Leaf River and at Pascagoula,
- RWI pipeline from the Richton site to the RWI,
- Crude oil pipeline to Liberty, MS,
- Two, multi-purpose crude oil/raw water/brine pipelines to Pascagoula, MS,
- Pascagoula and Liberty terminals,
- Power lines,
- New site access roads and RWI access road, and
- Brine disposal pipeline from Pascagoula to the Gulf of Mexico.

Eight maps for the Richton 160 MMB storage site and infrastructure are included in an attachment to the EIS. They show detailed NWI mapped wetlands.

B.6.3.1 Floodplain Impacts

The extent of 100-year and 500-year floodplain was determined based on the FEMA Flood Insurance Rate Maps covering the project area. The proposed Richton storage site is currently an active pine plantation. It has an intermittent stream that drains the site and runs south to Pine Branch. The proposed storage site is not located within the 100-year or 500-year floodplain (see figure B.6.3-2). All 49 acres (20 hectares) of the Pascagoula terminal and Pascagoula RWI would be located within a 100-year floodplain (figure B.6.3-3).

Some of the proposed pipeline ROWs would be located within floodplains. The associated power line and pipeline ROWs would cross and temporarily affect approximately 27 miles (43 kilometers) of 100-year floodplain and 3 miles (5 kilometers) of 500-year floodplain. The pipelines would intersect several floodplains associated with various streams mostly in the Pascagoula or Pearl River drainage system. The impacts on floodplains associated with the construction of the ROWs would be temporary because the preconstruction contours would be re-established and no aboveground fill or structures would exist following the completion of the construction activities. No significant increased risk of flooding would be expected from ROW construction because no net loss of flood attenuation capacity would occur compared to the existing conditions. There would be a potential minor increase in flood stage during the construction activities because some staging materials and construction equipment may be located in floodplains. Power poles and other associated fill would be located outside of floodplain areas to the maximum extent practical. These structures would not be expected to significantly increase flood stage levels.

Due to the geology and location of the salt dome, the water dependency of the RWI structures, and the long ROWs, floodplains could not be completely avoided with this site development. Proper design and compliance with the local, state, and Federal regulatory programs would reduce the impacts to floodplains to a level where there would be no significant change in the base flood elevation. All disturbed areas

Figure B.6.3-1: Proposed Richton Storage Site and Associated Facilities

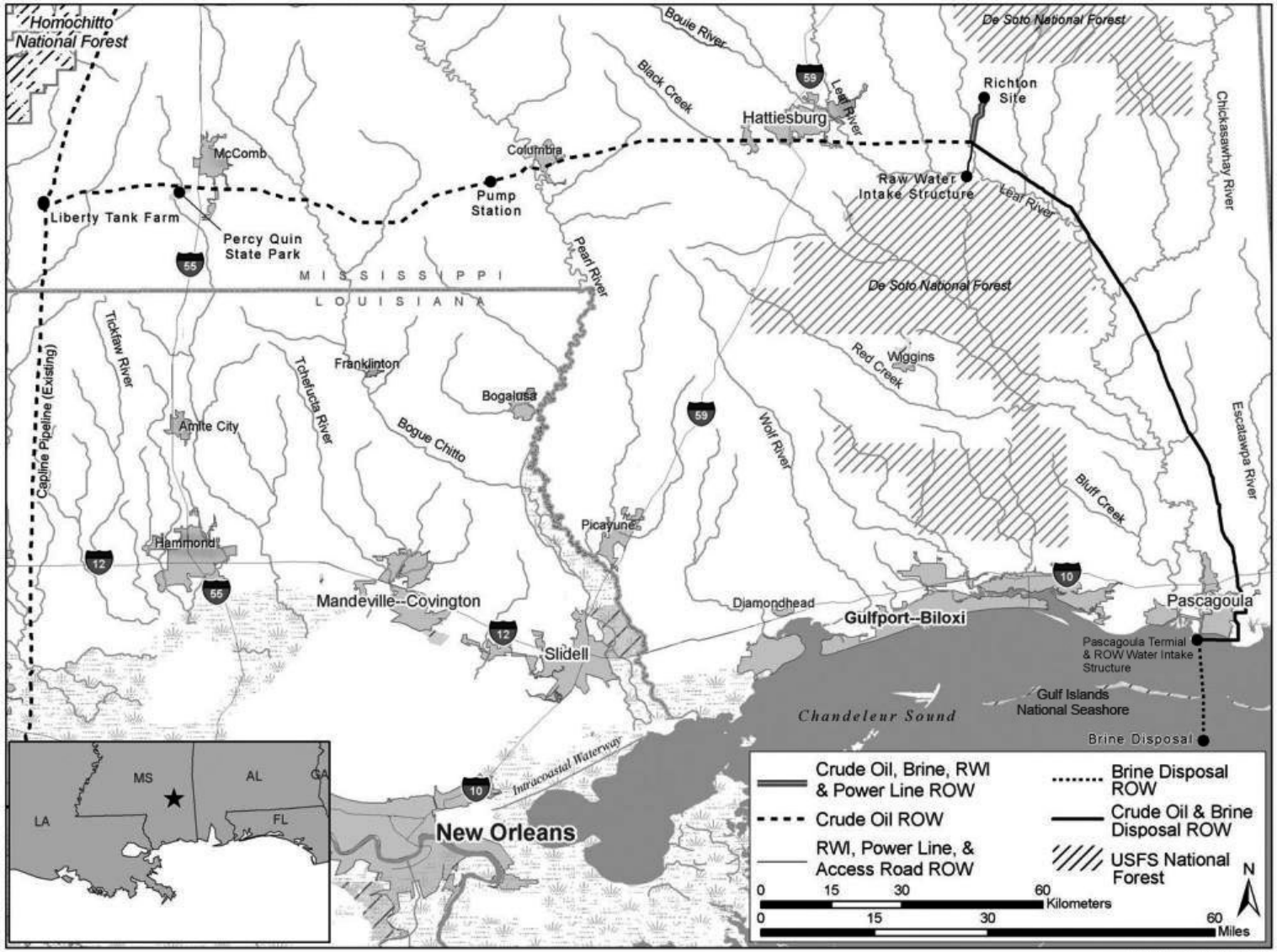


Figure B.6.3-2: Floodplain Map for the Proposed Richton Storage Site

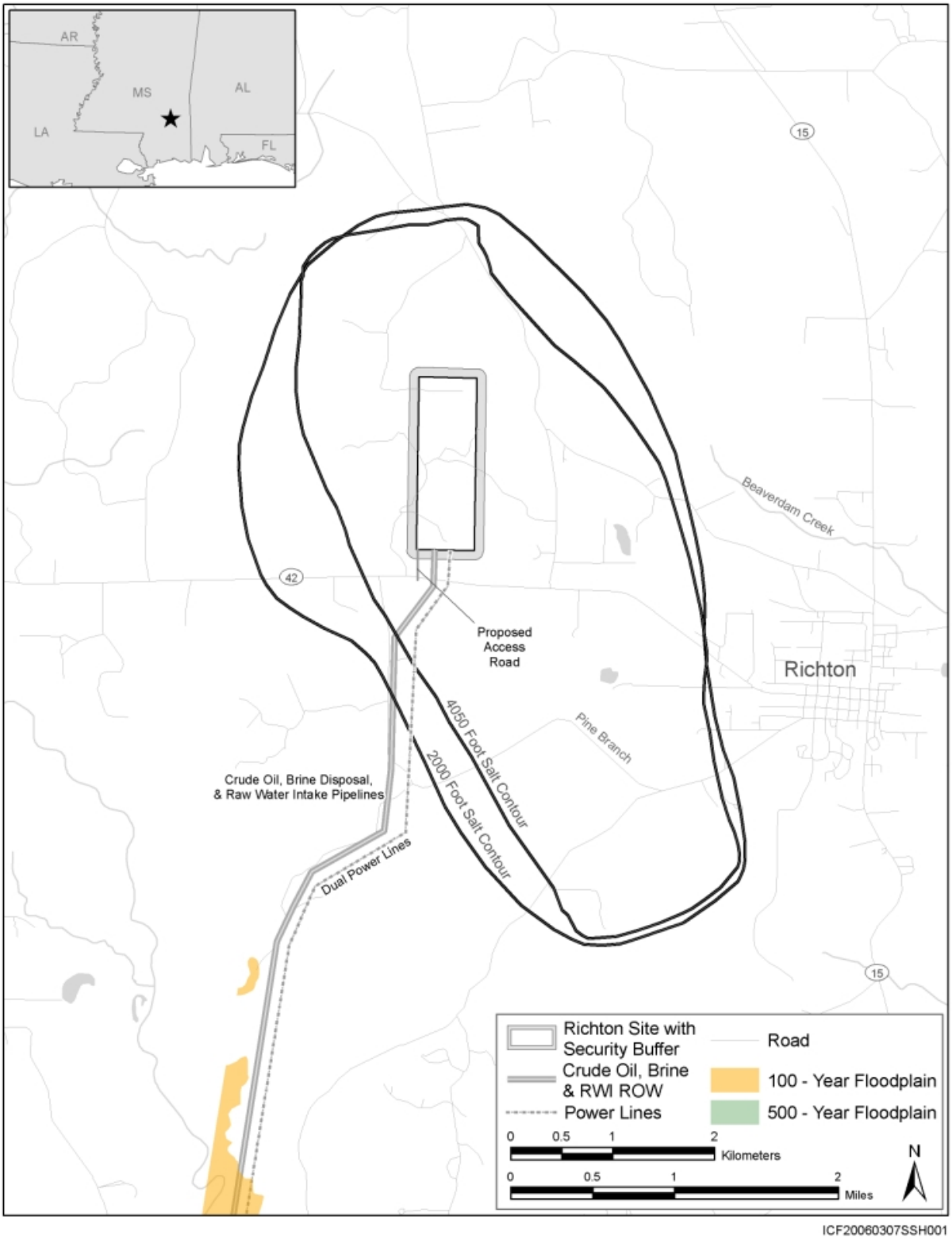
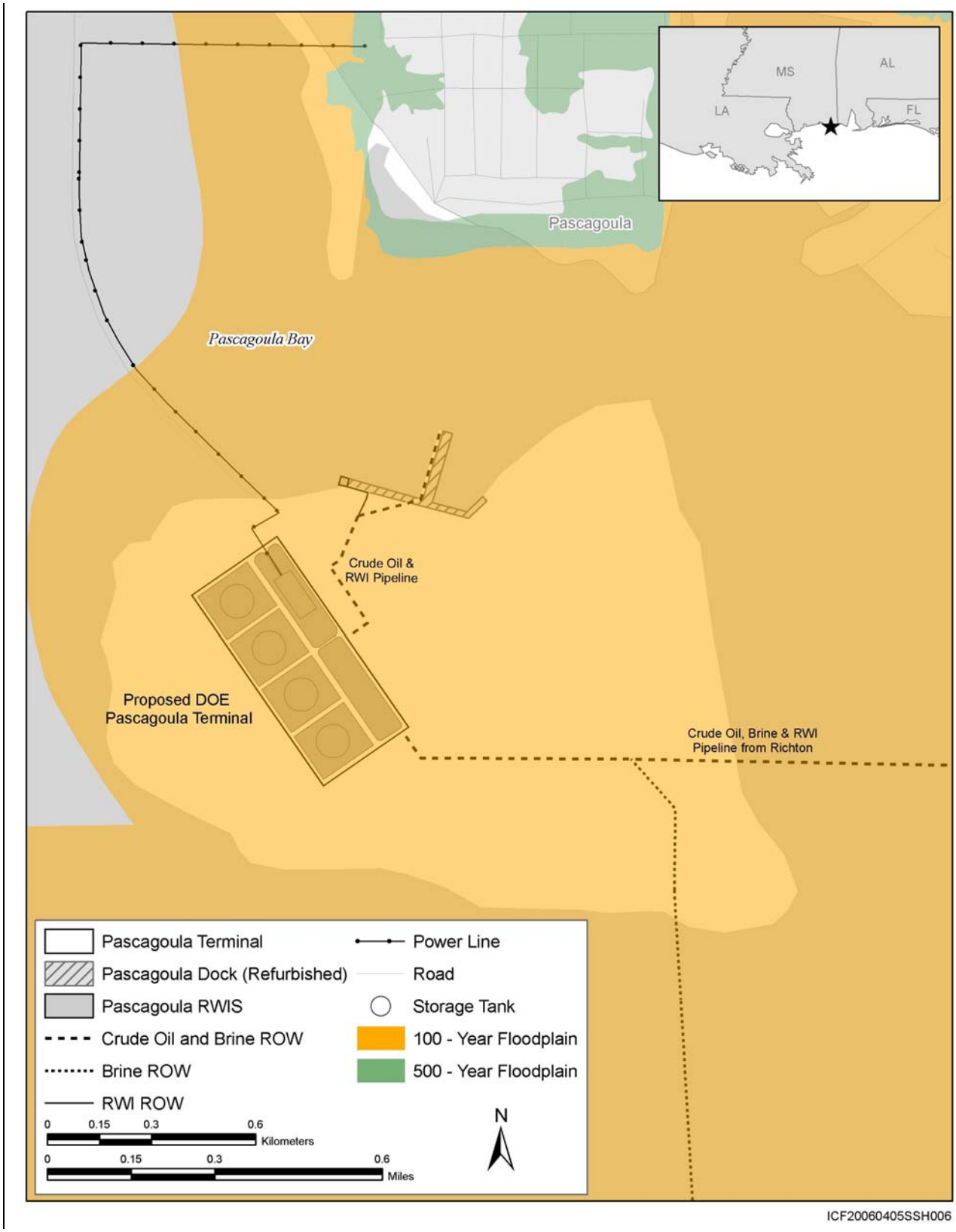


Figure B.6.3-3: Floodplain Map of the Proposed Pascagoula Terminal



within the floodplains would be restored to preconstruction contours. Section B.7 discusses in more detail the avoidance and minimization measures that DOE would use to reduce the effects to floodplains in the project area.

B.6.3.2 Wetland Impacts

The wetlands at the proposed Richton storage site are palustrine forested wetlands comprised of 15 to 20 year-old deciduous hardwoods, and are associated with a small intermittent stream originating on the site. In addition, a small area of palustrine forested wetlands is located adjacent to a small manmade pond along the western edge of the proposed site. Because the proposed Richton storage site is a managed pine plantation, harvesting of the pine trees continuously disturbs the small wetland area. These wetlands provide limited wildlife habitat and assist in filtering nutrients and runoff from the harvested/cleared areas.

Construction of the Richton storage site and associated facilities would affect about 76 acres (30 hectares) of wetlands. The permanent fill and conversion of wetlands would be associated with the construction of the storage site, terminal, RWI, and maintenance of security buffers around the new facilities (see figure B.6.3-4). Most of the wetland impacts (43 acres [17 hectares]) would be associated with the proposed terminal and RWI in Pascagoula, which is located on an island created by USACE dredging activities (figure B.6.3-5). The maintenance of the security buffer around the storage facility would permanently convert about 2 acres (0.8 hectares) of forested wetlands to emergent wetlands. The security buffer would require the clearing of woody vegetation and periodic maintenance to suppress or clear woody species. The proposed Liberty terminal would affect 2 acres (0.8 hectares) of wetlands (figure B.6.3-6).

The power line and pipeline ROW associated with the Richton storage site would cross and permanently or temporarily affect 1,252 acres (507 hectares) of wetlands. Table B.6.3-1 summarizes the wetland impacts per ROW that would result from this alternative. Construction of the ROWs would affect 467 acres (189 hectares) of wetland within the permanent easement and 785 acres (318 hectares) of wetland within the temporary easement. Pre-existing contours would be restored and some affected vegetative communities would be allowed to re-establish depending on the location within the temporary and permanent easement. The impacts to wetlands within the temporary easement would last between 2 to 3 years for emergent wetlands and 10 to 25 years for forested wetlands. DOE would suppress the growth of woody vegetation within the permanent easement to protect pipelines and to allow weekly overflight inspections. Therefore, forested and scrub-shrub wetlands in these areas would be permanently converted to emergent wetlands. Although, the converted wetlands would provide different habitat than before construction, other important wetland functions, such as flood storage and nutrient filtration, would be maintained within the emergent wetland.

The entire Richton storage site and associated facilities, which include the site, the terminals, two RWI structures, and ROWs, would affect approximately 1,328 acres (537 hectares) of wetlands associated with the filling activities required for new structures and facilities and temporary and permanent clearing for new power lines and pipelines. The construction activities would permanently fill approximately 74 acres (30 hectares) of wetlands associated with the construction of the storage site, two RWI, and terminals. The proposed ROWs would result in the clearing of about 786 acres (318 hectares) of palustrine forested wetlands, including 467 acres (189 hectares) within the permanent easement. This would be a potential adverse effect because of the regional and ecological importance of this wetland type (see table B.6.3-2).

Due to the geology and the location of the salt domes, the long ROWs, and the water dependency of the RWI structures, impacts to wetlands and waters of the United States would be unavoidable for this site development. All filling of and discharge to jurisdictional wetlands would require a Section 404/401

Figure B.6.3-4: NWI Wetlands at the Proposed Richton Storage Site

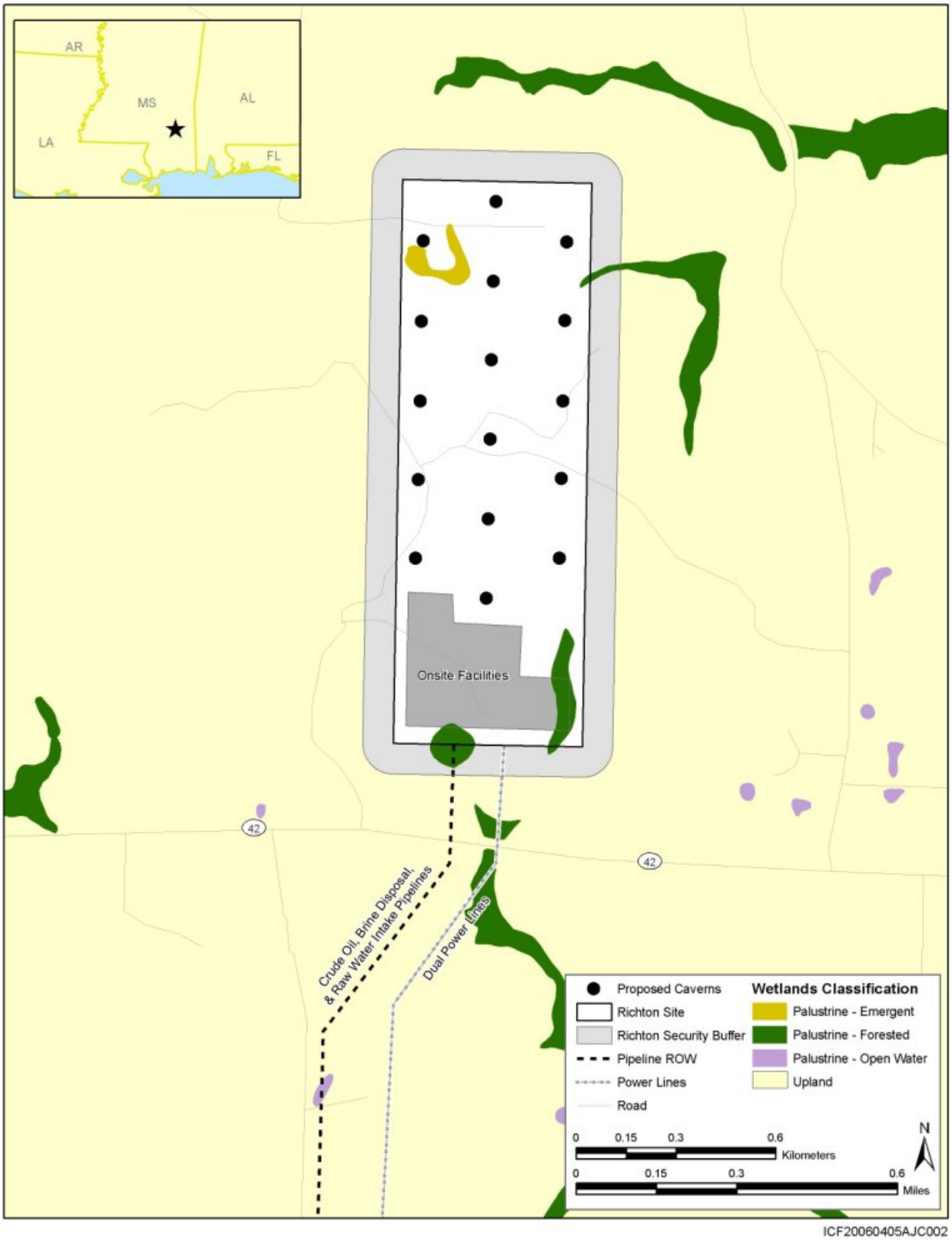


Figure B.6.3-5: NWI Wetlands at the Proposed Pascagoula Terminal

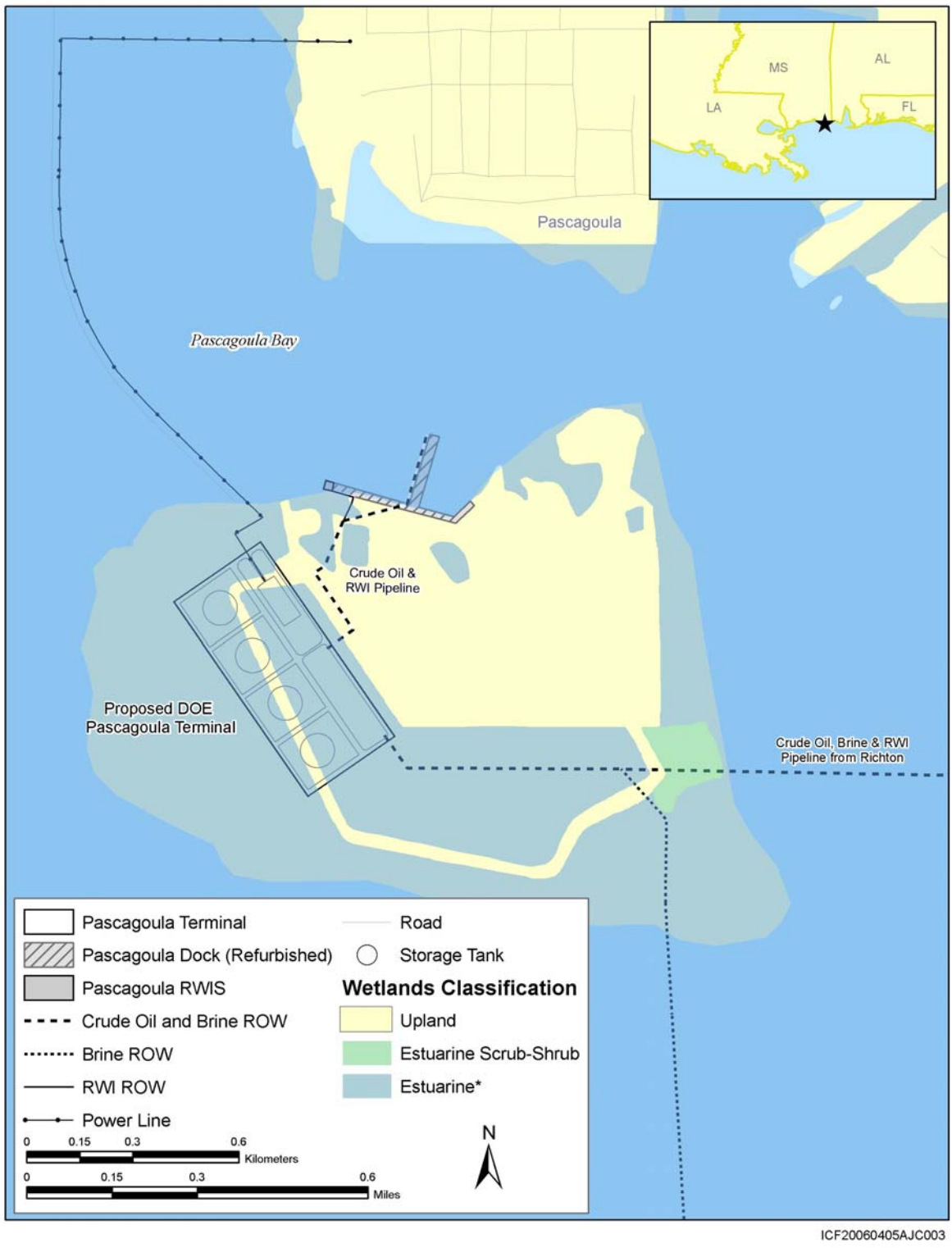


Figure B.6.3-6: NWI Wetlands at the Proposed Liberty Tank Farm

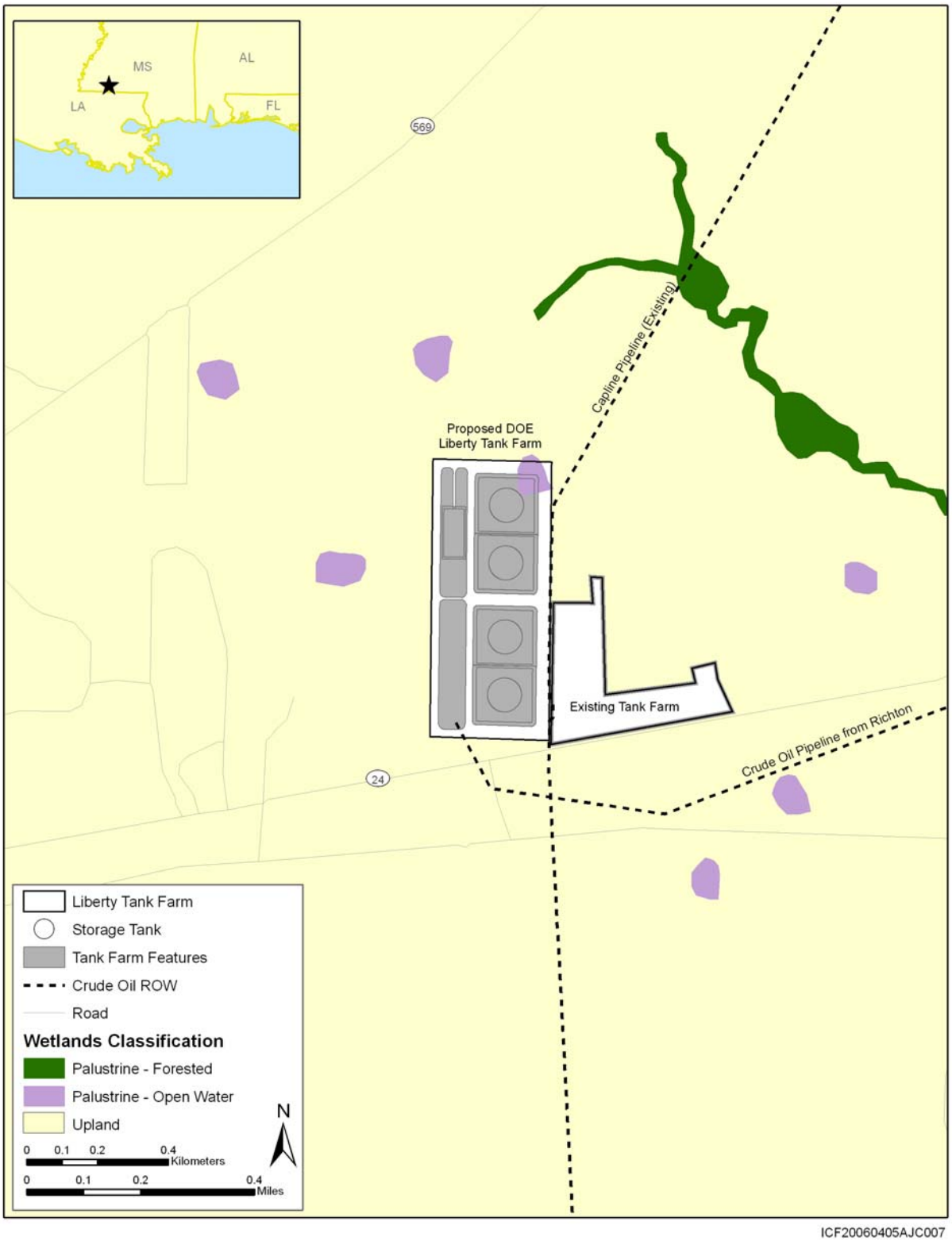


Table B.6.3-1: Potential Wetland Impacts for the Proposed Richton Storage Site ROWs[a]

Cowardin Wetland Classification	ROW from Site to Leaf RWI (acres)		ROW from RWI ROW to Pascagoula terminal (acres)		ROW from Leaf RWI ROW to Liberty Terminal (acres)		Power Line ROWs (acres)	
	Temporary easement	Permanent easement	Temporary easement	Permanent easement	Temporary easement	Permanent easement	Temporary easement	Permanent easement
Estuarine	0	0	94	62	0	0	NA	0
Estuarine – scrub-shrub	0	0	2	1	0	0	NA	0
Lacustrine	0	0	11	8	0	0	NA	0
Palustrine – aquatic bed	0	0	1	1	0	0	NA	0
Palustrine – emergent	0	0	24	16	0	0	NA	0
Palustrine – forested[b]	18	12	392	191	87	43	NA	43
Palustrine – scrub-shrub[b]	0	0	109	71	2	1	NA	0
Palustrine – open water	1	1	6	1	4	2	NA	0
Palustrine – unconsolidated bottom	0	0	13	3	9	4	NA	3
Riverine	0	0	5	1	4	2	NA	0
Other	1	0	1	0	1	0	NA	1
Totals	**20**	**13**	**658**	**355**	**107**	**52**	**NA**	**47**

Notes:

[a] This table presents only the wetland types that are present within the proposed ROW according to NWI data.

[b] Forested and scrub-shrub wetlands would be cleared of woody vegetation and permanently converted to and maintained as emergent wetlands within the permanent easement of all ROWs. Within the temporary construction easement, woody vegetation would be cleared but would be allowed to re-establish within the easement. DOE would follow any required wetland compensation for these temporary impacts that is required by the Section 404/401 permit. At a minimum, DOE would restore original contours, replace the original hydric topsoil back in the disturbed area (where practical), and seed with native species. Re-establishment of the scrub-shrub or forested wetland may take 5-25 years depending on the type of community affected.

[c] Impacts to these wetlands would be temporary and they would return to the pre-existing conditions shortly after construction is completed.

1 acre = 0.405 hectares; NA means no temporary easement

Table B.6.3-2: Summary of Potential Wetland Impacts for the Proposed Richton Storage Site[a]

Cowardin Wetland Classification	Storage Site (acres)		ROWs[b] (acres)		RWI Structures (acres)	Liberty Terminal	Pascagoula Terminal (acres)	Totals (acres)
	Filled wetlands	Permanent conversion	Temporary easement	Permanent easement	Filled wetlands	Filled wetlands	Filled wetlands	All affected wetlands
Estuarine	0	0	94	62	0	0	43	**199**
Estuarine – scrub-shrub	0	0	2	1	0	0	0	**3**
Lacustrine	0	0	11	8	0	0	0	**19**
Palustrine – aquatic bed	0	0	1	1	0	0	0	**2**
Palustrine - emergent	3	0	24	16	0	0	0	**43**
Palustrine – forested	6	2	497	289	20	0	0	**814**
Palustrine – scrub-shrub	0	0	111	72	0	0	0	**183**
Palustrine – open water	0	0	11	4	0	2	0	**16**
Palustrine – unconsolidated bottom	0	0	22	10	0	0	0	**32**
Riverine	0	0	9	3	0	0	0	**12**
Other	0	0	3	2	0	0	0	**5**
Totals	**9**	**2**	**785**	**467**	**20**	**2**	**43**	**1,328**

Notes:

[a] This table presents only the wetland types that are present within the proposed ROW according to NWI data.

[b] Forested and scrub-shrub wetlands would be cleared of woody vegetation and permanently converted to and maintained as emergent wetlands within the permanent easement of all ROWs. Within the temporary construction easement, woody vegetation would be cleared but would be allowed to re-establish within the easement. DOE would follow any required wetland compensation for these temporary impacts that is required by the Section 404/401 permit. At a minimum, DOE would restore original contours, replace the original hydric topsoil back in the disturbed area, and seed with native species. Re-establishment of the scrub-shrub or forested wetland may take 5-25 years depending on the type of community affected. Impacts to these wetlands would be temporary and they would return to the pre-existing conditions shortly after construction is completed.

1 acre = 0.405 hectares

permit from the USACE and the Mississippi Department of Environmental Quality. The permit application would require a comprehensive alternatives analysis that demonstrates avoidance and minimization of wetland impacts. The permit would contain conditions to minimize the impact on wetlands during construction and would require compensation for unavoidable impacts to wetlands. Section B.7 discusses in more detail the avoidance, minimization, and mitigation measures that DOE would use to reduce, avoid, and compensate for the potential impacts to wetlands and waters of the United States. Appendix O describes a conceptual compensation plan.

B.6.4 Stratton Ridge Storage Site and Associated Infrastructure

The Stratton Ridge salt dome is located in Brazoria County, TX, 3.0 miles (4.8 kilometers) east of Clute and Lake Jackson and 6.0 miles (9.7 kilometers) north of Freeport (figure B.6.4-1). This proposed site would consist of 16 new caverns with a combined storage capacity of 160 MMB. Two maps of the Stratton Ridge 160 MMB storage site and infrastructure, included as an attachment to this appendix, show the NWI mapped wetlands.

The Stratton Ridge storage would consist of the following:

- Sixteen new caverns and associated storage site infrastructure,
- New RWI structure and associated pipeline,
- One new terminal at Texas City,
- New crude oil pipeline to the Texas City terminal,
- Brine disposal pipeline to offshore diffuser in Gulf of Mexico,
- Power lines, and
- New access roads to the facility and to the brine injection wells.

B.6.4.1 Floodplain Impacts

The extent of 100-year and 500-year floodplain was determined based on the FEMA Flood Insurance Rate Maps covering the project area. The proposed new storage facilities would be located entirely within the 100-year and 500-year floodplains (see figure B.6.4-2 and B.6.4-3). The proposed Texas City tank farm would be located entirely in a 100-year floodplain (figure B.6.4-4). Table B.6.4-1 summarizes the floodplains that would be affected by this storage site and associates facilities.

Table B.6.4-1: Potential Floodplain Impacts for the Stratton Ridge Storage Site and Associated Facilities

Description	100-Year Floodplain (acres)	500-Year Floodplain (acres)
Storage site/access road	86	186
RWI structure	16	0
Texas City tank farm	37	0
Total	**139**	**186**

1 acre = 0.405 hectares

The proposed Stratton Ridge storage site would lie completely within the 100-year and 500-year floodplains. All onsite construction, therefore, would be within either a 100-year or a 500-year floodplain. This floodplain is large, extending over hundreds of square miles (square kilometers) and is part of the San Jacinto-Brazos Coastal Basin. Construction of the storage site would disturb

Figure B.6.4-1: Proposed Stratton Ridge Storage Site and Associated Facilities

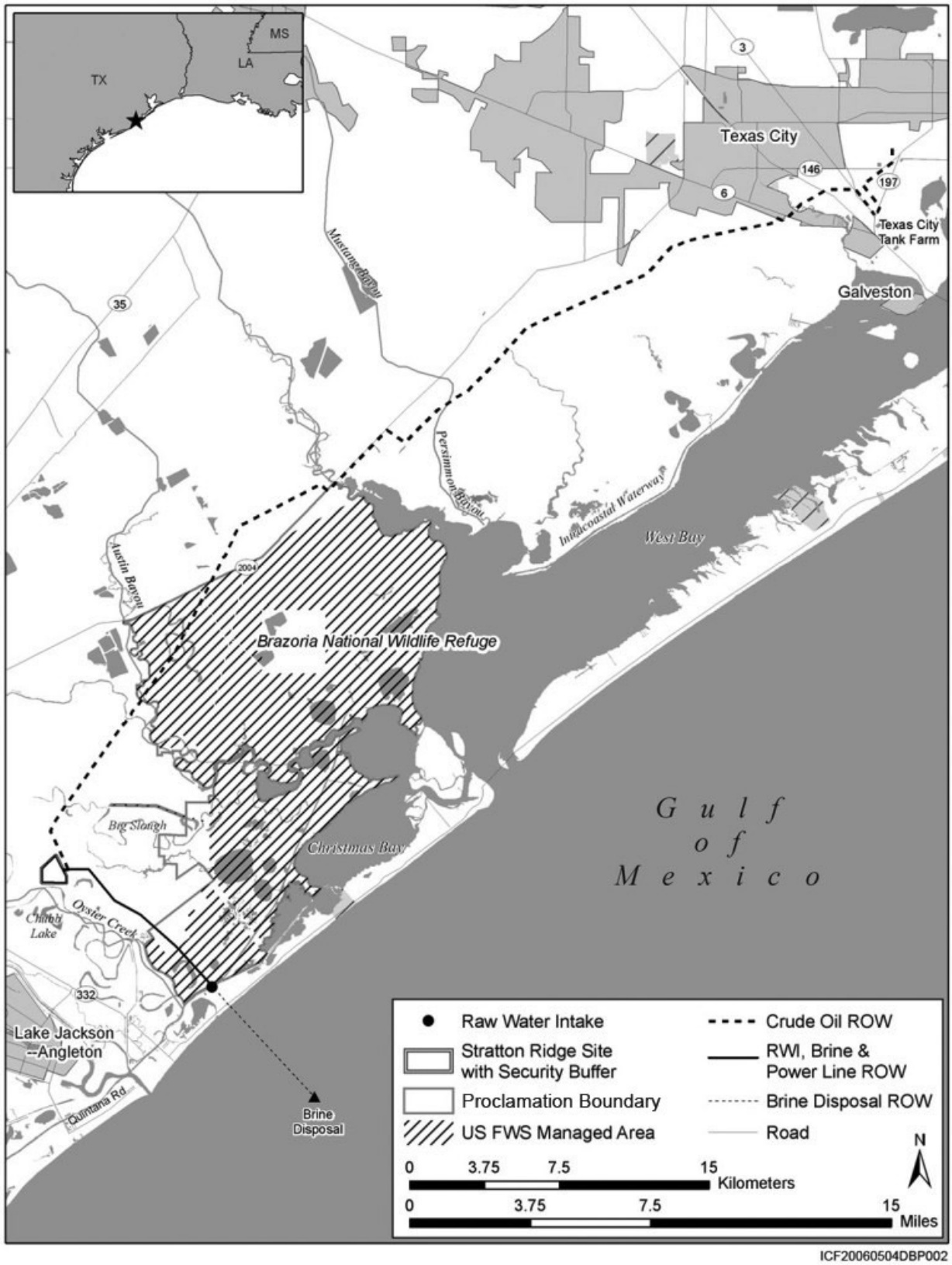


Figure B.6.4-2: Floodplain Map for Proposed Stratton Ridge Site and Associated Facilities

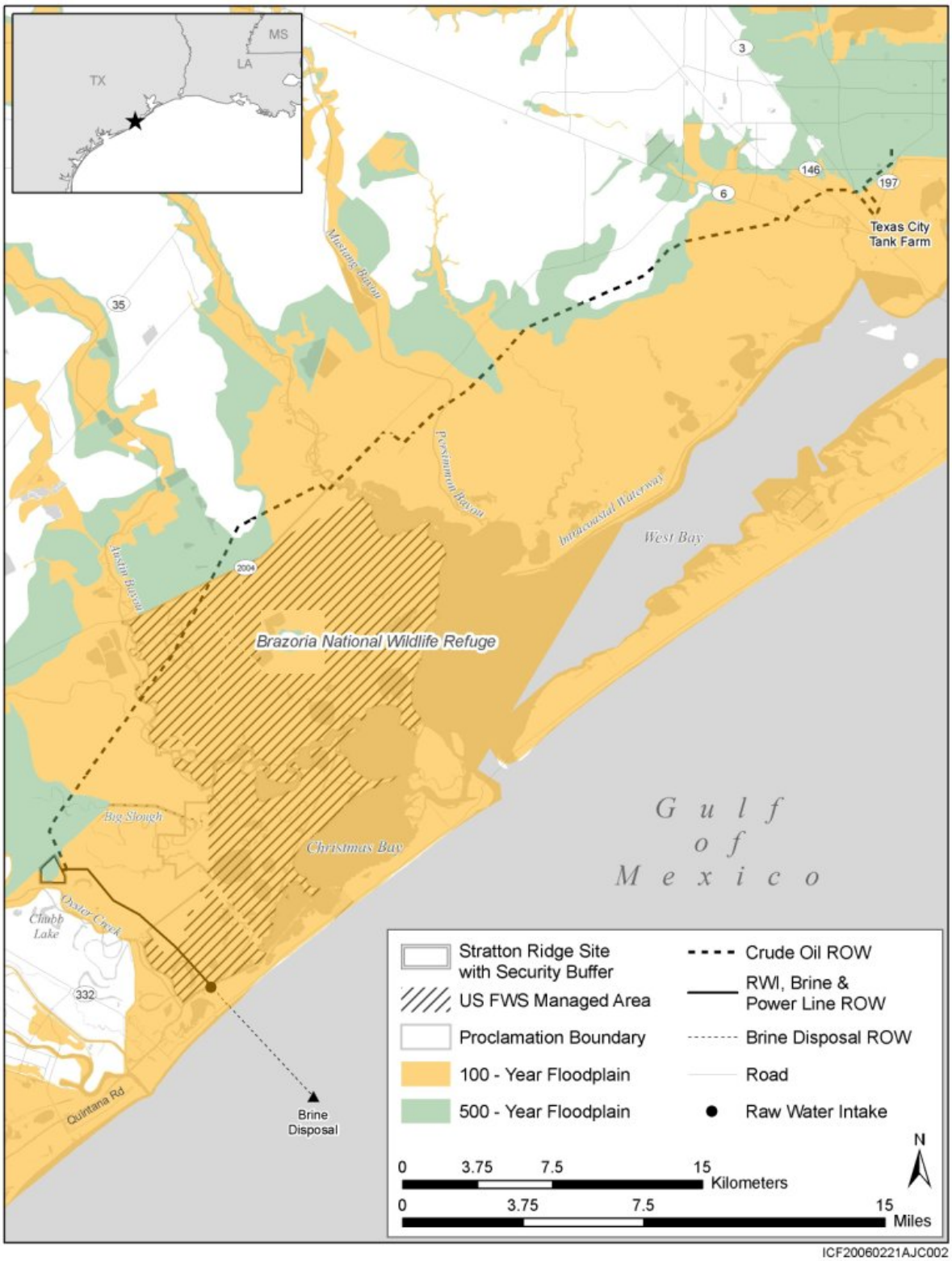


Figure B.6.4-3: Floodplain Map for Proposed Stratton Ridge Storage Site

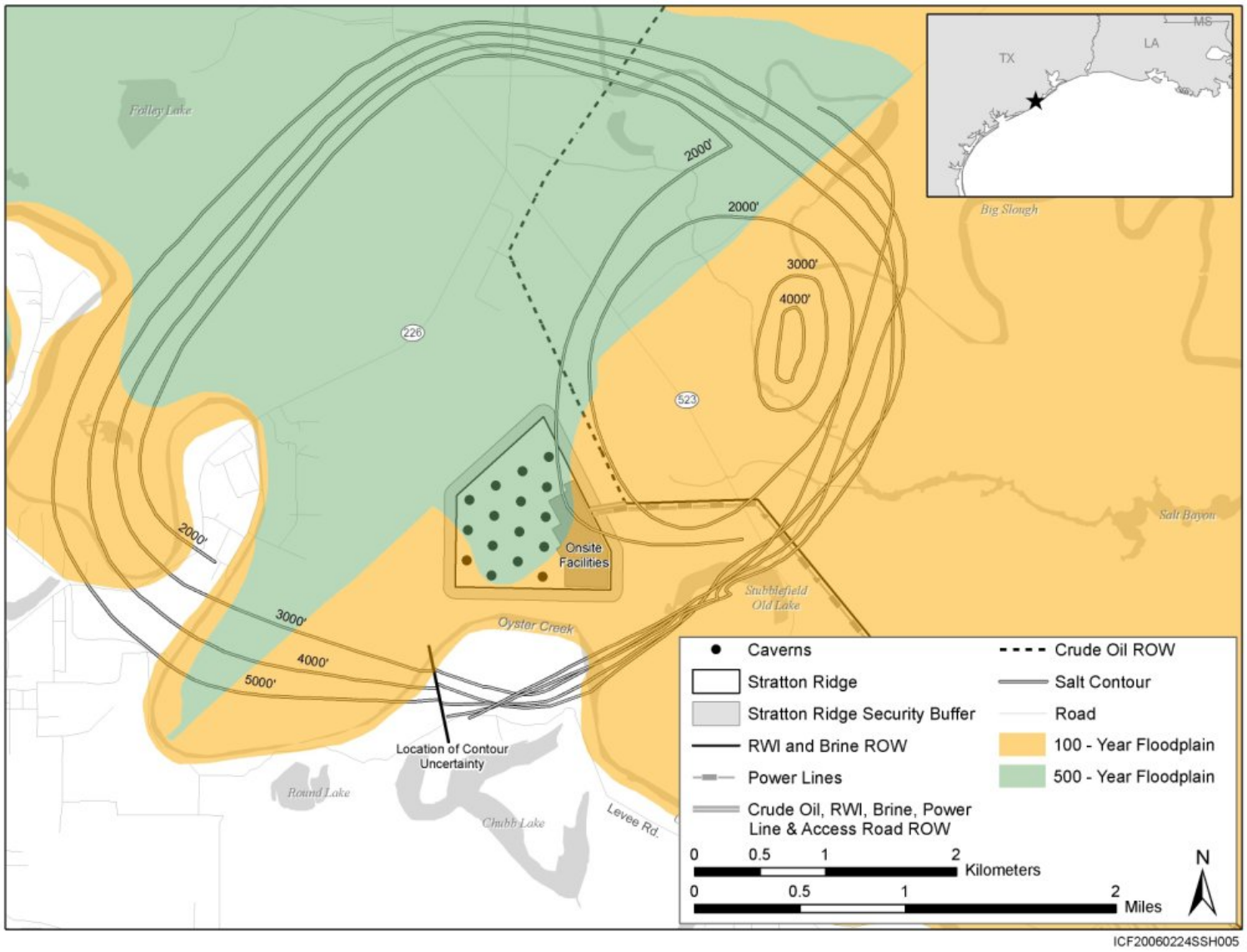
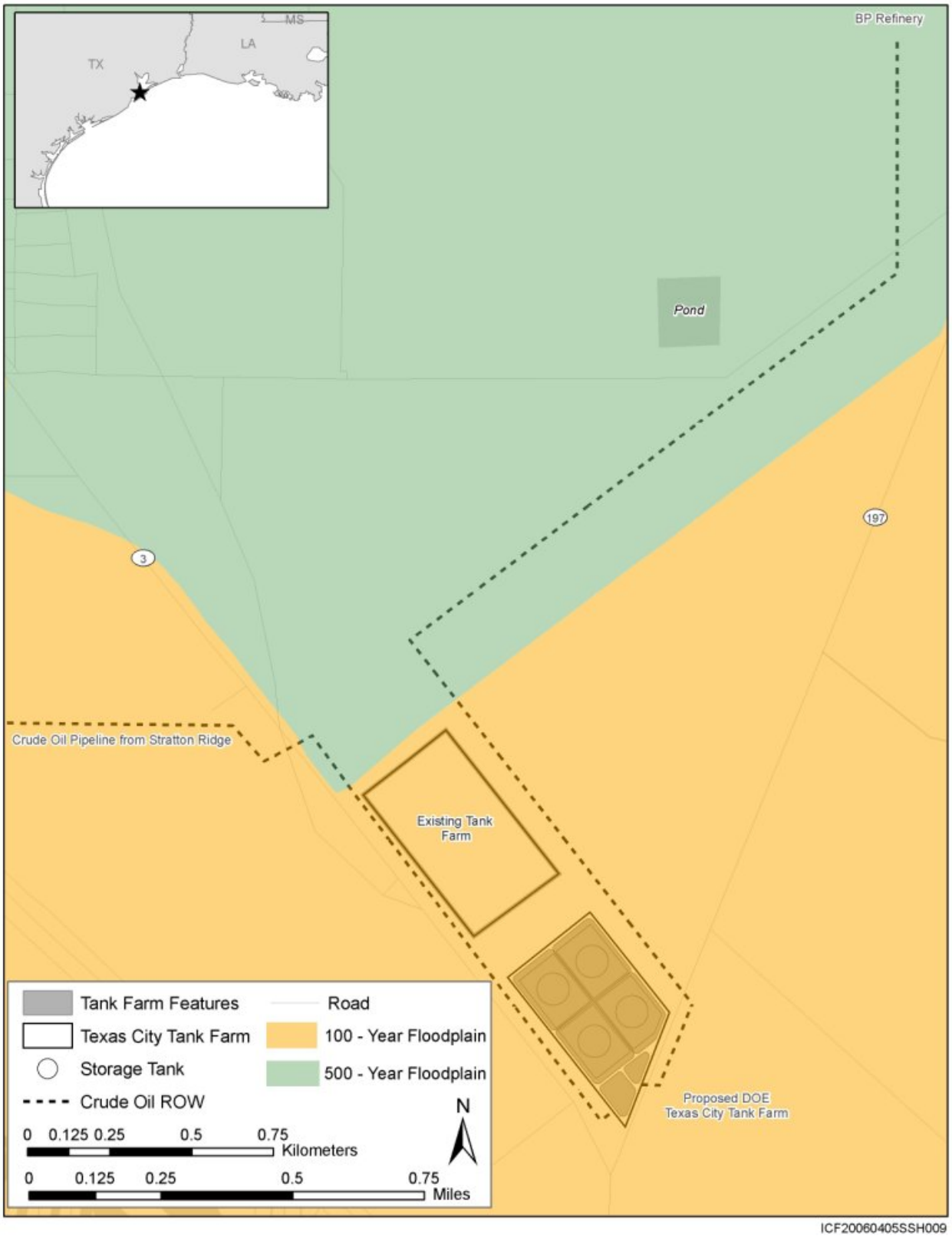


Figure B.6.4-4: Floodplain Map for Proposed Texas City Tank Farm



approximately 139 acres (56 hectares) of 100-year floodplain and 186 acres (75 hectares) of 500-year floodplain associated with the site infrastructure.

The Stratton Ridge storage site and associated facilities would have the potential to increase future downstream flooding due to proposed fill and construction of aboveground structures within the floodplain, including administrative buildings, a tank farm, RWI, well pads, roads, and wellheads. The impacts would be minimal due to the overall size of the floodplain system and compliance with local, state, and Federal floodplain regulations. After selection of an preferred alternative other than no action prior to construction, hydrological modeling would be conducted to ensure that base flood elevations would not be increased by the proposed fill structures.

Any structures located within the floodplain would be designed in accordance with the NFIP requirements for non-residential buildings and structures located in special flood hazard areas. The NFIP regulations are designed to require vulnerable structures to be elevated above the 100-year flood elevation or to be watertight. DOE would coordinate with and secure approval from the floodplain coordinator at the Texas Commission on Environmental Quality or the local government, if it has adopted the NFIP, during the design stage/site plan process.

The proposed Stratton Ridge power line and pipeline ROWs would cross and temporarily affect approximately 41 miles (66 kilometers) of 100-year floodplain and 8 miles (13 kilometers) of 500-year floodplain. The impacts on floodplains associated with the construction of the ROWs would be temporary because the preconstruction contours would be re-established and no aboveground fill or structures would exist following the completion of the construction activities. Therefore, no significant increased risk of flooding would be expected from ROW construction because there would be no net loss of flood attenuation capacity compared to the existing conditions. There would be a potential minor increase in flood stage during the construction activities because some staging materials and construction equipment may be located in a floodplain. Power poles and other associated fill would be located outside of floodplain areas to the maximum extent practical. These structures would not be expected to significantly increase flood stage levels.

Due to the geology and location of the salt dome, the water dependency of the RWI, and the long ROWs, floodplains could not be avoided with this site development. DOE has considered the practicable alternatives to siting in a floodplain and has evaluated the proposed design and modifications to minimize the potential impact to floodplains. Proper design and compliance with the required regulatory programs would reduce the impacts of these structures on floodplains to a level where there would be no significant change in the base flood elevation. Section B.7 discusses in more detail the avoidance and minimization measures that would be used to reduce the effects to floodplains located in the project area.

B.6.4.2 Wetland Impacts

The construction and operations and maintenance activities associated with the proposed Stratton Ridge site development would have temporary and permanent impacts on wetlands as described in the methodology. Tables B.6.4-2 and B.6.4-3 summarize the wetlands that would be affected by the new storage site, ROWs, and associated facilities.

The Stratton Ridge site is comprised predominantly of palustrine forested wetlands with areas of palustrine emergent wetlands and upland deciduous forest. Construction of the storage site and related facilities would fill 225 acres (91 hectares) of wetlands. The 192 acres (78 hectares) of palustrine forested wetlands on the Stratton Ridge site are also known as a bottomland hardwood forest, which is an ecologically diverse and greatly threatened ecosystem in the United States (see figure B.6.4-5). These ecosystems provide wildlife habitat and play important roles in maintaining water quality and retaining

Table B.6.4-2: Potential Wetland Impacts for the Proposed Stratton Ridge Storage Site ROWs[a]

Cowardin Wetland Classification	ROW from Site to Gulf of Mexico (acres)		ROW from Site to Texas City (acres)		Power Line ROWs (acres)	
	Temporary easement	Permanent easement	Temporary easement	Permanent easement	Temporary easement	Permanent easement
Estuarine	35	22	6	3	NA	19
Lacustrine	0	0	2	1	NA	0
Palustrine – emergent	19	13	84	41	NA	12
Palustrine – scrub-shrub[b]	0	0	1	1	NA	0
Palustrine – unconsolidated bottom[c]	0	0	17	8	NA	0
Riverine[c]	0	0	2	1	NA	0
Other	0	0	0	0	NA	0
Totals	**54**	**35**	**112**	**55**	NA	**31**

Notes:

[a] This table presents only the wetland types that are present within the proposed ROW according to NWI data.

[b] Forested and scrub-shrub wetlands would be cleared of woody vegetation and permanently converted to and maintained as emergent wetlands within the permanent easement of all ROWs. Within the temporary construction easement, woody vegetation would be cleared but would be allowed to re-establish within the easement. DOE would follow any required wetland compensation for these temporary impacts that is required by the Section 404/401 permit. At a minimum, DOE would restore original contours, replace the original hydric topsoil back in the disturbed area, and seed with native species. Re-establishment of the scrub-shrub or forested wetland may take 5-25 years depending on the type of community affected.

[c] Impacts to these wetlands would be temporary and they would return to the pre-existing conditions shortly after construction is completed.

1 acre = 0.405 hectares; NA means no temporary easement

Table B.6.4-3: Summary of Potential Wetland Impacts for the Proposed Stratton Ridge Storage Site[a]

Cowardin Wetland Classification	Storage Site (acres)		ROWs[b] (acres)		RWI Structure (acres)	Texas City Terminal (acres)	Totals (acres)
	Filled wetlands	Permanent conversion	Temporary easement	Permanent easement	Filled wetlands	Filled wetlands	All affected wetlands
Estuarine	0	0	41	44	17	0	**102**
Lacustrine	0	0	2	1	0	0	**68**
Palustrine – emergent	20	3[c]	103	66	0	4	**196**
Palustrine – forested	192	66	0	0	0	2	**260**
Palustrine – scrub-shrub	12	0	1	1	0	4	**18**
Palustrine – unconsolidated bottom	0	2[c]	17	8	0	1	**28**
Riverine	0	0	2	1	0	0	**3**
Other	1	2[c]	0	0	0	0	**3**
Totals	**225**	**73**	**166**	**121**	**17**	**11**	**613**

Notes:

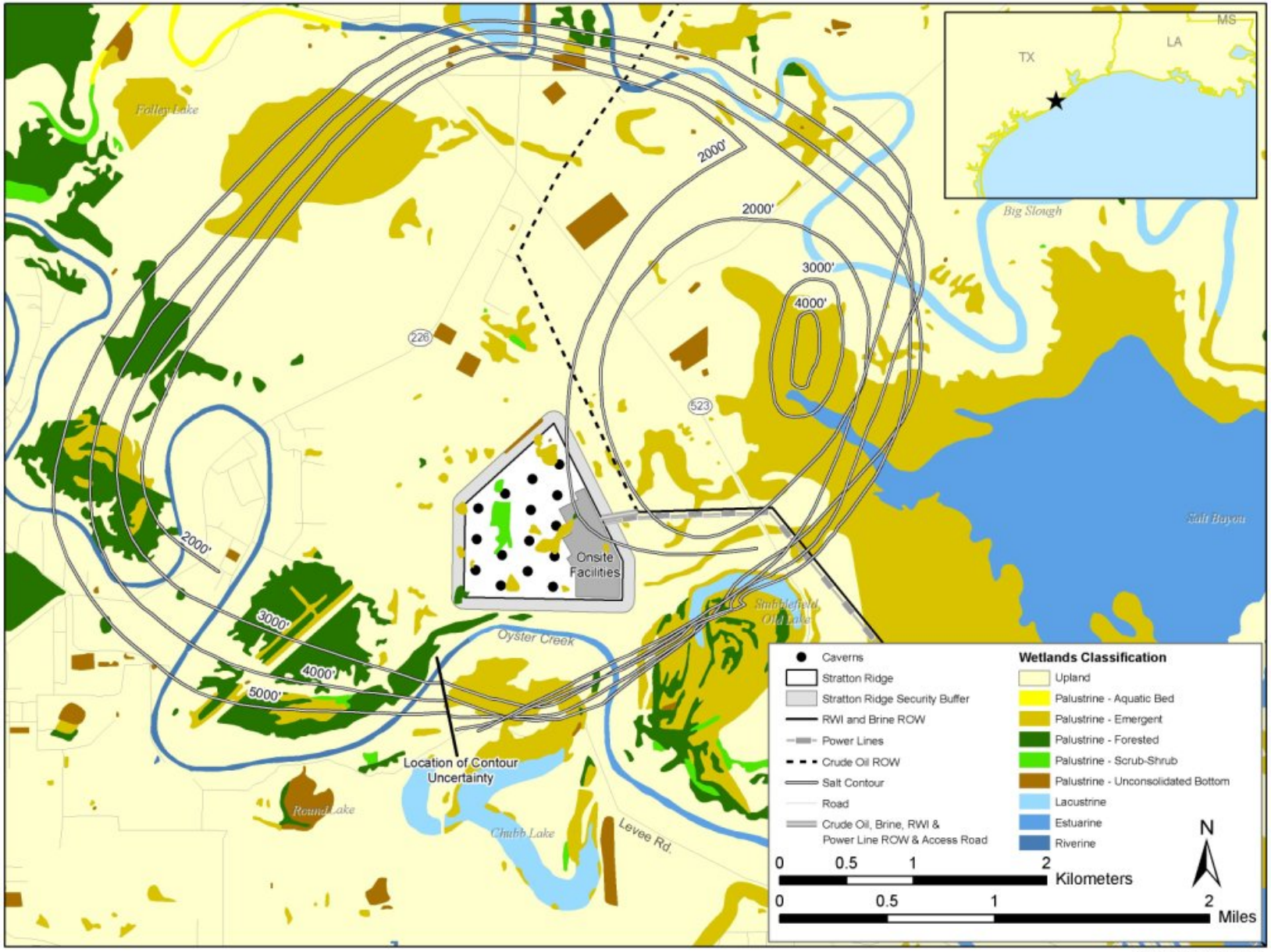
[a] This table presents only the wetland types that are present within the proposed footprint according to NWI data. Facilities were omitted if no wetlands were present within the footprint.

[b] Forested and scrub-shrub wetlands would be cleared of woody vegetation and permanently converted to and maintained as emergent wetlands within the permanent easement of all ROWs. Within the temporary construction easement, woody vegetation would be cleared but would be allowed to re-establish within the easement. DOE would follow any required wetland compensation for these temporary impacts that is required by the Section 404/401 permit. At a minimum, DOE would restore original contours, replace the original hydric topsoil back in the disturbed area, and seed with native species. Re-establishment of the scrub-shrub or forested wetland may take 5-25 years depending on the type of community affected. Impacts to these wetlands would be temporary and they would return to the pre-existing conditions shortly after construction is completed.

[c] During the site construction, non-woody wetland vegetation would be temporarily cleared in the security buffers. In these wetlands, DOE would restore original contours, replace hydric topsoil back in the disturbed area, and seed with native species. Impacts to these wetlands would be temporary and they would return to pre-existing conditions shortly after construction is completed.

1 acre = 0.405 hectares

Figure B.6.4-5: NWI Wetlands for Proposed Stratton Ridge Storage Site



flooding waters. The Stratton Ridge site has been disturbed and fragmented by human activities and introduced animals and plants. The maintenance of the security buffer around the storage facility would convert 73 acres (30 hectares) of wetlands to emergent or open water. The security buffer would require the clearing of woody vegetation and periodic maintenance to suppress or clear woody species. The proposed Texas City tank farm would permanently impact 11 acres (4 hectares) of palustrine wetlands (see figure B.6.4-6).

The power line and pipeline ROWs associated with the Stratton Ridge storage site and associated facilities would cross and permanently or temporarily affect 287 acres (116 hectares) of wetlands. Table B.6.4-2 provides a summary of the wetland impacts per ROW that would result from this site development. Construction of the ROWs would affect 121 acres (49 hectares) of wetlands within the permanent easement and 166 acres (67 hectares) within the temporary easement. Pre-existing contours would be restored and the affected plant communities would be allowed to re-establish depending on location within the temporary and permanent easement. DOE would promote the growth of the emergent or forested vegetation in the temporary construction easement. The impacts on wetlands within the temporary easement would last between 2 to 3 years for emergent wetlands and 10 to 25 years for forested wetlands. DOE would suppress the growth of woody vegetation within the permanent easement to protect pipelines and to allow weekly overflight inspections. Therefore, forested and scrub-shrub wetlands in these areas would be permanently converted to emergent wetlands. Although the converted wetlands would provide different habitat than before construction, other important wetland functions such as flood storage and nutrient filtration would be maintained with the emergent wetlands.

The Stratton Ridge alternative, which includes the site, the ancillary facilities, and ROWs, would affect approximately 613 acres (245 hectares) of wetlands associated with the filling activities required for new structures and facilities and permanent and temporary clearing for new power lines and pipelines. The construction activities would permanently fill approximately 253 acres (102 hectares) of wetlands associated with the storage site, Texas City terminal, and RWI (see table 6.4-3). About 260 acres (105 hectares) of palustrine forested wetland would be temporarily or permanently cleared. The impact on this relatively rare and important type of forested wetland would be a potential adverse effect, which would be mitigated by the compensation plan for wetland impacts. Appendix O outlines a conceptual compensation plan.

Due to the geology and location of the salt dome, the water dependency of the RWI, and the long ROWs, impacts to wetlands and waters of the United States would be unavoidable for this site development. All filling of and discharge to jurisdictional wetlands would require a Section 404/401 permit from the USACE and the Texas Commission of Environmental Quality. The permit application would require a comprehensive alternatives analysis that demonstrates avoidance and minimization on wetland impacts. The permit would contain conditions to minimize the impact to wetlands during construction and would require compensation for unavoidable impacts to jurisdictional wetlands. Section B.7 discusses in more detail the avoidance, minimization, and mitigation measures that DOE would use to reduce, avoid, and compensate for the potential impacts to wetlands and waters of the United States. A conceptual compensation plan is provided in Appendix O.

B.6.5 Bayou Choctaw Expansion Site and Associated Infrastructure

The Bayou Choctaw expansion site occupies a 360-acre (140-hectare) site in Iberville Parish, LA, located about 12 miles (19 kilometers) southwest of Baton Rouge (figure B.6.5-1). The Mississippi River is located about 4 miles (6 kilometers) east of the dome and the Port Allen Canal, an extension of the Intracoastal Waterway (ICW), is located about one quarter of a mile (0.4 kilometers) to the west.

Figure B.6.4-6: NWI Wetlands for Proposed Texas City Tank Farm

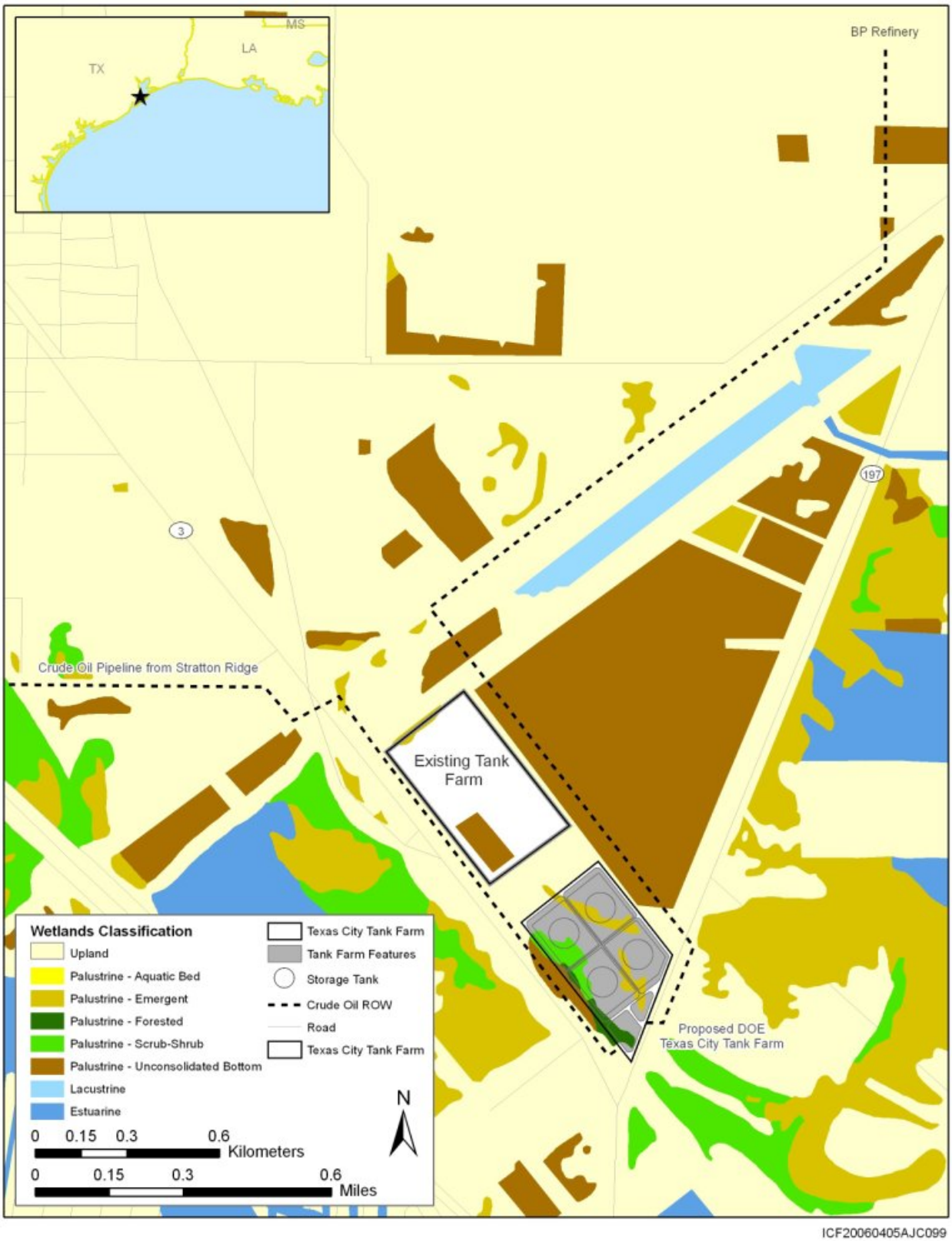
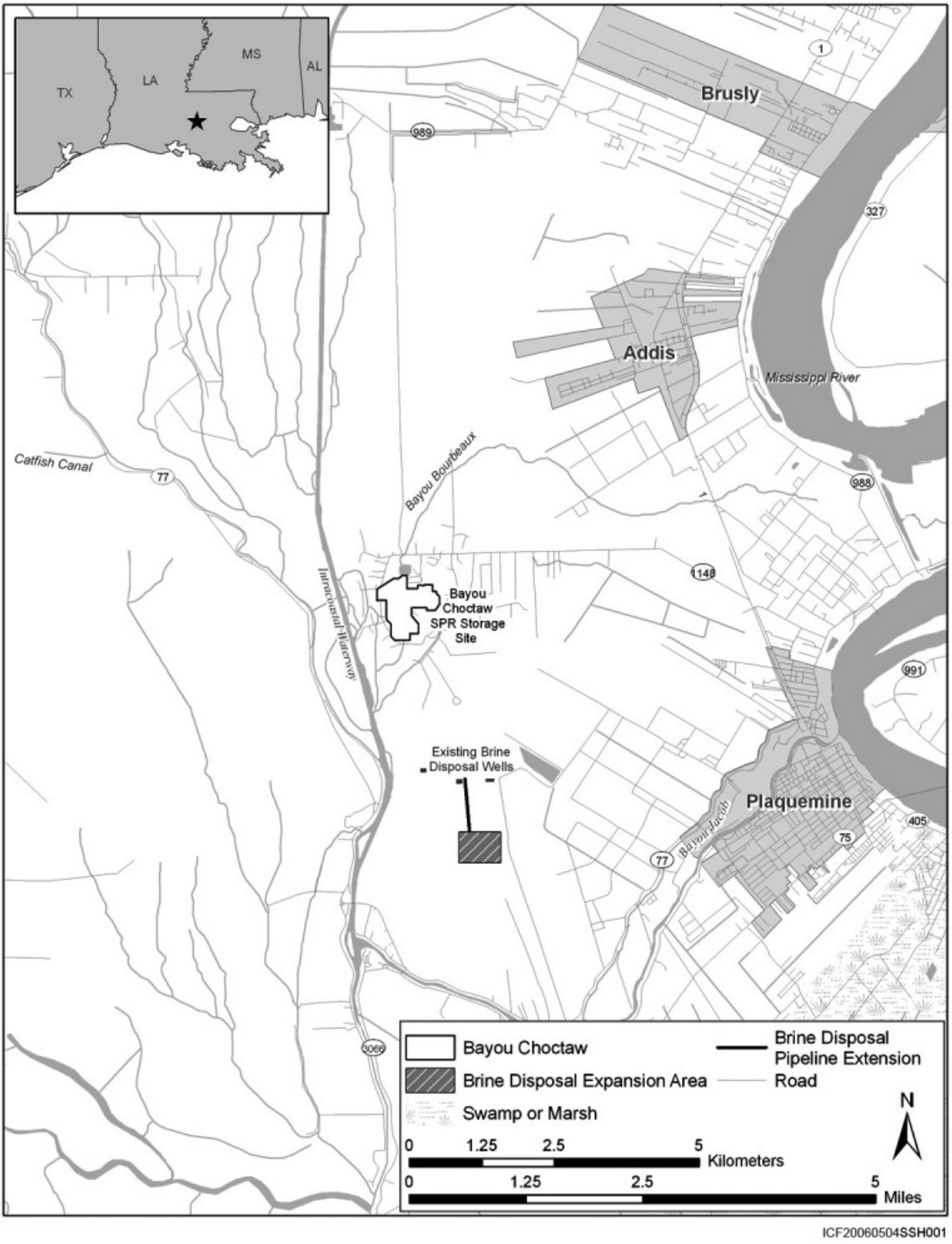


Figure B.6.5-1: Location of Bayou Choctaw Expansion Site and Associated Facilities



The existing storage facility consists of 6, approximately 12.5 MMB capacity caverns with a combined storage capacity of 76 MMB. Raw water is supplied from an intake facility on Cavern Lake located north of the site. Brine is disposed of via underground injection wells south of the storage site. The disposal wells are connected to the site by a 2.3-mile (3.7-kilometer) pipeline. Oil is moved to and from the site through the St. James terminal on the Mississippi River or through the Placid Refinery pipeline.

The expansion of Bayou Choctaw storage site and associated facilities would consist of the following:

- Development of two new 10 MMB caverns and possible acquisition of one existing 10 MMB cavern,
- Minor upgrades to existing infrastructure,
- New offsite brine pipeline, and
- Six new offsite brine injection wells.

B.6.5.1 Floodplain Impacts

The Bayou Choctaw expansion site is located in the east-central portion of Iberville Parish and the Louisiana portion of the Western Gulf Coastal Plain Province. This low-lying area, approximately 5 feet (1.5 meters) above mean sea level, is composed of the Mississippi River floodplain, coastal marshes, and a series of Pleistocene terraces and low hills.

Bayou Bourbeaux and several small canals drain surface water from the site into Bull Bay and wetlands in the southern portion of the site that extend to the south. These water bodies drain into the ICW (also called Bayou Choctaw) to the west and to the marsh to the south via drainage streams.

The Bayou Choctaw expansion site would use the existing property and would require no new land acquisition for construction of additional storage caverns. DOE would purchase and use approximately 20 acres (8 hectares) of land south of the storage site for 6 new brine injection wells. A 3,000-foot (914 meter) brine disposal pipeline ROW would be required to connect the existing brine injection wells to the new disposal area. Because the entire site is located within the 100-year floodplain (figure B.6.5-2), all new construction would occur within floodplains. The expansion site would affect approximately 24 acres (10 hectares) of 100-year floodplain associated with the site storage facility expansion and the expansion of the brine disposal area. The site expansion would use existing onsite and offsite infrastructure to the maximum extent practicable. Table B.6.5-1 summarizes the floodplain area that would be affected by this expansion.

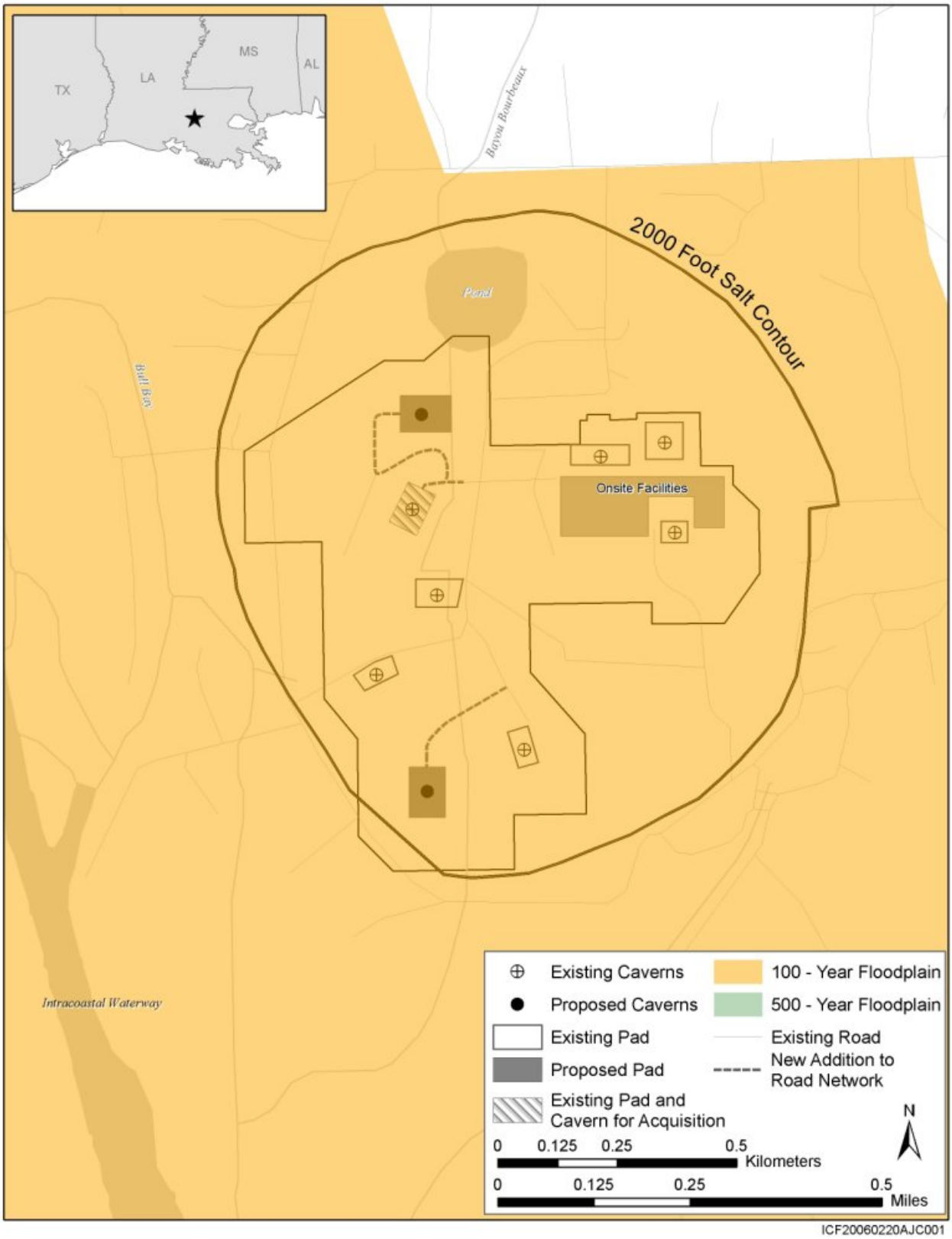
Table B.6.5-1: Potential Floodplain Impacts for Bayou Choctaw Expansion Site

Description	100-Year Floodplain (acres)	500-Year Floodplain (acres)
Caverns/road	4	0
Brine Disposal Expansion	20	0
Total	**24**	**0**

1 acre = 0.405 hectares

The Bayou Choctaw storage site expansion would have a small potential to increase future downstream flooding due to proposed construction of aboveground structures within the floodplain, including well pads, access roads, and wellheads. The potential impacts are expected to be minimal due to the overall size of the floodplain system, small amount of construction, and compliance with local, state, and Federal floodplain regulations. After selection of an alternative other than no-action and prior to construction,

Figure B.6.5-2: Floodplain Map for Bayou Choctaw Expansion Site



hydrological modeling would be conducted to ensure that base flood elevations would not be increased from the proposed fill structures.

Any structures located within the floodplain would be designed in accordance with the NFIP requirements for nonresidential buildings and structures located in special flood hazard areas. The NFIP regulations are designed to require vulnerable structures to be constructed above the 100-year flood elevation or to be watertight. DOE would coordinate with and secure approval from the floodplain coordinator at the Louisiana Department of Transportation and Development or the local government, if it has adopted the NFIP program, during the design stage/site plan process.

The brine pipeline would cross and temporarily affect 0.5 miles (0.8 kilometers) of 100-year floodplain during its construction. The impacts to floodplains associated with construction of the brine disposal pipeline ROW would be temporary because the preconstruction contours would be re-established and no aboveground fill or structures would exist following the completion of the construction activities. Therefore, no significant increased risk of flooding would be expected from ROW construction because there would be no net loss of flood attenuation capacity compared to the existing conditions. There would be a potential minor increase in flood stage during the construction activities because some staging materials and construction equipment might be located in a floodplain.

B.6.5.2 Wetland Impacts

The construction and operations and maintenance associated with the expansion of the Bayou Choctaw storage site would have temporary and permanent impacts on wetlands as described in the methodology. Table B.6.5-2 summarizes the wetlands that would be affected by the expansion site, ROWs, and brine injection wells.

Table B.6.5-2: Summary of Potential Wetland Impacts for the Proposed Bayou Choctaw Storage Site and Associated Facilities[a]

Cowardin Wetland Types	Storage Site (acres)		Brine Pipeline ROW (acres)		Brine Injection Wells (acres)	Totals (acres)
	Filled wetlands	Permanent conversion	Temporary easement	Permanent easement	Filled wetlands	All affected wetlands
Palustrine – Forested[b]	4	0	7	3	20	**34**

Notes:

[a] This table presents only the wetland types that are present within the proposed footprint according to NWI data. Facilities were omitted if no wetlands were present within the footprint.

[b] Forested and scrub-shrub wetlands would be cleared of woody vegetation and permanently converted to and maintained as emergent wetlands within the permanent easement of all ROWs. Within the temporary construction easement, woody vegetation would be cleared but would be allowed to re-establish within the easement. DOE would follow any required wetland compensation for these temporary impacts that is required by Section 404/401 permit. At a minimum, DOE would restore original contours, replace the original hydric topsoil back in the disturbed area, and seed with native species. Re-establishment of the scrub-shrub or forested wetland may take 5-25 years depending on the type of community affected.

The wetlands at the Bayou Choctaw storage site and brine disposal expansion area are palustrine forested (figure B.6.5-3 and figure B.6.5-4). This important type of fresh-water ecosystem generally provides functions that include nutrient transformation, flood storage, wildlife habitat, and timber production. The wetlands at the site have been disturbed by past facility construction and operations and maintenance.

Figure B.6.5-3: NWI Wetlands at the Bayou Choctaw Expansion Site

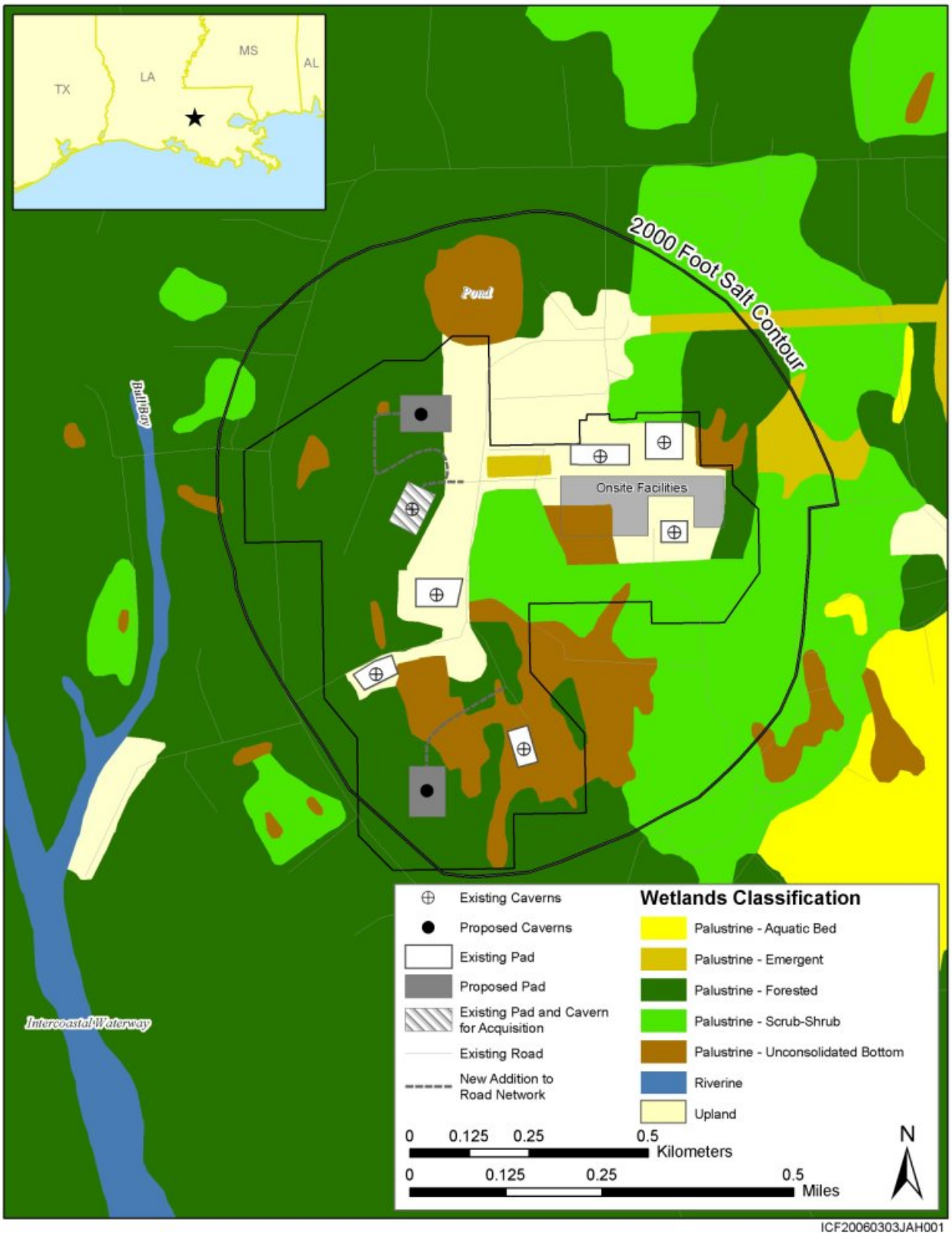
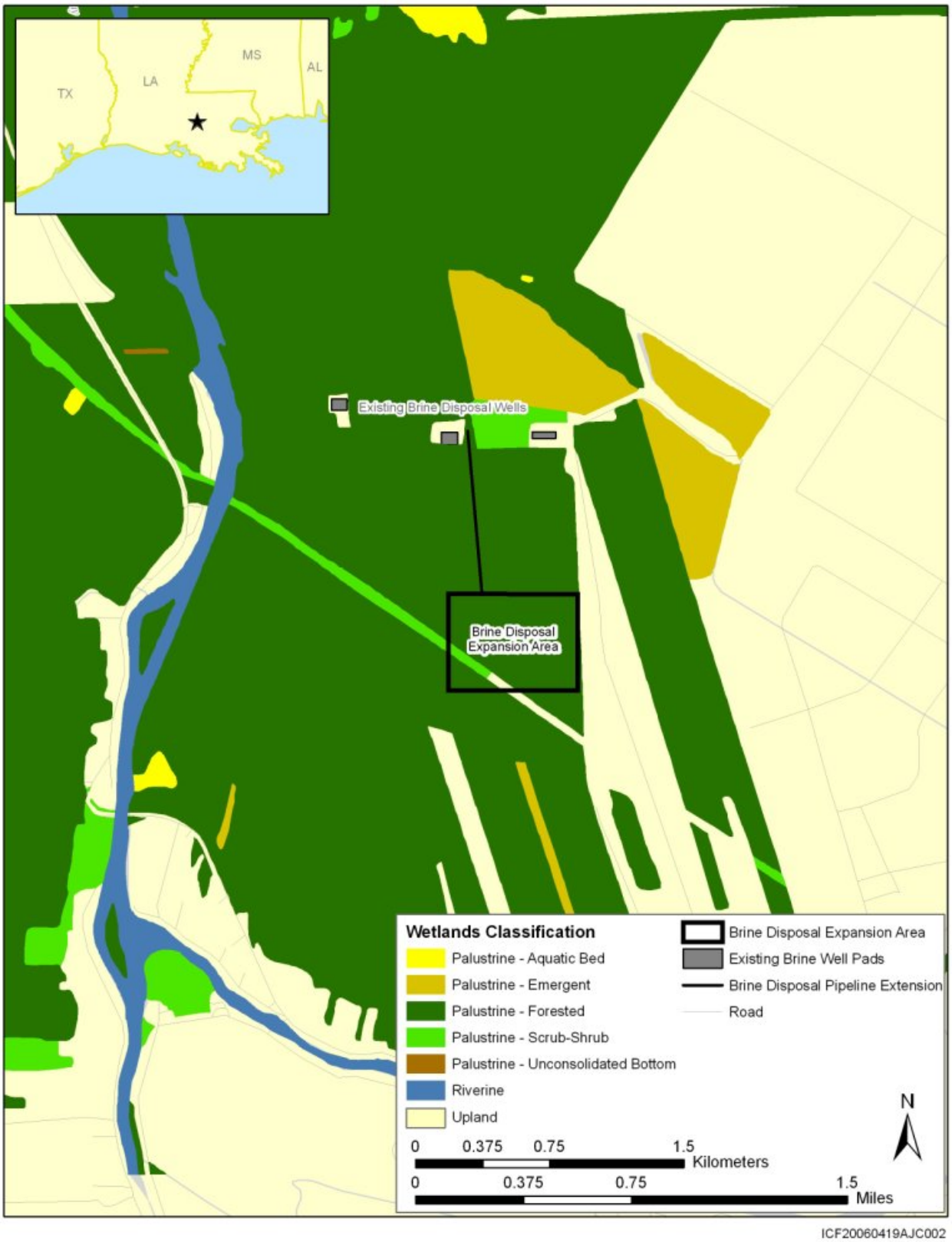


Figure B.6.5-4: NWI Wetlands at the Expansion Site Brine Disposal Wells



Expansion of the Bayou Choctaw storage site and associated facilities would affect approximately 24 acres (10 hectares) of wetlands. The permanent fill and conversion of wetlands would be associated with the construction of the storage facility and brine injection well pads.

The brine pipeline ROW associated with the Bayou Choctaw expansion site would cross and permanently or temporarily affect 10 acres (4 hectares) of wetlands. Table B.6.5-2 summarizes the potential wetland impacts from the proposed ROW. Pre-existing contours would be restored within the ROW and the affected plant communities would be allowed to re-establish depending on location within the temporary and permanent easement. DOE would promote the growth of emergent or forested vegetation in the temporary construction easement. The impacts to wetlands within the temporary easement would last between 10 to 25 years for forested wetlands. DOE would suppress the growth of woody vegetation within the permanent easement to protect the pipeline and to allow weekly overflight inspections. Therefore, forested wetlands in these areas would be permanently converted to emergent wetlands. Although the converted wetlands would provide different habitat than before construction, other important wetland functions, such as flood storage and nutrient filtration, would be maintained within the emergent wetlands.

The entire Bayou Choctaw site development, which includes the expansion site, the brine disposal expansion area, and the ROWs, would affect approximately 34 acres (14 hectares) of wetlands associated with the filling activities required for new structures and temporary and permanent clearing for new power lines and pipelines. The construction activities would permanently fill approximately 24 acres (10 hectares) of wetlands associated with the expansion area and brine injection wells. The clearing of palustrine forested wetlands for the brine injection would affect an important ecological resource. These impacts would be mitigated by the compensation plan for wetland impacts (Appendix O).

Due to the location and geology of the salt domes and the long ROW, impacts to wetlands and waters of the United States would be unavoidable for this site development. All filling of and discharge to jurisdictional wetlands would require a Section 404/401 permit from the USACE and the Louisiana Coastal Management Division of the Department of Natural Resources. The permit application would require a comprehensive alternatives analysis that demonstrates avoidance and minimization of wetland impacts. The permit would contain conditions to minimize the impact to wetlands during construction and would require compensation for unavoidable impacts to wetlands. Section B.7 discusses in more detail the avoidance, minimization, and mitigation measures that would be used to reduce, avoid, and compensate for the potential impact to wetlands and waters of the United States. Appendix O describes a conceptual mitigation plan.

B.6.6 Big Hill Expansion Site and Associated Infrastructure

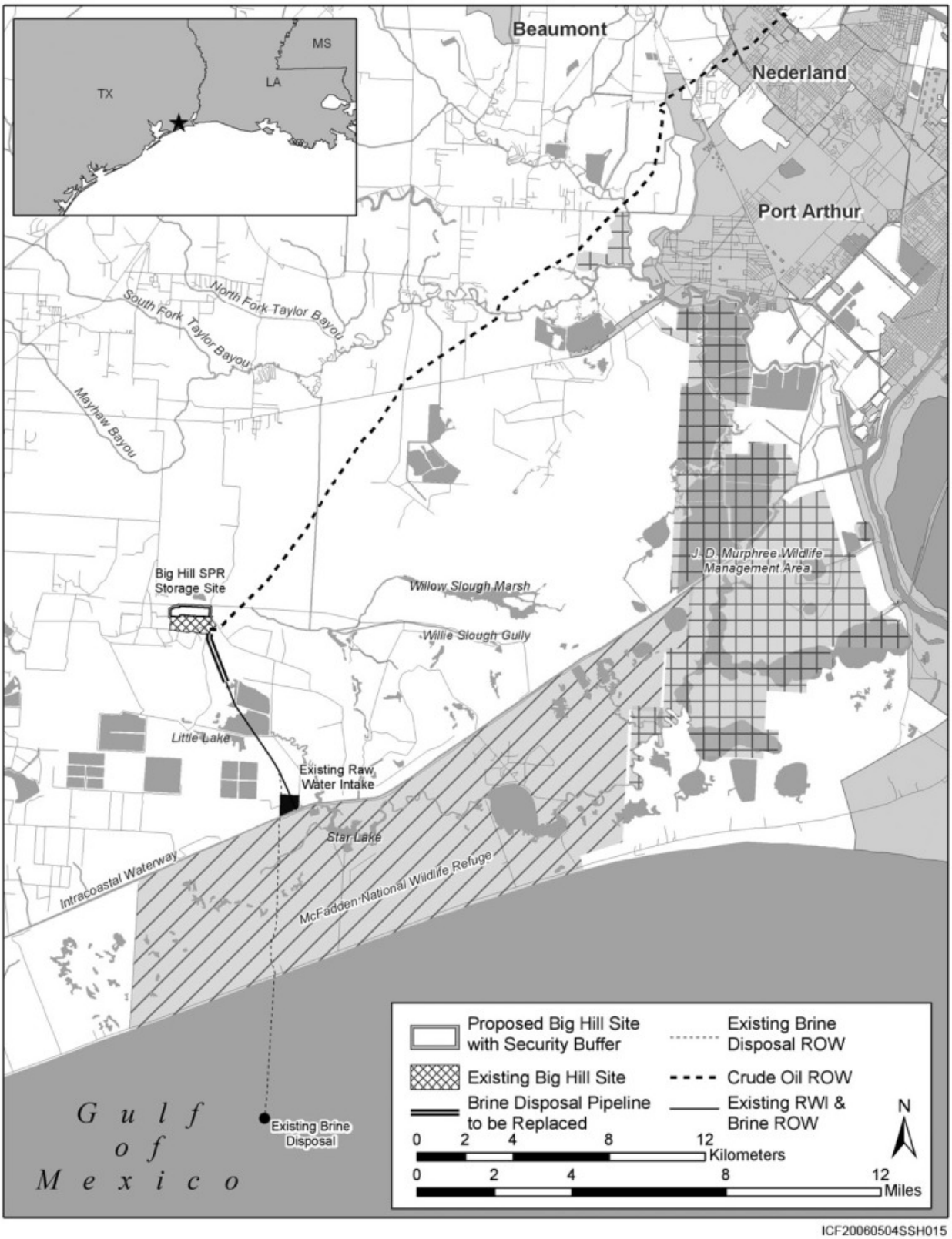
The Big Hill storage site is located in Jefferson County, TX, 17 miles (27 kilometers) southwest of Port Arthur and 70 miles (113 kilometers) east of Houston.

The existing Big Hill storage site consists of 14 crude oil storage caverns with a combined capacity of 170 MMB, a brine disposal system, an RWI system, and a crude oil distribution system (figure B.6.6-1). The site also has various support facilities, including a heliport, diesel oil storage, and several administration buildings. The caverns are located in the central portion of the salt dome and are arranged in two rows of five caverns and one row of four caverns.

The Big Hill expansion would consist of the following:

- Up to nine new caverns with a capacity of up to 96 MMB,
- Crude oil pipeline to the Sun terminal,

Figure B.6.6-1: Location of Big Hill Expansion Site and Associated Facilities



- Refurbishment of the 7,000 feet (2,134 meters) brine disposal pipeline, and
- New fencing, roads, onsite pipelines, and new anhydrite settling pond.

A map for the Big Hill Expansion storage site and associated facilities, included as an attachment to this appendix, shows detailed NWI mapped wetlands.

B.6.6.1 Floodplain Impacts

The extent of 100-year and 500-year floodplain was determined based on the FEMA Flood Insurance Rate Maps covering the project area. The proposed Big Hill expansion site is located in a predominantly undeveloped, extensive floodplain system (see figures B.6.6-2 and B.6.6-3).

The Big Hill expansion site would take advantage of the existing infrastructure, reducing the area required for new construction and operations. The proposed expansion would consist of the construction of up to nine new caverns immediately north of the existing facility. A large percentage of this expansion site (about 73 percent) would be located outside of the 100-year and the 500-year floodplain. The expansion site would affect 11 acres (5 hectares) of 100-year floodplain and approximately 27 (11 hectares) of 500-year floodplain.

The Big Hill expansion site would have some potential to increase future downstream flooding due to the proposed fill construction of aboveground structures within the floodplain including well pads, roads, and ponds. The impacts would be minimal due to the overall size of the floodplain system, the small impact area, and compliance with local, state, and Federal floodplain regulations. After selection of an alternative other than no-action and prior to construction, hydrological modeling would be conducted to ensure that base flood elevations would not be increased from the proposed fill structures.

Any structures located within the floodplain would be designed in accordance with the NFIP requirements for nonresidential buildings and structures located in special flood hazard areas. The NFIP regulations require vulnerable structures to be constructed above the 100-year flood elevation or to be watertight. DOE would coordinate with and secure approval from the floodplain coordinate at the Texas Commission on Environmental Quality or the local government, if it has adopted the NFIP, during the design stage/site plan process.

The proposed crude oil pipeline ROWs would cross and affect 18 miles (29 kilometers) of 100-year floodplain and 3 miles (4.8 kilometers) of 500-year floodplain. The impacts on floodplains associated with the pipeline ROWs would be temporary because the preconstruction contours would be re-established and no fill or aboveground structure would exist following the completion of the construction activities. Therefore, no significant increased risk of flooding would be expected from the pipeline ROWs because there would be net loss of floodplain storage capacity compared to the existing conditions. There would be a potential minor increase in flood stage during the construction activities because some staging materials and construction equipment may be located in the floodplain.

Due to the geology and location of the salt dome and the long ROWs, floodplains would be unavoidable for this site development. DOE has considered the practicable alternatives to siting in a floodplain and has evaluated the proposed design and modifications to minimize the potential impact to floodplains. Proper design and compliance with the required regulatory programs would reduce the impacts of these structures on floodplains to a level where there would be no significant change in the base flood elevation. Section B.7 discusses in more detail the avoidance and minimization measures that DOE would use to reduce the effects to floodplains located in the project area.

Figure B.6.6-2: Floodplain Map for Big Hill Expansion and Associated Facilities

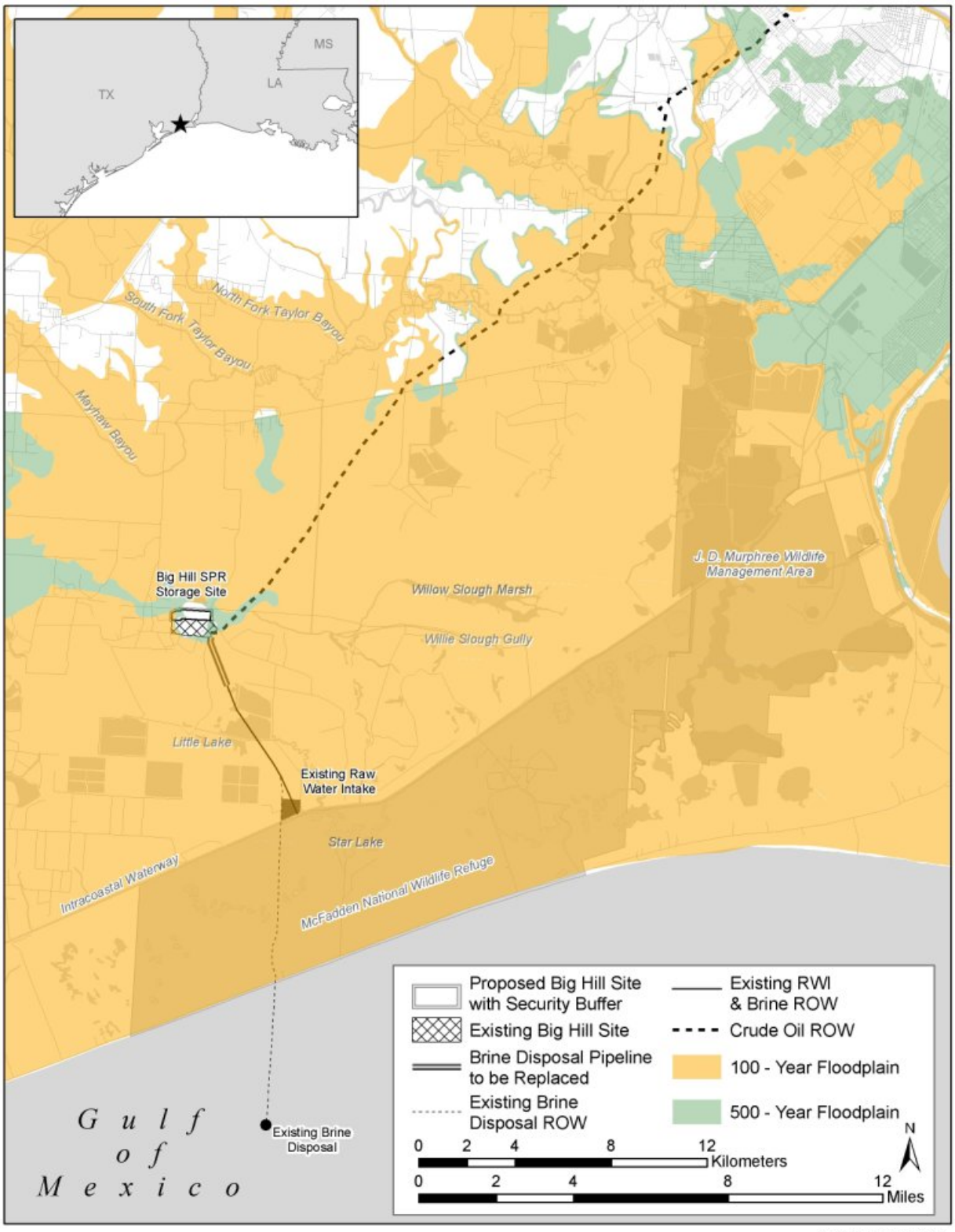
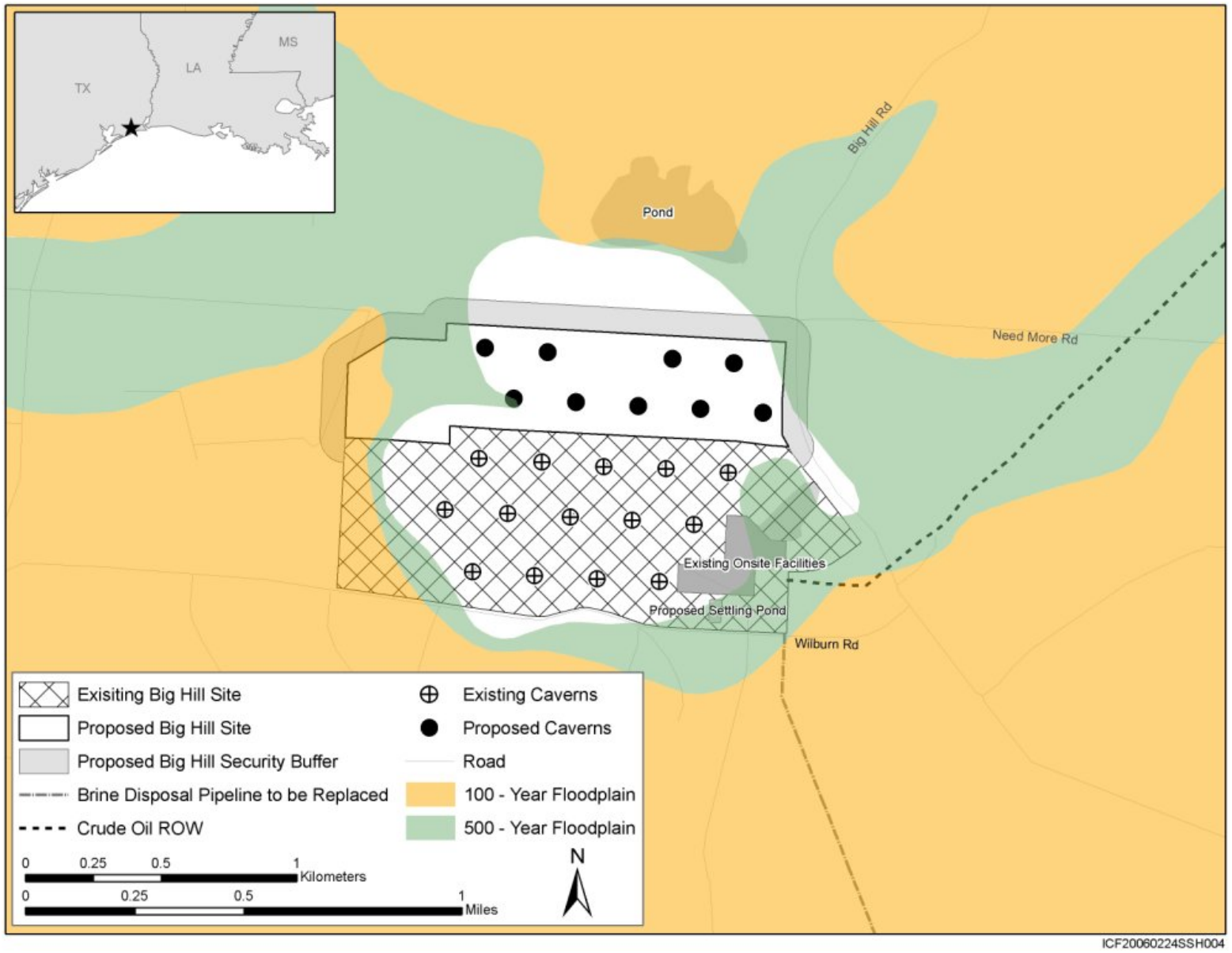


Figure B.6.6-3: Floodplain Map for Big Hill Expansion Site



B.6.6.2 Wetland Impacts

The construction and operations and maintenance activities associated with the proposed Big Hill expansion site would have temporary and permanent impacts on wetlands as described in the methodology. Table B.6.6-1 summarizes the wetlands that would be affected by expansion of capacity at the site.

Table B.6.6-1: Summary of Potential Wetland Impacts for the Proposed Big Hill Expansion Site[a]

Cowardin Wetland Types	Storage Site (acres)		ROW to Sun Terminal[b] (acres)		Brine Pipeline to be Replaced[b] (acres)		Totals
	Filled wetlands	Permanent conversion	Temporary easement	Permanent easement	Temporary easement	Permanent easement	All affected wetlands
Lacustrine	0	0	5	3	3	1	**12**
Palustrine – emergent	6	0	92	45	4	2	**149**
Palustrine – forested	9	0	2	1	0	0	**12**
Palustrine – scrub-shrub	0	0	0	0	3	2	**5**
Palustrine – unconsolidated bottom	0	2[c]	3	2	0	0	**7**
Riverine	0	0	2	1	0	0	**3**
Other	0	0	1	0	0	0	**1**
Totals	**15**	**2**	**105**	**52**	**10**	**5**	**189**

Notes:

[a] This table presents only the wetland types that are present within the proposed footprint according to NWI data. Facilities were omitted if no wetlands were present within the footprint.

[b] Forested and scrub-shrub wetlands would be cleared of woody vegetation and permanently converted to and maintained as emergent wetlands within the permanent easement of all ROWs. Within the temporary construction easement, woody vegetation would be cleared but would be allowed to re-establish within the easement. DOE would follow any required wetland compensation for these temporary impacts that is required by the Section 404/401 permit. At a minimum, DOE would restore original contours, replace the original hydric topsoil back in the disturbed area, and seed with native species. Re-establishment of the scrub-shrub or forested wetland may take 5-25 years depending on the type of community affected. Impacts to these wetlands would be temporary and they would return to the pre-existing conditions shortly after construction is completed.

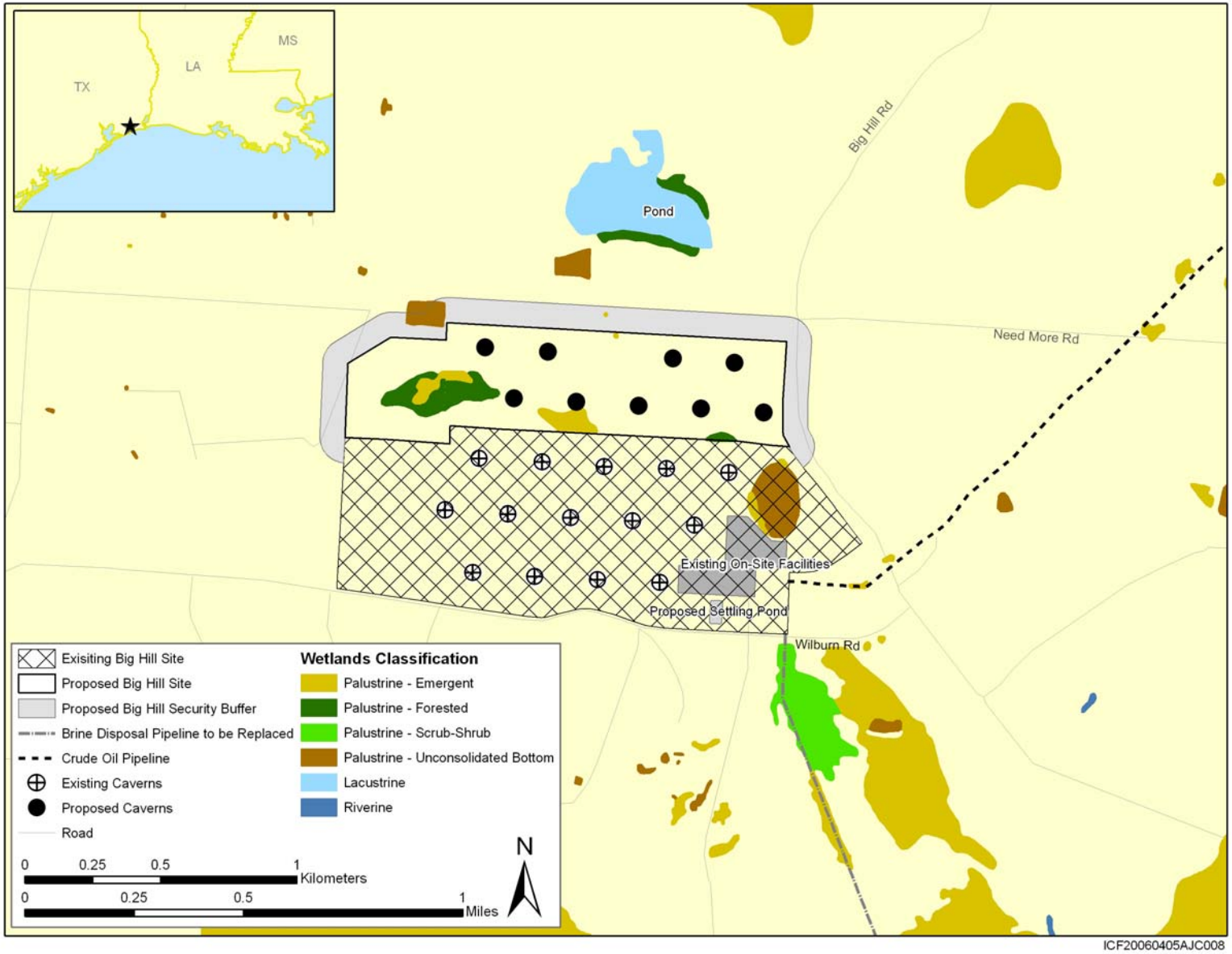
[c] During the site construction, non-woody wetland vegetation would be temporarily cleared in the security buffers. In these wetlands, DOE would restore original contours, replace hydric topsoil back in the disturbed area, and seed with native species. Impacts to these wetlands would be temporary and they would return to pre-existing conditions shortly after construction is completed.

1 acre = 0.405 hectares

The proposed expansion area is located immediately north of the existing Big Hill SPR facility. Much of the area proposed for expansion has been disturbed from past construction activities associated with the existing storage site and other oil development in the region. Construction of the Big Hill expansion site would fill approximately 15 acres (6 hectares) of wetlands. The permanent fill and conversion of wetlands would be associated with construction of the expansion site and the maintenance of a security buffer around the new facilities (see figure B.6.6.4). Wetlands within the security buffer would be permanently converted from forested and scrub-shrub wetlands to emergent wetlands or open water. The security buffer would require the clearing of woody vegetation and periodic maintenance to suppress or clear woody species.

The replacement of 7,000 feet (2,134 meters) of the brine pipeline and new crude oil pipeline associated with the Big Hill expansion site would cross and permanently or temporarily affect 172 acres (70 hectares) of wetlands. Construction of the ROWs would affect 115 acres (47 hectares) of wetlands within the temporary easement and 57 acres (23 hectares) of wetlands within the permanent easement. Pre-existing contours would be restored and the affected plant communities would be allowed to re-establish depending on the location within the temporary and permanent easement. DOE would promote

Figure B.6.6-4: NWI Wetlands at the Proposed Big Hill Expansion Site



the regrowth of emergent vegetation or forested vegetation within the temporary construction easement. The impacts on wetlands within the temporary easement would last between 2 to 3 years for emergent wetlands and 10 to 25 years for forested wetlands. DOE would suppress the regrowth of woody vegetation within the permanent easement to protect the pipeline and to allow weekly overflight inspections. Therefore, forested wetlands in these areas would be permanently converted to emergent wetlands. Although the converted wetlands would provide different habitat than before construction, other important wetland functions, such as flood storage and nutrient filtration, would be maintained within the emergent wetlands.

The entire Big Hill expansion site alternative, which includes the expansion area and the ROWs, would affect approximately 189 acres (76 hectares) of wetlands associated with the filling activities required for new structures and facilities and permanent and temporary clearing new pipelines. The construction would permanently fill approximately 15 acres (6 hectares) of wetland associated with the expansion site (table B.6.6-1). The impact to wetlands would not be adverse because the wetlands have been disturbed in the past. The impact would be mitigated by the compensation plan for wetland impacts (Appendix O).

Due to the geology and location of the salt dome, the water dependency of the RWI, and the long ROWs, impacts to wetlands and waters of the United States would be unavoidable for this site development. All filling of and discharge to jurisdictional wetlands would require a Section 404/401 permit from the USACE and the Texas Commission of Environmental Quality. The permit application would require a comprehensive alternatives analysis that demonstrates avoidance and minimization of wetland impacts. The permit would contain conditions to minimize the impact to wetlands during construction and would require compensation for unavoidable impacts to wetlands. Section B.7 discusses in more detail the avoidance, minimization, and mitigation measures that DOE would use to reduce, avoid, and compensate for the potential impacts to wetlands and waters of the United States. Appendix O describes a conceptual compensation plan.

B.6.7 West Hackberry Expansion Site and Associated Infrastructure

The West Hackberry site occupies approximately 570 acres (230 hectares) in Cameron and Calcasieu Parishes in southwestern Louisiana (figure B.6.7-1). The site is located approximately 20 miles (32 kilometers) southwest of the City of Lake Charles and 16 miles (26 kilometers) north of the Gulf of Mexico.

The existing SPR storage facility consists of 22 caverns with a combined capacity of 227 MMB. DOE would use the existing oil distribution pipelines, RWI, and brine disposal for the proposed expansion.

The West Hackberry expansion site consists of the following:

- Acquisition of three existing caverns with a total of 15 MMB of capacity,
- Use of existing infrastructure, and
- New access road, fencing, and onsite pipelines connecting acquired caverns to the existing DOE site.

B.6.7.1 Floodplain Impacts

The proposed expansion at West Hackberry would involve the acquisition of three existing storage caverns adjacent to the existing SPR site. DOE would acquire, but not develop, a large property containing the storage caverns. Only a small portion of the acquired land would be located within a floodplain. The proposed construction area that contains the three existing storage caverns would be outside of this floodplain; therefore, the West Hackberry expansion site would not affect floodplains (see figure B.6.7-2).

Figure B.6.7-1: Location of West Hackberry Expansion Site and Associated Facilities

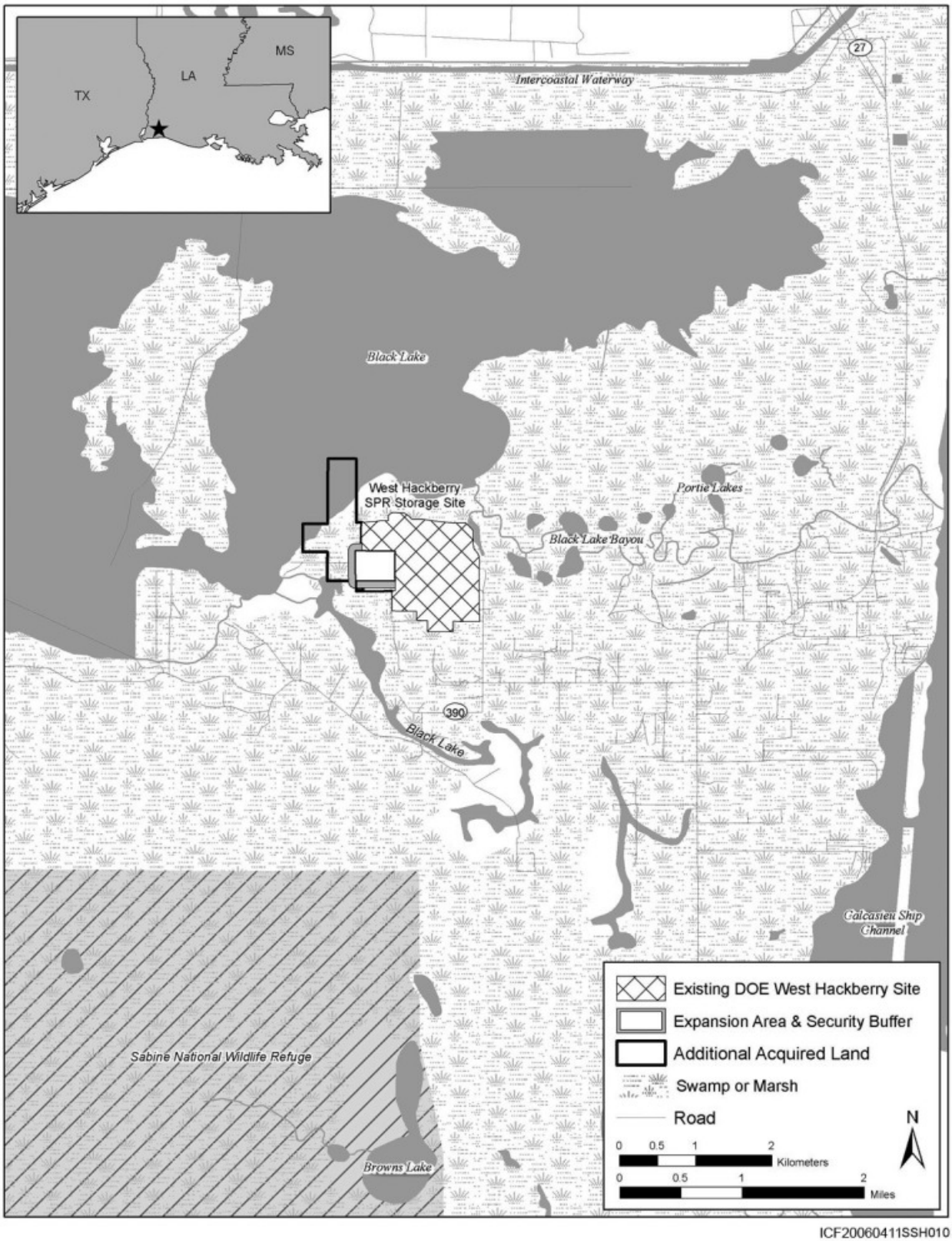
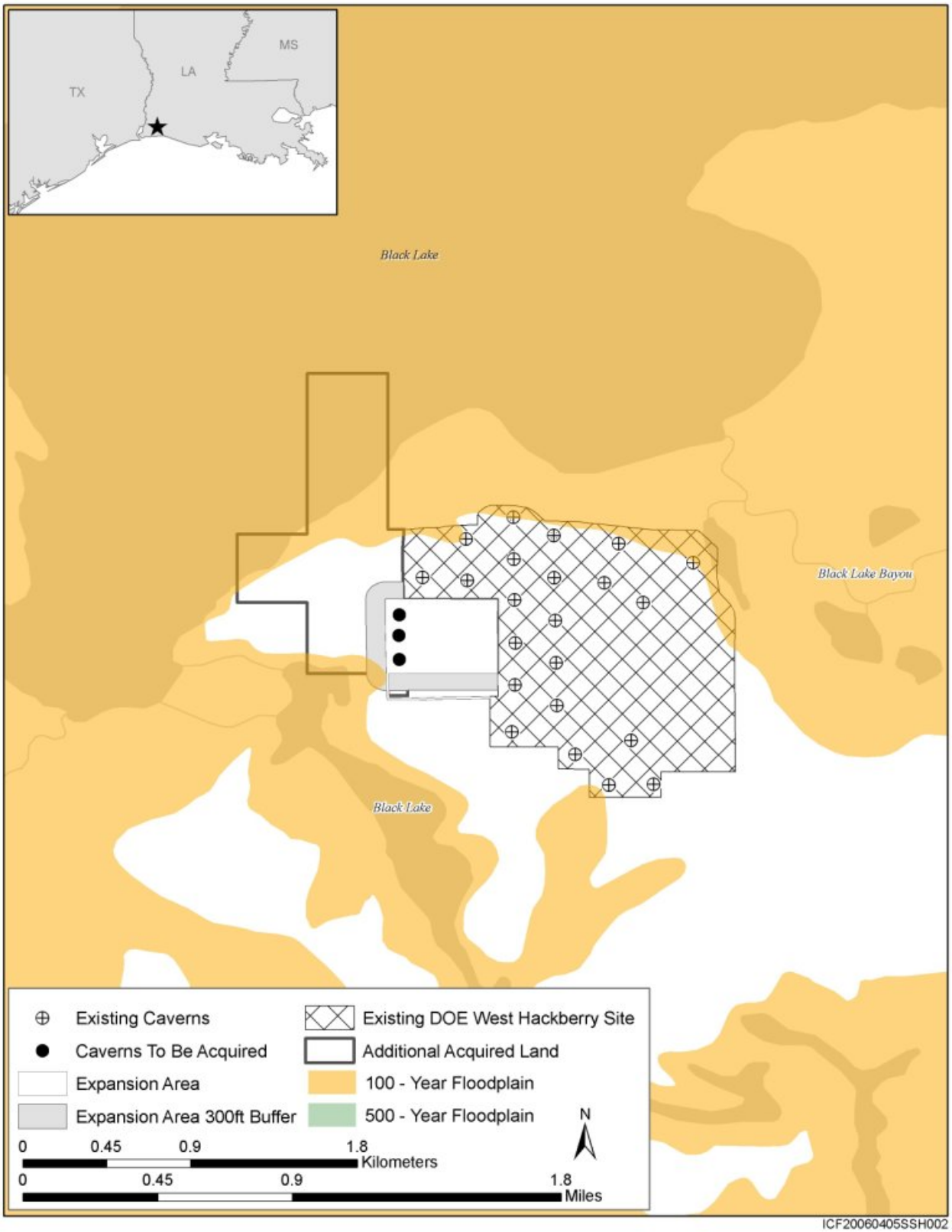


Figure B.6.7-2: Floodplain Map for West Hackberry Expansion



B.6.7.2 Wetland Impacts

The construction and operations and maintenance associated with the proposed West Hackberry expansion would have temporary and permanent impacts on wetlands as described in the methodology. Table B.6.7-1 summarizes the wetlands that would be affected by this expansion. Figure B.6.7-3 shows the wetlands located at the expansion site.

Table B.6.7-1: Summary of Potential Wetland Impacts for the Proposed West Hackberry Expansion Site[a]

Cowardin Wetland Types	Storage Site (acres)		Totals (acres)
	Filled wetlands	Permanent conversion	All affected wetlands
Palustrine – scrub-shrub[b]	0	5	**5**

Notes:

[a] This table presents only the wetland types that are present within the proposed facility footprint according to NWI data. Facilities were omitted if no wetland were present within the footprint.

[b] Forested and scrub-shrub wetlands would be cleared of woody vegetation and permanently converted to and maintained as emergent wetlands within the security buffer. DOE would follow any required wetland compensation for these temporary impacts that is required by Section 404/401 permit. At a minimum, DOE would restore original contours, replace the original hydric topsoil back in the disturbed area, and seed with native species

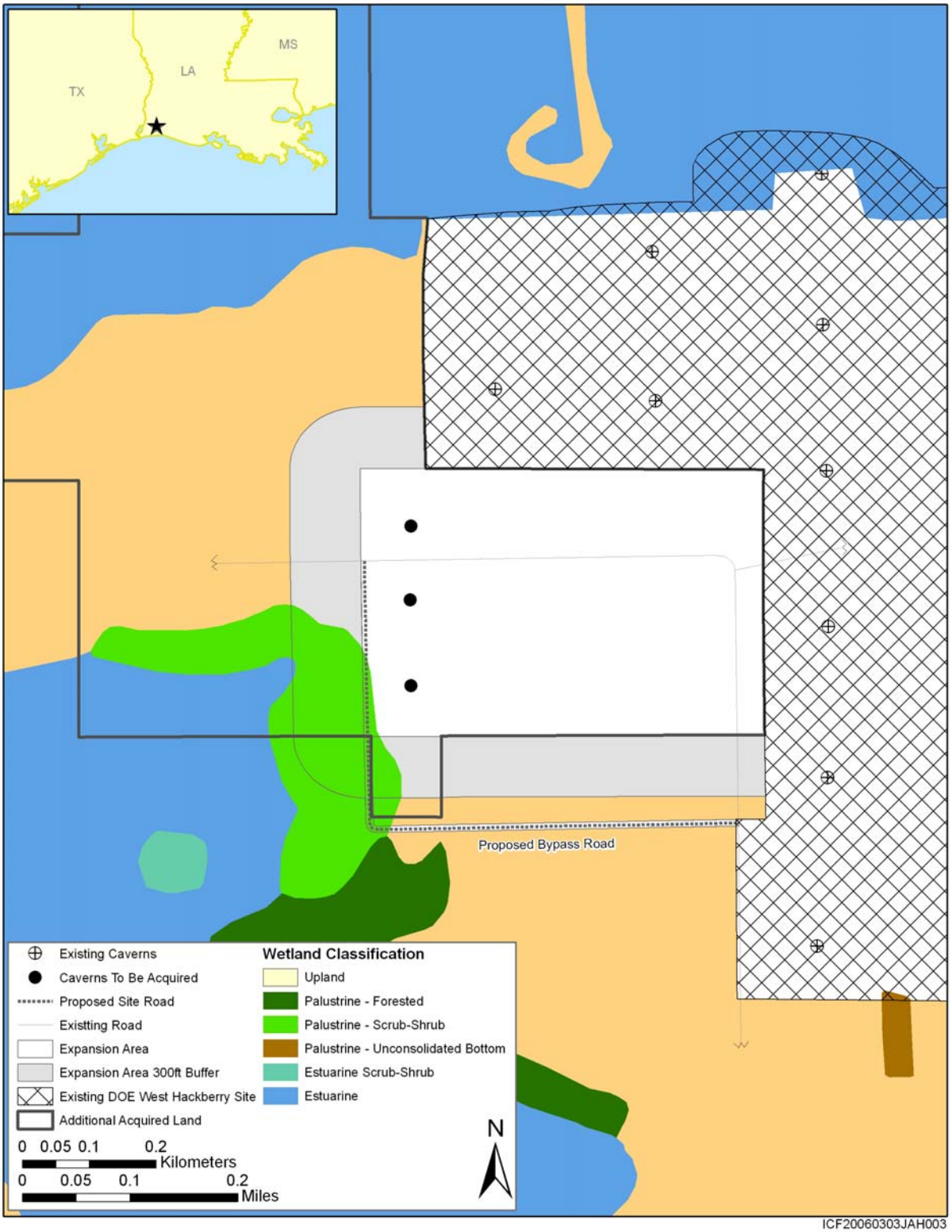
Numerous canals and natural waterways bisect the area where the West Hackberry storage site is located. This region consists of estuaries associated with the Louisiana coast. Natural ridges in the area typically support grass and trees and affect water flow through the marshes. Construction and operations and maintenance of the West Hackberry expansion site would permanently convert approximately 5 acres (2 hectares) of scrub-shrub wetlands to emergent wetlands. These potential wetland impacts are associated with the expansion area 300-foot (91-meter) site security buffer. This area would be permanently maintained for security purposes, converting the existing scrub-shrub wetlands to emergent wetlands. No additional wetland impacts are anticipated to result from the West Hackberry expansion.

Due to the location and geology of the salt domes, impacts to wetlands would be unavoidable for this alternative. All impacts of jurisdictional wetlands would require a Section 404/401 permit from the USACE and from the Louisiana Coastal Management Division of the Department of Natural Resources. The permit application would require a comprehensive alternatives analysis that demonstrates avoidance and minimization of wetland impacts. The permit would contain conditions to minimize the impact to wetlands during construction and would require compensation for unavoidable impacts to wetlands. Section B.7 below discusses in more detail the avoidance, minimization, and mitigation measures that DOE would use to reduce, avoid, and compensate for the wetland impacts. Appendix O describes a conceptual compensation plan.

B.7 ALTERNATIVES, MINIMIZATION, AND MITIGATION

This discussion is not site-specific because alternatives, avoidance, minimization, and mitigation efforts that DOE pursues would be similar regardless of which site is chosen. Once DOE has selected an alternative other than the no-action alternative, a more detailed analysis of avoidance and minimization would be conducted as part of the design and Section 404/401 permit process. In addition, a compensation plan for unavoidable impacts to wetlands would be prepared. If required by the USACE, the compensation plan would include a functional assessment of affected wetlands in order to establish appropriate compensation ratios.

Figure B.6.7-3: NWI Wetlands at the West Hackberry Expansion Site



B.7.1 Alternatives Consideration for Floodplains and Wetlands

DOE has taken into consideration alternatives to avoid adverse effects and incompatible development within floodplains and wetlands, to the maximum extent practicable. DOE has concluded there are no practicable alternatives to construction within floodplains or wetlands for the individual proposed SPR sites. Site locations, the location of onsite facilities, and site access roads are dictated by the location and configuration of the salt domes, which constitute a unique geologic setting. In addition, DOE needs a raw water source that is adequate for solution mining of storage caverns. Similarly, because the salt dome sites are largely located in lowland areas surrounded by wide expanses of floodplain and/or wetlands, there are no practicable alternatives to the location of the pipelines running to and from these sites within floodplains and wetlands. RWI structures and their pipeline ROWs also are water dependent because of their function and therefore cannot be located outside of the floodplain associated with the water source. Pipelines, power lines, and roads are long by nature and cannot avoid crossing waterways, wetlands, and the associated floodplains.

As discussed in the foregoing sections, the facilities to be constructed for the SPR expansion are not expected to significantly impact floodplain values or the base flood elevation—particularly in view of the impact minimization and mitigation measures that would be employed. The project would avoid "adverse effects and incompatible development within the floodplain," regardless of the alternative selected.

From the standpoint of the overall SPR expansion program, DOE considered alternatives for minimizing the potential impacts of pipeline and power line ROWs in floodplains and wetlands. Selecting pipeline and power line ROWs along existing ROWs was the primary approach that DOE employed in selecting pipeline ROWs. The Gulf Coast consists of a large number of gas and oil fields and associated facilities, which offer a network of existing pipeline and power line ROWs. This network of utilities enabled DOE to minimize the potential impacts to floodplains and wetlands. Table B.7-1 summarizes the percentage of the length of proposed SPR pipeline ROWs that would follow existing ROWs for each proposed new or expanded storage site.

Table B.7-1: Percentage of Proposed ROW Located In Existing ROWs

Storage Site	Total ROW Required (miles)	Total Proposed ROW Following Existing ROW (miles)	Percent in Existing ROW
Bruinsburg	206	77	37
Chacahoula	146	77	55
Richton	222	92	41
Stratton Ridge	48	37	78
Bayou Choctaw	1	N/A	0
Big Hill	24	24	100
West Hackberry	No pipelines	No pipelines	No pipelines

1 mile = 1.61 kilometers; N/A = not applicable

As shown in table B.7-1, a significant portion of the length of the proposed ROWs would use existing ROWs. The use of the existing ROWs would minimize the floodplain and wetland impacts associated with project construction and operation and would help prevent fragmentation of the natural environment.

B.7.2 Mitigation of Site Construction Impacts on Floodplains

To comply with E.O. 11988 and existing regulations, DOE would follow the U.S. Water Resources Council's (1978) *Floodplain Management Guidelines for Implementing Executive Order 11988* and FEMA's *Unified National Program for Floodplain Management* (FEMA 1986, 1994) while planning its mitigation strategy for the selected SPR alternative. Those actions would include the following:

- The use of minimum grading requirements to save as much of the site from compaction as possible;
- Returning the site and ROWs to original contours where feasible;
- Preserving free natural drainage when designing and constructing roads, fills, and large built-up centers;
- Maintaining wetland and floodplain vegetation buffers to reduce sedimentation and discharge of pollutants to nearby water bodies where feasible;
- Constructing stormwater management facilities (where appropriate) to minimize any alteration in natural drainage and flood storage capacity;
- Limiting the practice of clear-cutting and amount of fill placed within wetlands where feasible;
- Directional drilling of larger wetland and stream crossings where feasible;
- Locating buildings above the base flood elevation or flood proofing;
- Complying with the floodplain ordinance/regulations for the jurisdiction where the selected alternative is located; and
- Performing a hydrological demonstration (using the Hydrologic Engineering Center Hydrologic Modeling System or an approved floodplain model) that proposed fill and structures within the floodplain would not increase the base flood elevation. The proposed facility would be designed and constructed to avoid increasing the base flood elevation.

B.7.2.1 Additional Alternatives Considered for Wetlands

DOE would follow established practices to avoid dredging and filling in wetlands, or where there is no practicable alternative, to minimize the wetland and compensating for unavoidable wetland losses. DOE has initiated actions to identify the least environmentally damaging practicable alternative (LEDPA) for the routing of the ROWs and the storage sites and associated facilities. DOE would further refine the conceptual design for the selected alternative to minimize the construction and operations impacts, and finally mitigate for unavoidable impacts to wetlands. Suggested best practices to limit or avoid pipeline construction and operation impacts in wetlands are presented in section B.7.3.

DOE used geospatial data to identify the LEDPA route for ROWs where possible. DOE used a GIS software tool to assign weights to data features in order to compute a cost-weighted distance between two points, which represents the ease of movement between two points (Theobald 2003). For example, one often thinks of the distance to an object in terms of both measured distance and the time it will take to travel through obstacles such as steep slopes. A cost-weighted distance takes into consideration the obstacles as well as the distance. This geospatial tool is often used to locate a new road or hiking trail (Theobald 2003). DOE used this approach to identify alternative routes for proposed ROWs that would use existing corridors and would avoid high value wetlands to the extent possible.

To find potential ROWs, DOE used data on existing pipeline and power line ROWs along with wetland data acquired from NWI. Existing ROWs and non-wetland areas were assigned the lowest weights, open

water and emergent wetlands were moderately weighted, while forested wetland areas not along an existing ROW were heavily weighted. In this way, DOE identified the shortest path between two points that would avoid wetlands or certain wetland types and would maximize distance along existing ROWs.

DOE was able to apply this tool to the proposed sites at Stratton Ridge and Chacahoula. At Stratton Ridge, the tool did not find a practicable alternative to the refined proposed ROWs. The cost-weighted shortest path went through heavily developed areas or was longer than what was considered practicable. Before application of the cost-weighted path, DOE had already adjusted the ROWs at Stratton Ridge to maximize distance along existing ROWs and shorten distance through wetland areas, particularly Brazoria National Wildlife Refuge. These proposed alignments are shown on figure B.7.2-1.

The tool also did identify practicable alternatives to the ROWs at Chacahoula. After application of the tool, the ROWs were moved to follow existing pipeline ROWs that reduced the distance through wetlands and reduced the overall distance between points. Figure B.7.2-2 shows the proposed ROWs before and after application of the cost-weighted shortest path tool.

Due to limited availability of digital wetland data in Mississippi, DOE was not able to use this tool for the Richton or Bruinsburg sites and their infrastructure. Instead, DOE used USGS maps to align proposed ROWs along existing pipeline or power line ROWs. Aligning ROWs with existing ROWs was more challenging in Mississippi due to the relative lack of pipeline or power line infrastructure as compared to the coastal areas in Louisiana and Texas. Additionally, the Bruinsburg pipeline ROWs were limited by the rolling terrain in the area.

Wetland impacts would be unavoidable for any alternative other than the no-action alternative. Site selection for the oil storage caverns depends on the location of the salt domes designated by EPACT. Therefore, in cases where wetlands exist above the salt domes designated by EPACT criteria, development could not avoid impacts to wetlands. In addition, all of the proposed new sites would require a new source of raw water for solution mining. Therefore, the impacts to wetlands would be unavoidable, except under the no-action alternative, due to the water dependency of the project.

B.7.3 Mitigation of Site Construction Impacts on Wetlands

DOE would comply with Section 404/401 of the Clean Water Act, E.O. 11990, the National No Net Loss Policy, and 10 CFR Part 1022 when planning its mitigation strategy for the wetland impacts from the selected alternative. Although some impacts to wetlands could not be avoided (e.g., removal of vegetation during site or pipeline construction), the impacts would be partially mitigated through the use of appropriate engineering designs and good operating procedures. In addition to selecting the LEDPA, DOE would mitigate impacts throughout construction by using the following:

- Impact avoidance and minimization, which in addition to the LEDPA approach described above, includes ongoing infrastructure siting refinements and low-impact construction methods and containment measures.

- Restoration, which includes replanting, restoration, and other postconstruction compensation. Mitigation of impacts to wetlands would be specified in the Clean Water Act Section 404/401 Water Quality Certificate for the selected alternative.

Figure B.7.2-1: Alternative ROWs Considered for the Proposed Stratton Ridge Site

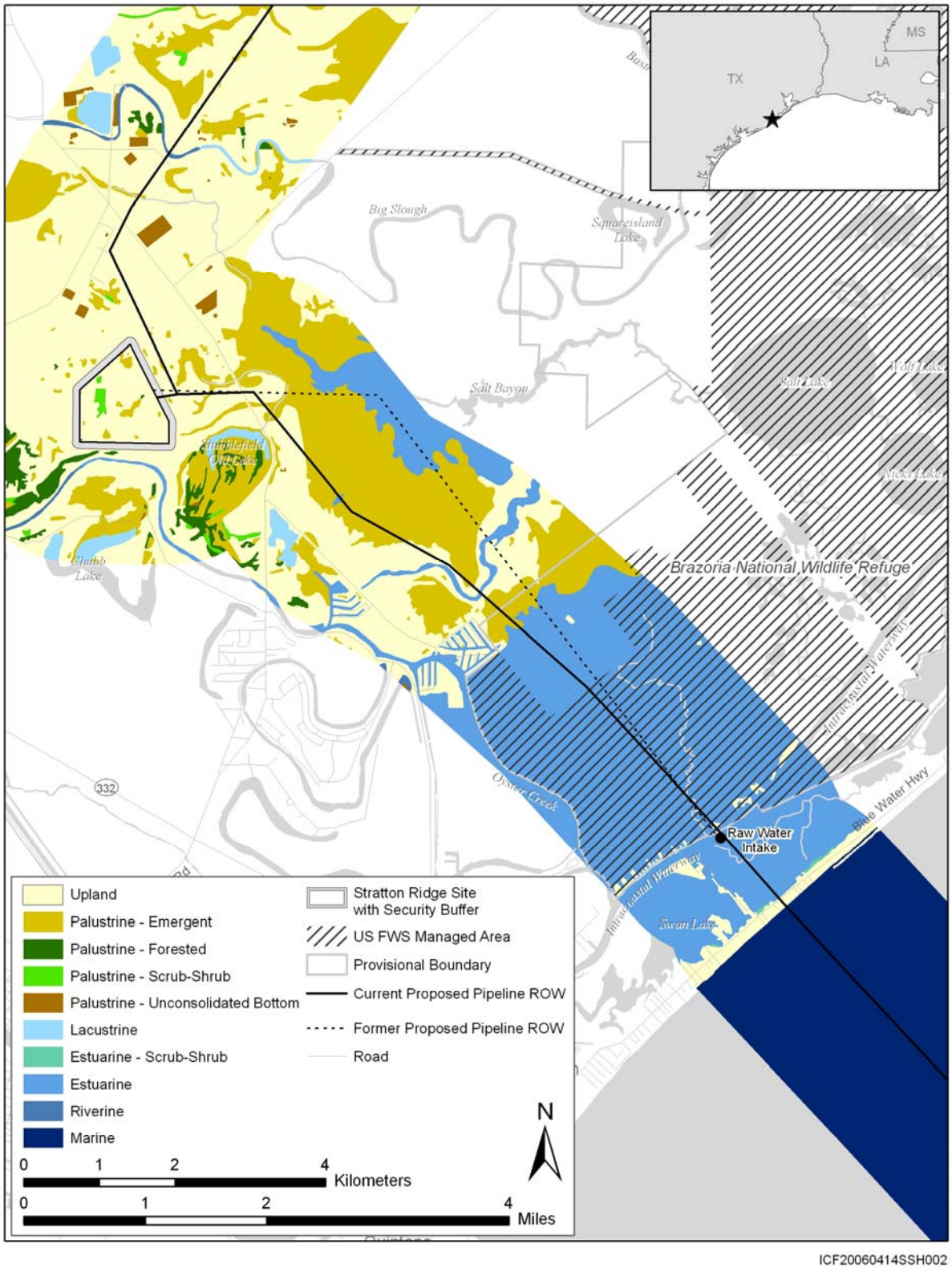
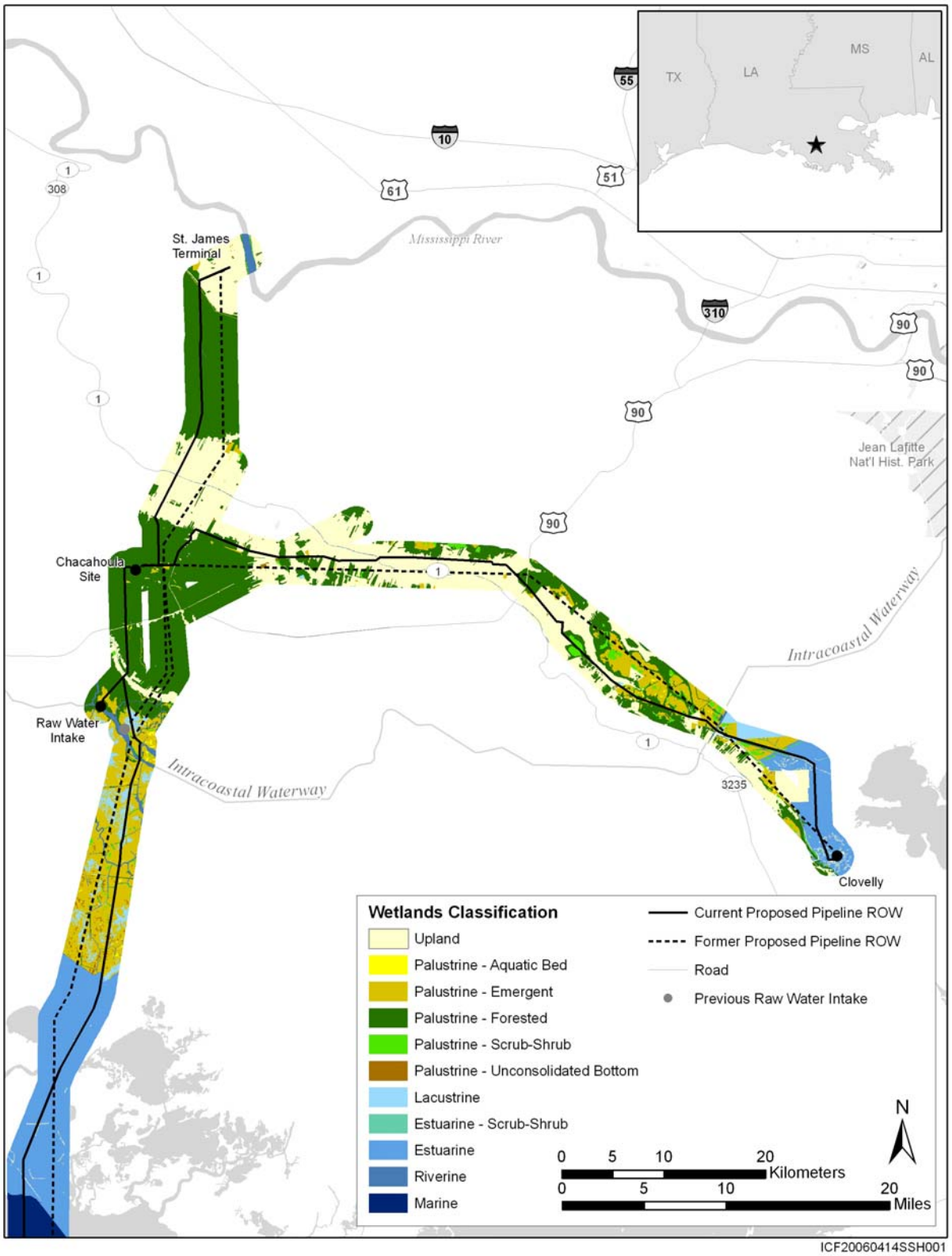


Figure B.7.2-2: Alternative ROWs Considered for the Proposed Chacahoula Site



B.7.4 Impact Avoidance and Minimization

DOE's primary mitigation measure for wetland impacts would be avoidance and minimization. As described in chapter 2 and in the preceding text of this appendix, DOE would locate temporary access roads and staging areas in upland areas or would use temporary floating staging areas, as appropriate. Larger wetlands (about 100 feet [30 meters] or wider) would be directionally drilled wherever practicable. DOE would continue to refine the concept plans for the site storage areas and terminals to avoid placing aboveground structures and fill in wetlands as much as practicable. Where the security buffers around the storage areas or permanent ROW easements extend into wetlands, DOE would preserve emergent wetlands and would allow herbaceous species to re-establish themselves within the forested and scrub-shrub wetlands that would be cleared.

Within the temporary construction easements of the ROWs, DOE would promote the restoration and re-establishment of the existing plant community by stockpiling and reusing the hydric soils (and their diverse seed bank) from the disturbed wetlands. In this way, some wetland functions and values would be preserved and wetlands would be restored more quickly if there was a temporary impact to wetlands or permanent conversion from forested to emergent wetlands. For wetland impacts that cannot be avoided, DOE would implement one or more of the following mitigation measures:

- As described in chapter 2, DOE would install trench plugs (using low-permeability clay placed around the pipe) at intervals to prevent the unintentional draining of water from the wetlands or mixing of fresh-water and marine wetland systems.

- Excess dredged material would be disposed of in consultation and in accordance with permits issued by USACE and the state. Dredge spoils would be used for wetland creation or restoration activities wherever possible.

- Where possible, power line poles would not be placed in wetlands.

- If the wetlands are forested, tree stumps and root mass from all plants would be left intact, except where this would interfere with excavation of the pipeline trench.

- For wetlands that are not inundated or that have shallow standing water, equipment would be supported on timber mats or on prefabricated equipment mats. Spoil from the trench would be stored within the ROW on the nonworking side of the pipeline ROW. Topsoil would be stored separately, where appropriate. Stockpiling of soil would be interrupted at appropriate intervals to prevent change of surface water flow (sheet flow). If the bottom of the pipeline trench would be at a lower elevation than the wetlands, a permanent trench plug of impervious clay would be placed into the trench at the wetland boundaries. If a fresh-water marsh (palustrine emergent wetlands) would likely be exposed to brackish or marine water by connection with these water sources via the pipeline trench, then temporary trench plugs would be used during construction and permanent trench plugs would be installed after the pipe is lowered into the trench. The trench plugs would be installed between the fresh-water marsh (palustrine emergent wetlands) and any adjacent body of water with a higher salinity.

- Excavated wetlands would be backfilled with either the same hydric topsoil removed or a comparable material capable of supporting similar wetlands vegetation. Original wetland elevations would be restored and adequate material would be used so that following settling and compaction of the material, the proper preconstruction elevation would be attained. After backfilling, DOE would

implement erosion protection measures to stabilize and revegetate the site and prevent further wetland degradation.

- DOE would remove all construction-related materials, such as timber mats, rip rap, silt fence, prefabricated equipment mats, and geotextile fabric, upon completing construction. Where the pipeline trench may drain wetlands, DOE would construct trench breakers and/or seal the trench bottom as necessary to maintain the original wetland hydrology. For each wetland area crossed, DOE would install a permanent slope breaker and a trench breaker at the base of the slopes near the boundary between the wetlands and the adjacent upland areas. The trench breaker would be located immediately upslope of the slope breaker. DOE would not use fertilizer, lime, or mulch along the ROW within wetlands, nor immediately upslope from wetlands. Reseeding efforts would use a seed mix of native wetland species. For ongoing ROW maintenance, DOE would limit vegetation in a narrow corridor over the pipeline and to either side to facilitate periodic pipeline corrosion and leak surveys. DOE would not use herbicides or pesticides in or within 100 feet (30 meters) of wetlands. DOE would conduct a postconstruction monitoring program of the disturbed wetlands within the ROWs to ensure that the hydrology and wetland plant community is re-establishing. The monitoring would follow approved procedures contained in the USACE Section 404 permit. If the monitoring showed that wetland plants and hydrology were not successfully re-established, DOE would implement corrective action.

- Other potential mitigation measures or best management practices that DOE would consider during permit application and design include the following:
  - Other than the construction ROW, only use pre-existing roads within wetlands. Do not construct new access roads through wetlands.
  - Assemble the pipeline in an upland area and use the push technique to place the pipe in the trench where water and other site conditions allow.
  - Minimize the duration of construction-related disturbance within wetlands.
  - Schedule the construction-related disturbance during the dry season.
  - Limit construction equipment operating in wetland areas to equipment needed to clear the ROW, dig the trench, fabricate and install the pipeline, backfill the trench, and restore the ROW.
  - Cut vegetation off at ground level, leaving existing root systems in place, except within the path of the pipe trench.
  - Do not pile woody vegetation within wetlands.
  - Do not store hazardous materials, chemicals, fuels, or lubrication oils, or perform concrete coating activities in wetlands or within 30 yards (9 meters) of any wetland boundary.
  - Attempt to refuel all construction equipment in an upland area at least 30 yards (9 meters) outside a wetland boundary. If construction equipment must be refueled within wetlands, follow fueling procedures outlined in project-specific spill prevention or contingency plans.
  - Do not use rock, soil imported from outside the wetlands, tree stumps, or brush rip rap to stabilize the ROW.
  - If standing water or saturated soils are present, use low-ground-weight construction equipment or operate normal equipment on timber mats or prefabricated equipment mats.
  - Do not cut trees outside the construction ROW to obtain timber for equipment mats.
  - Do not discharge hydrostatic test water into wetlands.

B.7.5 Wetland Compensation

DOE would compensate for unavoidable wetland impacts by creating, restoring, and/or preserving wetlands, paying an in-lieu of fee, or buying credits from an approved mitigation bank. DOE would develop and submit the compensation plan as part of the Section 404/401 permit process. A conceptual plan is presented in Appendix O. Wetland creation would typically involve alteration of an upland (generally though excavation) to create the proper hydrology for wetlands and planting of wetland species at the site. Restoration typically involves the modification of a previously disturbed wetland that may no longer function as a wetland because it has been ditched or drained. The wetland hydrology is restored and wetland species are planted at the site. Wetland preservation typically involves the purchase and preservation of existing wetlands in perpetuity.

Compensation credits and a compensation ratio would be established based on the functions and values of the affected wetland, the acreage of wetland impacts, and the type of compensation offered. Because the compensation ratio would be based on the functions and values of the wetlands and the type of mitigation proposed, one compensation credit does not necessarily equate to one acre of wetlands. Thus, the type of mitigation is important in determining how many acres would need to be preserved, created, or restored to equal one compensation credit. For example, the compensation required for preservation of wetlands would be much higher than that for wetland restoration to reach one compensation credit.

The type of wetland affected and its rarity would be important in determining the compensation ratio. The filling of palustrine forested wetlands would cause a complete loss of functions and values of a relatively rare and ecologically important resource. This type of impact would require the highest compensation ratio, such as 5:1 or 7:1. On the other hand, impacts to emergent wetlands within the permanent easement for pipeline corridors would cause only a temporary loss of the wetland functions and values and would probably require compensation at the lowest ratio.

Representative mitigation ratios for unavoidable impacts to wetlands are presented in table B.7-2 Wetland Mitigation Ratios. If required by the USACE, the compensation ratios would be determined through a formal assessment of wetland functions and values, which would be completed during the permit application stage. The Vicksburg, Mobile, and New Orleans Districts of USACE indicated that they would probably require DOE to use the USACE Charleston District methodology for determining wetland compensation credits (USACE Charleston District 2002).

Table B.7-2: Approximate Wetland Mitigation Ratios

State	Approximate Compensation Requirements		
	High Wetland Functions and Values	Moderate Wetland Functions and Values	Low Wetland Functions and Values
Louisiana	5:1	3:1	2 to 1:1
Mississippi	5:1	3:1	2 to 1:1
Texas	7:1	5:1	3 to 1:1

Notes:

These are estimates of the compensation ratios that may be required by regulatory agencies. The actual requirements would depend on several factors, including existing wetland conditions and their functions and values. If required for the selected alternative, a formal assessment of affected wetland functions and values would be completed to determine appropriate compensation ratios.

Source: U.S. Army Corps of Engineers, New Orleans, Vicksburg, Galveston, and Mobile Districts

B.8 SUMMARY

Table B.8-1 summarizes and compares the potential floodplain and wetland impacts associated with each proposed new and expansion site; table B.8-2 summarizes and compares the potential floodplain and wetland impacts by alternative.

Table B.8-1: Summary of Potential Floodplain and Wetland Impacts for Each Proposed New and Expansion Site

Storage Site	Storage Site and Associated Facilities Floodplain Impacts (acres)		ROW Floodplain Impacts (miles)		Storage Site, Associated Facilities, and ROW Wetland Impacts (acres)
	100-year	500-year	100-year	500-year	
Bruinsburg	272	22	30	4	480
Chacahoula	150	0	91	<1	2,274
Richton	49	0	27	3	1,328
Stratton Ridge	139	186	41	8	613
Bayou Choctaw	24	0	<1	0	34
Big Hill	11	27	18	3	189
West Hackberry	0	0	0	0	5

1 acre = 0.405 hectares; 1 mile = 1.61 kilometers

Table B.8-2: Summary of Potential Floodplain and Wetland Impacts by Alternative with Three Expansion Sites

Alternative	Storage Site and Associated Facilities Floodplain Impacts (acres)		ROW Floodplain Impacts (miles)		Storage Site, Associated Facilities, and ROW Wetland Impacts (acres)
	100-year	500-year	100-year	500-year	
Bruinsburg	312	49	48	7	708
Chacahoula	185	27	109	3	2,502
Richton	84	27	45	6	1,556
Stratton Ridge	174	213	59	11	841
No-action	0	0	0	0	0

1 acre = 0.405 hectares; 1 mile = 1.61 kilometers

All of the alternatives presented in table B.8-2, with the exception of no-action, could be developed with the expansion of two sites (Big Hill and Bayou Choctaw) or the expansion of three sites (Big Hill, Bayou Choctaw, and West Hackberry). With only two expansion sites developed, the total acres of wetlands impacted under each alternative would be reduced by five acres (2 hectares) because West Hackberry would not be expanded.

A substantial portion of the proposed storage sites and associated infrastructure would be located in the 100-year and 500-year floodplain. The amount of onsite construction would vary by site, with the greatest amount of floodplain disturbance at Stratton Ridge and Bruinsburg. Richton would have no floodplain disturbance due to onsite construction activities. Offsite pipeline construction would affect floodplains only during construction, and areas would be brought back to grade following construction. Pipeline construction associated with the Chacahoula project crosses the largest area of floodplains.

Because most of the infrastructure on the affected floodplains would be built below ground, the impacts would be lessened. The main impacts on flood storage and flooding attenuation would result from constructing some aboveground structures and placing fill at the new cavern facilities at Chacahoula, Bayou Choctaw, Stratton Ridge, and Big Hill. These fill areas, however, would be insignificant in comparison the total areas of the floodplains in which where they would be located. The Bruinsburg, Chacahoula, Richton, Stratton Ridge, and Big Hill sites are located in floodplains that extend over hundreds of acres (hectares) in coastal basins. The Bayou Choctaw site also is located in an extensive floodplain area. Thus, fill areas developed as part of the proposed action at these sites would have insignificant impact on the flood storage capacity or hydraulic function of the related floodplains.

DOE would comply fully with applicable local and state guidelines, regulations, and permit requirements regarding floodplain construction. In general, DOE would be required to evaluate the impact of placing fill or structures in the 100-year floodplain and to demonstrate that the proposed fill/structures would not increase the base flood elevation. Based on these factors, DOE expects that overall impacts to floodplain hydraulic function, and therefore to lives and property, would not be significant.

As shown in table B.8-2, the relative order of potential impacts on wetlands from least to most by alternative would be as follows:

- Bruinsburg,
- Stratton Ridge alternative,
- Richton alternative, and
- Chacahoula alternative.

Relatively rare and ecologically important bald cypress forested wetlands would be filled or converted at the Bruinsburg alternative. The potential impacts on wetlands under the Stratton Ridge alternative would involve filling and converting relatively rare and ecologically important bottomland hardwood forest at the Stratton Ridge site.

The Richton alternative would affect almost double the amount of wetland (over 600 acres [243 hectares]), in terms of permanent impacts, compared to the Bruinsburg alternative. The majority of the potential wetland impacts associated with the Richton alternative result from the long ROWs (over 200 miles [322 kilometers]). The Chacahoula alternative has the most potential impacts on wetlands (over 1,000 acres [405 hectares]). Relatively rare and ecologically important bald cypress forested wetlands would be filled and converted at Chacahoula, and the majority of each ROW would pass through the extensive wetlands located throughout southern Louisiana.

B.9 REFERENCES

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