

Chapter 4. Cumulative Impacts

4.1 INTRODUCTION

This section of the EIS evaluates the potential cumulative impacts associated with the potential development of new or expanded SPR sites in combination with the potential impacts associated with other relevant activities that have occurred, are occurring, or may occur in the vicinity of the proposed new or expanded storage sites and their infrastructure. The primary goal of the cumulative impact analysis is to determine the magnitude and significance of the environmental consequences of the proposed action in the context of the cumulative effects of other past, present, and future actions. Cumulative impact analysis is required by the CEQ regulations. The definition of cumulative impacts is:

the impact on the environment which results from the incremental impact of the action when added to other past, present, or reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

Impacts subject to the cumulative impacts analysis were identified by determining the potential environmental impacts associated with the proposed expansion of SPR facilities, establishing the geographic scope of the potential impacts, establishing the time frame of the analysis, and identifying other past, present, or future actions that have affected, or could affect, the resources of concern.

The cumulative impact assessment identifies activities in the region that have the potential interaction in time or space with the effects from the proposed SPR program expansion. The geographic scope and time frame of the cumulative impacts analysis varies depending on the environmental resource category under consideration. DOE analyzed the cumulative impacts for those situations where planned or reasonably foreseeable projects overlapped with the proposed SPR expansion in terms of geographic area and time frame. Cumulative impacts can stem from both construction and operations impacts. This analysis differentiates, where appropriate, between cumulative impacts associated with short-term, but overlapping, construction impacts and longer-term overlapping impacts associated with operations. The analysis considers all potential activities including Federal, other government, and private actions.

Because the potential sites extend over a wide geographic area within three states, the cumulative analysis considers both site-specific activities that could have cumulative impacts with the SPR and general categories of activities relevant to the Gulf Coast region as a whole. Impacts of activities within the Gulf Coast region are discussed on the ecoregion province scale because these ecologic units describe the interaction of various natural resources and environmental conditions and characteristics. Ecoregion provinces are characterized by climatic subzones and similar soil orders, factors that lead to similar natural vegetation and the establishment of similar natural resources and environmental conditions and characteristics within each zone.

4.2 METHODOLOGY

To evaluate the potential for cumulative impacts, public and private activities in the Gulf Coast were identified and reviewed to determine if the impacts associated with these actions could coincide in time and space with the impacts from the new or expanded SPR sites. The search for potential projects entailed researching projects from four sources, as shown in table 4.2-1.

Table 4.2-1: Sources for Projects for Potential Inclusion in Cumulative Impacts Analysis

Source	Expected Type of Project
USACE: New Orleans, Vicksburg, Galveston, and Mobile District Web sites (USACE 2005b, 2006a, 2006b, 2006c)	Projects affecting waterways or wetlands, including water-related projects managed by USACE
Louisiana Coastal Wetlands Conservation and Restoration Task Force Web site (www.lacoast.gov) (CWPPRA 2006)	Projects funded by the Coastal Wetlands Planning, Protection and Restoration Act aimed at wetlands restoration along the coast of Louisiana; such projects might be carried out by USACE, EPA, NOAA Fisheries, NRCS, or USFWS
State Transportation Improvement Programs for Texas, Louisiana, and Mississippi (LADOTO 2006; MDOT 2004; TxDOT 2005)	Large transportation projects
City and county governments	Private land development projects; local government projects
Federal Energy Regulatory Commission (FERC)	Liquefied natural gas (LNG) developments, pipelines, facility alterations

For each source, projects were sought for inclusion in initial lists for each proposed SPR site and associated facilities. The lists were then narrowed down through multiple passes to eliminate projects based on a variety of factors, including proximity to SPR facilities, size of project, type of project, and date of expected completion. The methods used for developing the final lists from each of these sources are discussed below.

4.2.1 U.S. Army Corps of Engineers

In addition to planning, designing, building, and operating aspects of civil works projects, the USACE is responsible for regulating the use of water resources by private organizations and government agencies. USACE District Web sites were searched for USACE-sponsored operations and both USACE and non-USACE permit applications to generate a list of projects that could potentially contribute to the cumulative impacts of SPR construction and operations. After initial county- and parish-level lists were compiled from the Web sites, multiple screening stages narrowed the lists. The screening stages included discussions with district staff regarding specific projects.

As shown in table 4.2.1-1 below, SPR proposed project sites and associated facilities are located in four USACE districts: Galveston, New Orleans, Vicksburg, and Mobile.

Table 4.2.1-1: USACE Districts and SPR Sites

District	SPR Sites
Galveston	Stratton Ridge, Big Hill
New Orleans	West Hackberry, Bayou Choctaw, Chacahoula
Vicksburg	Bruinsburg
Mobile	Richton

For each of these districts, lists were compiled for all ongoing and foreseeable projects, including projects in the construction and operation phases, as well as projects pending approval of regulatory permits. DOE then singled out projects occurring within the counties or parishes of interest for each potential SPR site. A county or parish was included in the assessment if it contained any planned SPR infrastructure or pipeline ROWs. Although differences in district Web sites forced a variety of search techniques, the process generally relied on public notice documents, pending permit application lists, and specific project

Web sites in order to populate the lists. In some cases, Web sites had not been updated recently and may have been missing projects started within the last year and recently filed permit applications.

Candidate projects for the four districts were collected from public notices of pending permit applications and other information contained in the district Web sites, sorted by county. The Galveston District's pending applications list was current as of March 2004, and its current public notice list was current as of February 2006. The New Orleans and Vicksburg Districts also provided a monthly backlog of completed projects, but gave little information regarding scale or location. A search of these lists was made dating back to January of 2004. The majority of these operations were maintenance dredging, filling, and surveying. The completed projects were listed, but not enough information was available to map the projects or conduct cumulative impact assessments. This combination of searches produced a county- and parish-wide list of projects.

DOE used several criteria to narrow the lists further. Projects that were significantly out of range of SPR operations were not considered for cumulative impact analysis, unless they influenced an entire watershed or affected large areas. Due to the scope of their effects, several of the hurricane and flood protection projects, as well as the Louisiana Coastal Area Ecosystem Restoration Project, were included for cumulative impact assessment with multiple proposed SPR sites. Many of the permits issued to individuals, as opposed to government agencies or corporations, were intended for small projects and not included on the final lists. For the same reason, permit applications for projects influencing less than 2 acres (0.8 hectares) were not considered. In addition, the process focused on permits for specific construction projects. General permits and regulatory permits did not provide precise locations and were omitted from the final lists. Finally, projects whose description area was very general or whose location could not be determined (e.g., Gulf of Mexico, ICW) were not retained. These criteria were used to create the final project lists.

Table 4.2.1-2: USACE Project Results by Screening Stage

SPR Site and Associated Facilities	Number of Projects Resulting from County/Parish Level Screen	Number of Projects Resulting from Intermediate Stage Screen	Number of USACE Projects on Shortlist
Bruinsburg	8	10	13
Chacahoula	37	7	7
Richton	6	4	2
Stratton Ridge	251	200+	122
Bayou Choctaw	5	5	5
Big Hill	29	26	13
West Hackberry	9	5	5
Totals	326	254+	167

4.2.2 Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) Projects in Louisiana

Congress passed the CWPPRA in 1990, designating approximately \$50 million per year for wetlands restoration work in Louisiana. Projects are planned by a cooperative commission and carried out by a number of different agencies, including USACE, EPA, NOAA Fisheries, NRCS, and USFWS. The Web site for Louisiana Coastal Wetlands Planning, Protection and Restoration Act work (www.lacoast.gov) lists past, ongoing, and future projects taking place within Louisiana coastal wetlands (CWPPRA 2006). SPR sites with associated facilities in these areas include West Hackberry, and Chacahoula.

Using the Coastal Wetlands Planning, Protection and Restoration Act Louisiana Web site, a list of projects occurring in the same basin as SPR facilities was developed. This list was then narrowed by excluding projects already completed and by locating projects on maps to determine proximity to proposed SPR facilities. Projects more than 10 miles (16 kilometers) from proposed SPR facilities were excluded from the final lists. Results from the screening process are shown in table 4.2.2-1 below.

Table 4.2.2-1: Coastal Wetlands Planning, Protection and Restoration Act Screening

SPR Site and Associated Facilities	Number of Projects Resulting from Basin Level Screen	Number of Projects Resulting from Intermediate Stage Screen	Number of Projects on Shortlist
Chacahoula	50	27	9
West Hackberry	18	4	2
Totals	68	31	11

4.2.3 State Transportation Improvement Programs

State departments of transportation are responsible for developing lists of projects that will be funded by local, state, and federal sources on a three-year basis. These documents are called State Transportation Improvement Programs and include lists of all projects in the state that are expected to receive funding for the given improvement program’s period. Table 4.1.3-1 below shows the improvement program documents reviewed for projects and the relevant SPR site.

Table 4.2.3-1: State Transportation Improvement Programs and SPR Sites

State Transportation Improvement Programs	SPR Sites and Associated Infrastructure
Louisiana, 2005–2007	Bruinsburg; Chacahoula; Bayou Choctaw; West Hackberry
Mississippi, 2005–2007	Bruinsburg; Richton
Texas, 2006–2008	Stratton Ridge; Big Hill

The program documentation provide limited information about projects, including a project’s description, location (generally a road name or route number and the project termini), cost, and, sometimes other information such as expected completion date, sponsor, and phase (ROW, engineering, or construction).

The above STIPs were reviewed and initial lists of projects that were occurring in the counties and parishes where SPR facilities are being proposed were compiled. Small projects were omitted (generally those under \$3 million), as well as projects that consisted of re-constructing existing facilities. The process instead focused on new construction, such as new alignments, re-alignments, or widenings. Each project was then located on maps and compared with proposed SPR facility locations. Based on this more specific locating, several projects were eliminated from consideration, producing the shortlist. Results from the screening process are shown in table 4.2.3-2 below.

Table 4.2.3-2: Transportation Project Results by Screening Stage

SPR Site and Associated Facilities	Number of Projects Resulting from County/Parish Level Screen	Number of Projects Resulting from Intermediate Stage Screen	Number of Projects on Shortlist
Bruinsburg	30	8	8
Chacahoula	6	2	0
Richton	10	3	3
Stratton Ridge	35	5	3
Bayou Choctaw	0	0	0
Big Hill	6	4	3
West Hackberry	1	1	0
Totals	88	23	17

4.2.4 City and County Governments

Staff at city and county governments where SPR sites are proposed were contacted to inquire about large potential land development or local government projects known to be proposed in the vicinity of SPR facilities (Falgout 2006; Floyd Batiste 2006; Johnston 2006). The process focused on the vicinity of the sites themselves, rather than the associated pipeline facilities.

4.2.5 Federal Energy Regulatory Commission

ID Dockets at FERC were researched to identify new LNG project developments in the region and in particular those proposed within a 50-mile (62-kilometer) spatial region of influence of the proposed new SPR storage sites in Bruinsburg, MS; Chacahoula, LA; Richton, MS; and Stratton Ridge, TX; and the expansion sites at Bayou Choctaw, LA; Big Hill, TX; and West Hackberry, LA. The Gulf Coast region is well suited for LNG development because of underlying attributes that include: a Gulf-based point of entry for inbound LNG shipments, a large market for natural gas users, and considerable existing infrastructure that supports LNG regasification, storage, and pipeline distribution. Overall estimates have been made of up to \$1 billion in positive economic impact from future regional development of low-cost LNG and the creation of approximately 12,000 jobs.

LNG-related projects that lay within the region of influence of proposed and existing sites and supporting ancillary facilities that were considered for cumulative impact analysis were identified as:

- *West Hackberry, LA:* A new LNG terminal, LNG terminal expansion, and new pipelines to be located at Hackberry, Cameron, and Calcasieu Parishes, LA; underground storage at Starks salt dome in Calcasieu Parish, LA; Sabine Pass Pipeline in Cameron Parish, LA; and two natural gas storage caverns with associated distribution pipelines in Calcasieu Parish, LA.
- *Ancillary Pascagoula Tank Farm (Richton, MS):* Proposed LNG import marine terminal and related facilities in Pascagoula, MS.

Other existing and proposed LNG terminals and pipeline construction in the Gulf Coast region include: approved expansion at Lake Charles, LA; LNG terminals in the Gulf of Mexico; proposed terminals at Freeport, TX, Sabine, LA, and Sabine, TX; and planned terminal and expansions at Lake Charles, LA. LNG-related activities that were located outside the region of influence were not considered in the cumulative impact analyses.

4.2.6 Hurricane Recovery

Hurricane Katrina was one of the most destructive storms to ever hit the United States, causing extensive damage to the coastal regions of Louisiana, Mississippi, and Alabama. Katrina was a Category 4 hurricane when it made landfall on August 29, 2005 with maximum sustained winds of 143 miles per hour (230 kilometers per hour) and gusts to 165 miles per hour (266 kilometers per hour). Hurricane Rita made landfall as a Category 3 hurricane on the Louisiana-Texas border, about a month later on September 24, 2005, with maximum sustained winds of 120 miles per hour (193 kilometers per hour). A combination of high winds and water surges made these two storms the most costly natural disasters in the modern history of the United States. By far the most devastated area impacted by these two storms was the New Orleans MSA. Estimates of recovery and rebuilding range upwards of \$200 billion over the next decade. Rebuilding and recovery is well underway in 2006 in all of the major elements of the regional economy, including housing, industry, education, tourism, oil and gas production, construction, and the undertaking of these efforts will ripple throughout all major job sectors. Recovery on this scale also will affect regional economic stimulus and can bring about positive benefits.

These hurricanes impacted Lafourche Parish, host to the proposed Chacahoula site; and the existing Bayou Choctaw, Big Hill, and West Hackberry expansion sites. Recovery efforts have been undertaken in these areas. The Bruinsburg, Richton, and Stratton Ridge proposed sites were not substantially impacted. DOE has found that the cumulative effects of the proposed action at proposed new sites or existing expansion sites were not discernable against the scale of regional recovery efforts and infrastructure rebuilding (much of which is focused on the levee systems and housing in the New Orleans MSA). Hence analysis is not detailed below for individual sites.

4.2.7 Gulf of Mexico Coastal Wetlands and Floodplains

The coastal areas along the Gulf of Mexico have lost more than 1.3 million acres of coastal wetlands associated with agricultural activities, land development, natural land subsidence, and erosive forces. Louisiana is experiencing the nation's highest rate of coastal wetland loss and represents about 80 percent of the wetland loss in the entire continental United States. Louisiana coastal areas have lost over 900,000 acres (364,217 hectares) of wetlands and associated floodplains since the 1930s. As recently as the 1970s, the loss rate for Louisiana coastal wetlands was as high as 25,600 acres (10,360 hectares) per year. The current rate of wetland loss is about 16,000 acres (6,475 hectares) per year. Studies estimate that Louisiana will experience a 320,000 acre (129,500 hectares) net loss of wetlands by the year 2050 (Louisiana Coast 2006).

Mississippi wetlands and floodplains have been under significant development pressure in recent decades. By the 1980s Mississippi had lost about 60 percent of its wetlands and floodplains due to agricultural activities and more recently, residential and commercial coastal development (MDEQ 2002).

The coastal wetlands of Texas also have come under similar pressures as Louisiana and Mississippi. The majority of the estuarine wetland loss in Texas has occurred in the Galveston Bay system according to the Galveston Bay Estuary Program report. The report attributes the accelerated loss of wetlands around Galveston Bay relative to the rest of Texas coast to subsidence induced by withdrawal of groundwater, oil, and gas. About 52 percent of the coastal freshwater wetlands have been lost due to agricultural activities and residential and commercial development (GBEP 1994).

The loss of Gulf Coast wetlands and floodplains and their associated functions/values increased the damage caused in the region by the 2005 hurricane season. Because of the importance of the wetlands and floodplains in the region and the potential direct effects of the proposed SPR expansion on those resources, the cumulative impact section concentrates on the biology and water issues of the region. DOE

evaluated the potential direct and cumulative impacts to land use, environmental risks and health, air quality, socioeconomics, noise, and environmental justice for the various alternatives and concluded that there were no overlapping impacts of any consequence. The following sections describe the potential cumulative impacts associated with the proposed development of new and expanded SPR sites in combination with the potential impacts associated with other relevant activities that have occurred, are occurring, or may occur in the vicinity of the proposed new and expanded storage sites and their infrastructure. The potential cumulative impacts for each SPR new site and expansion site are discussed below. DOE evaluated and described the impact of each new SPR site and each expansion site separately because they are located within different ecoregions and watersheds. The selected alternative would actually include one new SPR site plus two or three expansion sites.

As presented above, table 4.2.7-1 presents a summary of the cumulative impacts by alternative for biological and water resources. The following sections discuss the cumulative impacts associated with each proposed new and expansion site.

Table 4.2.7-1: Summary of Cumulative Impacts by Alternative

Alternative*	Bruinsburg Alternative	Chacahoula Alternative	Richton Alternative	Stratton Ridge Alternative
Biological Resources	Cumulatively, up to 708 acres (286 hectares) of wetlands would be affected No cumulative impact on EFH Potential cumulative impact on the pallid sturgeon and fat pocketbook mussel**	Cumulatively, up to 2,502 acres (1013 hectares) of wetlands would be affected No cumulative impact on EFH Potential cumulative impact on the bald eagle and brown pelican**	Cumulatively, up to 1,157 acres (626 hectares) of wetlands would be affected No cumulative impact on EFH Potential cumulative adverse impacts on the gulf sturgeon, yellow blotched map turtle, and pearl darter**	Cumulatively, up to 841 acres (340 hectares) of wetlands would be affected No cumulative impact on EFH No cumulative impacts on threatened and endangered species**
Water Resources	No cumulative adverse impacts on water resources and floodplains	No cumulative adverse impact on water resources	Potential cumulative adverse impact on water resources during cavern drawdown	No cumulative adverse impacts on water resources

Notes:

*Each alternative includes the expansion of the three potential expansion sites.

**DOE would initiate formal Section 7 Consultation with the U.S. Fish and Wildlife Service and NOAA Fisheries if an alternative may adversely affect a listed species or designated critical habitat. DOE would prepare a Biological Assessment and implement conditions of the Biological Opinion, which would ensure that the cumulative impact of an alternative would not interfere with the continued viability of the species or adversely affect designated critical habitat.

4.3 BRUINSBURG STORAGE SITE AND ASSOCIATED INFRASTRUCTURE

4.3.1 Reasonably Foreseeable Activities On or Near the Bruinsburg Storage Site

In the area around the Bruinsburg site, agriculture and timber production have traditionally been and are still important economic and land use drivers. In addition, the hardwood forests in the area also provide hunting and fishing opportunities. The Grand Gulf nuclear power plant is located about 15 miles (24 kilometers) north of the SPR site. The region has extensive historic resources associated with the Civil War and the Natchez Trace Parkway.

There are no known proposed future uses of the proposed SPR site for other purposes, and the existing site-specific and adjacent land uses would likely continue into the future if the SPR site at Bruinsburg were not developed. The Grand Gulf nuclear power plant is planning for a second nuclear unit at the site, but the expansion would be built within the confines of the existing site.

No overlapping impacts exist between the storage site and the expansion of the nuclear power plant that the EIS could assess at this time. The cumulative potential impacts of the RWI and the nuclear power plant’s water withdrawal are discussed below.

4.3.2 Reasonably Foreseeable Activities Near the Associated Infrastructure for Bruinsburg

The following activities are expected to occur within 5 miles (8 kilometers) of the proposed ROWs for the crude oil and brine pipelines associated with the Bruinsburg site (Johnston 2006; LADOT 2006; MDOT 2004; USACE 2006c).

Known Activity	Description
Grand Gulf Nuclear Power Plant expansion, 6 miles from raw water pipeline	The Grand Gulf nuclear station lies on a 2,100-acre site near Vicksburg. The site is wooded and contains two lakes. The plant has a 520-foot cooling tower. Plans have been submitted for a simplified boiling water reactor.
Lakes Casino Complex, northern end of the northwest branch of the crude oil pipeline near the Mississippi River	Construction of Lakes Vicksburg Casino Resort, including clearing and filling wetlands and other waters, concrete pile foundations, asphalt roadways, and parking areas for a casino, hotel, access road, parking garage and overflow parking area on 160 acres of land.
Groom Road widening, East Baton Rouge Parish, LA, 2 miles from crude pipeline	Removal of two-lane asphalt road and replacement with two-lane concrete road with turn lanes and sidewalks. No details available regarding potential wetlands effects. Does not appear to cross any perennial water bodies.
US 61 paving, Jefferson County, MS, beginning 2 miles from crude oil pipeline	Paving of US 61. Improvements are slated for the interchange at US 61 and Natchez Trace Parkway. No details available regarding potential wetlands effects.
LA 19, E. Baton Rouge Parish, 1 mile from crude oil pipeline	Widening of LA 19 from Lavey Lane to Twin Oak. No details available regarding potential wetlands effects. Does not appear to cross any perennial water bodies.

Notes:

1 foot = 0.30 meter; 1 mile = 1.609 kilometers; 1 acre = 0.404 hectare

4.3.3 Cumulative Impacts Discussion

4.3.3.1 Biology

DOE evaluated the potential cumulative impacts to plant communities, wetlands, wildlife and fish communities, including EFH and threatened and endangered species from the above-listed projects. The Lakes Casino Complex project was the only other project for which information on biological impacts was available.

The Bruinsburg alternative would require over 150 miles (245 kilometers) of ROW for pipeline and powerlines. The Lakes Vicksburg Casino Resort would be constructed on a 160-acre (65-hectare) parcel adjacent to the proposed raw water line near the Mississippi River. The casino parcel consists of about 48 acres (19 hectares) of wetlands and 112 acres (45 hectares) of active pastureland. Based on available information it appears that the construction and operation Bruinsburg alternative and the casino would have no cumulative adverse effects to EFH.

The projects listed in the table have the potential to affect wetland resources, including wetlands and floodplains, located in the Bruinsburg’s ecoregion. The Bruinsburg storage site, associated facilities, and

ROW would affect 480 acres (194 hectares) of wetlands. Information about impacts for other projects in the same watershed was lacking, except for the proposed Lakes Casino Complex project, which would potentially impact 20 acres (8 hectares) of wetlands associated with the casino building and parking facilities.

The Bruinsburg alternative would include either two or three of the SPR expansion sites thereby increasing the cumulative impacts to wetlands and floodplains within the region. The cumulative impacts to wetlands associated with the Bruinsburg alternative and the expansion sites would increase from 703 acres (285 hectares) with two expansion sites and to 708 acres (287 hectares) with three expansion sites. The Bruinsburg alternative and the other projects in the area would have to secure regulatory permits and meet regulatory requirements for any impacts to wetlands and waters of the United States.

The regulatory permits for filling and affecting wetlands would require mitigation or compensation to ensure there is no net loss of wetlands within the project watershed. A combination of wetland and stream restoration, creation, or preservation in the watershed and use of authorized mitigation sites (bank sites/creation sites or in-lieu fees) would be utilized by these projects to mitigate for the impacts. The proposed Bruinsburg storage site would cause the clearing and filling of an ecologically important bald cypress forest. Therefore, DOE has determined that the Bruinsburg alternative and other planned or foreseeable projects would have a potentially adverse impact to wetlands. The adverse impact would be mitigated by compensation for impacts through wetland creation, restoration, preservation or use of a mitigation bank in accordance with the 404/401 permit.

The proposed Bruinsburg project may affect the pallid sturgeon (Federally endangered) and fat pocketbook mussel (Federally endangered). It is possible that the proposed water withdrawal from the Grand Gulf Power Plant may affect these species, but no information is available. If this site is selected for development, DOE would initiate formal Section 7 Consultation with the USFWS and NOAA Fisheries if the proposed Bruinsburg site may adversely affect these species. DOE would prepare a Biological Assessment and implement the conditions of the Biological Opinion. These actions would ensure that any cumulative impact did not adversely affect the species viability or designated critical habitat.

4.3.3.2 Water

DOE evaluated the potential cumulative impacts to water resources that include floodplains, surface water and groundwater in the Bruinsburg watershed. DOE concluded the Grand Gulf nuclear power plant expansion is the only other project that would have measurable effects to surface water and groundwater within the same watershed. Public information about impacts to floodplains and surface waters for the power plant expansion project is currently not available. It appears that the power plant expansion would require additional surface or groundwater for the cooling towers. The power plant withdraws groundwater under the influence of surface water from collector wells under the Mississippi River for a period of 4-5 years. The Bruinsburg alternative would withdraw about 50 mgd raw water directly from the Mississippi River. This represents less than 0.003 percent of the average flow in the river. A significant portion of the raw water used in the power plant cooling process is ultimately discharged back into the Mississippi River. Water would be lost during the cooling process but the percentage of water loss is not available for this EIS. Permits would be required for the Bruinsburg RWI and the power plant withdrawals, which would establish a minimum instream flow that could not be depleted. This would ensure that withdrawal rates would not pose adverse effects to surface water and groundwater resources. The Bruinsburg storage site, associated facilities, and ROW would affect about 273 acres (110 hectares) of 100-year floodplain and about 22 acres (9 hectares) of 500-year floodplain. The proposed Bruinsburg storage site is located in a predominantly undeveloped area that has numerous floodplains associated with the Mississippi River and Bayou Pierre, and their tributaries. No information was available to determine if the power plant would affect floodplains. DOE would comply with floodplain protection requirements

of the local and state government. Therefore, DOE has determined that the Bruinsburg alternative and other planned or foreseeable projects in the region would not have a cumulative adverse impact to water resources or floodplains.

4.4 CHACAHOU LA STORAGE SITE AND ASSOCIATED INFRASTRUCTURE

4.4.1 Chacahou la Storage Site

The salt dome at Chacahou la has historically been the site of extractive operations for production of hydrocarbons, brine, and sulfur. There is also evidence of historical oil and gas exploration and development on the south and northeast sides of the dome. Sulfur production occurred from 1955 to 1962 and 1967 to 1970 along the northeastern part of the dome. The Texas Brine Company operates three brine caverns in the south-central dome area. Infrastructure to support these operations includes roads, power lines, pipeline ROWs, well pads, and flood control levees. Areas have been filled or dredged to support these operations, resulting in alterations to the natural swamp habitat and hydrology. With the exception of the brining operations, there are presently no other activities on the dome. Other local activities include hunting, fishing, and tourism. There are no known proposed future uses of the proposed SPR site for other purposes, and the existing site-specific and adjacent land uses would likely continue into the future if the SPR site at Chacahou la were not developed.

4.4.2 Reasonably Foreseeable Activities Near the Associated Infrastructure for Chacahou la

The following activities are expected to occur within 5 miles (8 kilometers) of the proposed ROWs for the crude oil and brine pipelines associated with the Chacahou la site (Falgout 2006; CWPPRA 2006; USACE 2006b).

Known Activity	Description
Ring levee for Samson Contour, Lafourche Parish, LA, less than 1 mile from crude pipeline	Installation of board road and fill for a ring levee and culvert crossing for a drilling well, with 2 acres of bottomland hardwoods affected
Airport runway expansion, Clovelly, 2 miles from end of crude pipeline	Expansion of runway to 6,500 feet, including minor re-routing of levee. Project involves grading, but no dredging, and no wetlands will be affected
Penchant Basin Natural Resources Plan, Terrebonne Parish, LA, near the brine pipeline	Project may include rock and steel sheet-pile weirs, rock bank stabilization, dredging and marsh creation, and shell plugs, 140,000 acres
Grand Bayou hydrologic restoration, Lafourche Parish, LA, 5 miles from the crude pipeline	Installation of a major water control structure in Bayou Pointe au Chien and water control structures through the existing levee along the west side of the Grand Bayou, 16,000 acres
Little Lake shoreline protection and dedicated dredging near Round Lake, Lafourche Parish, LA, 5 miles from crude pipeline	Project includes 21,000 feet of shoreline protection constructed parallel to existing shoreline, and marsh creation along the Little Lake shoreline, 1,400 acres
Mississippi River reintroduction to Bayou Lafourche, Lafourche Parish, LA, 5 miles from the crude pipeline	Project features include a receiving intake structure at the point of diversion in the Mississippi River, a pump-siphon system, a discharge pond at Donaldsonville, modification of weir structures, bank stabilization, monitoring stations, and dredging of Bayou Lafourche, 85,000 acres
Mississippi River reintroduction to Barataria Basin, St. James Parish, LA, 5 miles from crude pipeline	Restoration strategy includes installing two siphons, gapping spoil banks, culverts, and plantings, 5,000 acres

Known Activity	Description
Delta building diversion at Myrtle Grove, Jefferson and Lafourche Parishes, 5 miles from crude pipeline	Installation of gated box culverts on Mississippi River, 416,000 acres
South Lake De Cade freshwater introduction, Terrebonne Parish, LA, 5 miles from the brine pipeline	Control structures, enlargement of Lapeyrouse Canal for controlled diversion of Atchafalaya River, outfall management structures, and installation of a rock dike along the shoreline, 1,700 acres
ICW bank restoration of critical areas, Terrebonne Parish, 1 mile from the brine pipeline	Restoration and stabilization of deteriorated channel banks with hard shoreline materials
North Lake Mechant landbridge restoration, Terrebonne Parish, LA, 1 mile from the brine pipeline	Creation of marsh using dredged material from Lake Mechant, planting of smooth cordgrass along shoreline, and repair of breeches formed by erosion and oilfield access canals, 7,600 acres

Notes:

1 foot = 0.30 meter; 1 mile = 1.609 kilometers; 1 acre = 0.404 hectare

4.4.3 Cumulative Impacts Discussion

4.4.3.1 Biology

DOE evaluated the potential cumulative impacts to plant communities, wetlands, wildlife and fish communities, including EFH, and threatened and endangered species from the above listed projects. The majority of the projects listed above consist of wetlands and waters of the United States restoration and protection activities initiated by the CWPPRA. The CWPPRA designs and constructs projects to preserve and restore Louisiana's coastal landscape. The USACE administers accounting and tracks project status of all CWPPRA projects. The projects listed above have restored, created, and preserved over 600,000 acres (240,000 hectares) of wetland and waters and associated wildlife habitat.

According to publicly available information, there are two known development projects in the vicinity of the Chacahoula alternative including the Ring Levee project (about 1 mile [1.6 kilometers] from the crude pipeline) and the Clovelly Airport runway extension (about 2 miles [3.2 kilometers] from the crude pipeline). The Ring Levee project would impact about 2 acres (1 hectare) of bottomland hardwood forest, and the Clovelly Airport project would not affect wetlands or waters of the United States but could affect the surrounding natural habitat where the expansion is planned.

The Chacahoula alternative and the Ring Levee project would potentially affect 2,504 acres (1,102 hectares) of wetlands, including clearing and filling of a bald cypress forest for the site storage area. The initial review of both the projects indicates that cumulative adverse effects to EFH would not result from construction and operation of the Chacahoula alternative. The Chacahoula alternative would affect about 1,067 acres (432 hectares) of EFH, most of which would be a temporary impact due to pipeline construction. The Chacahoula storage site area and proposed ROWs may affect the bald eagle, which is a Federally-threatened species that has been proposed for de-listing. The brown pelican, a Federally endangered species may be affected by the ROW for the crude oil pipeline to Clovelly. It is not known if the Ring Levee project may affect these species. DOE would initiate formal Section 7 Consultation if the project may adversely affect those species. DOE would prepare a Biological Assessment and implement any conditions of a Biological Opinion. These actions would ensure that the cumulative impact of the projects did not interfere with the continued viability of the species or adversely affect designated critical habitat.

Public information providing detailed wetland and waters of the U.S. impacts for the projects in the same watershed was not available, except for the proposed Ring Levee project, which would potentially affect

2 acres (1 hectare) of wetlands. Both the Chacahoula alternative and Ring Levee project would have to secure regulatory permits and meet regulatory requirements for impacts to wetlands and waters of the United States. Compensation for the wetland impacts would be required by the Section 404/401 permit before the actions were authorized.

The Chacahoula alternative would include either two or three of the SPR expansion sites, increasing the cumulative impacts to wetlands and floodplains within the region. The cumulative impacts to wetlands associated with the Chacahoula alternative and the expansion sites would increase from 2,497 acres (1,011 hectares) with two expansion sites and to 2,502 acres (1,013 hectares) with three expansion sites.

The regulatory permits for filling wetlands would require compensation or mitigation to ensure there is no net loss of wetlands in the project area watershed. A combination of wetland and stream creation, restoration, or preservation in the watershed and use of authorized mitigation sites (bank sites/creation sites or in-lieu fees) would be utilized by these projects to mitigate for wetland impacts. In addition, the number of wetland restoration and creation projects within the region far outnumbers the anticipated impacts from the proposed projects. DOE has determined that the Chacahoula alternative and other planned or foreseeable projects would have a cumulative adverse impact to wetland resources.

4.4.3.2 Water

DOE evaluated the potential cumulative impacts to water resources, which includes surface water, floodplains, and groundwater in the Chacahoula ecoregion. DOE concluded that the water-related projects within the project area include multiple stream and floodplain restoration projects, which would improve the water quality, and water resources in the ecoregion. Public information about other proposed projects that affect water resources and floodplains for the area are not available. The Chacahoula storage site and associated facilities would affect about 150 acres (61 hectares) of 100-year floodplain and the site is outside the 500-year floodplain. The floodplain in which the Chacahoula site is located extends over thousands of acres, and is part of the Louisiana Western Gulf Coastal Plain Province. DOE has determined that the Chacahoula alternative and the other planned or reasonably foreseeable projects would not have a cumulative adverse impact. The impacts from the Chacahoula site development would be mitigated by securing permits for the proposed filling or discharges to surface water and compensating for the permanent impacts to surface water bodies through the Section 404/401 permit process.

4.5 RICHTON STORAGE SITE AND ASSOCIATED INFRASTRUCTURE

4.5.1 Richton Storage Site

The Richton site currently consists of a slash pine plantation, overgrown fields (former timber stands and crops), forested, emergent, and open water wetlands, and an active chicken farm. The slash pine plantation consists of stands with ages varying between 10 to 20 years. The overgrown fields include portions of former slash pine timber stands and old cropland. Forested and emergent wetlands and open water are associated with a constructed pond located along the central portion of the western boundary. The town of Richton is about 1 mile (1.6 kilometers) from the site, and residential development is scattered near the site. While the area is not a historical oil and gas development area, there is an extensive network of oil and gas pipelines nearby. The Richton storage site and the locations of all its proposed ancillary facilities including Pascagoula were affected significantly by Hurricane Katrina.

While disturbed, the Richton site has no known proposed future uses other than SPR development or continued agricultural use. There has been discussion of use of the site for natural gas storage in past years, but there is no formal proposal for this project at the current time. The town of Richton is in close proximity to the site, and future residential development near the proposed SPR site is possible. The

existing site-specific and adjacent land uses would likely continue into the future if the SPR site at Richton were not developed.

4.5.2 Reasonably Foreseeable Activities Near the Associated Infrastructure for Richton

The following activities are expected to occur within 5 miles (8 kilometers) of the proposed ROWs for the crude oil and brine pipelines associated with the Richton site (MDOT 2004).

Project	Description
SR 48 paving, Amite County, MS, following the crude pipeline for approximately 20 miles east of McComb	Paving of SR 48
US 98 widening, Pike County, MS, parallel and within 2 miles of the crude pipeline	Widening of highway for two additional lanes. No wetlands impact information is known at this time.
Shell marine Terminal	Shell has proposed constructing a LNG import marine terminal outside of the main port of Pascagoula, within 5 miles (8 kilometers) of Singing River Island.
DuPont Pascagoula Plant	The DuPont Pascagoula plant, located adjacent to the Chevron refinery, has proposed a major plant expansion project.

1 mile = 1.609 kilometers

An LNG import marine terminal and related facilities in Pascagoula, MS, has been proposed for construction and operation, and would be located within 5 miles (8 kilometers) of the tank farm that would be located on the former Naval Station on Singing River Island just outside of the main port of Pascagoula. A terminal and RWI on the Gulf of Mexico is proposed on the island. The Naval operations at Pascagoula have ceased and the property has been transferred to the state of Mississippi for future redevelopment. DOE could not identify specific details of the redevelopment at this time, but some cumulative impacts may arise because of DOE's and the State's future use of the property.

4.5.3 Cumulative Impacts Discussion

4.5.3.1 Biology

DOE evaluated the potential cumulative impacts to plant communities, wetlands, wildlife and fish communities, including EFH and threatened and endangered species from the above-listed projects. Two roadway projects parallel the crude oil pipeline for various distances. The SR 48 project follows the crude pipeline for approximately 20 miles (32 kilometers) and consists of repaving the road surface. No direct impacts to wetlands or other biological resources would likely result from the project construction. The US 98 project parallels the crude pipeline and is located about 2 miles (3.2 kilometers) from the Richton ROW. The US 98 roadway project consists of widening the existing road from two lanes to four lanes. No information concerning project impacts to biological resources was available at this date.

The Richton storage site, associated facilities, and ROWs would affect about 1,320 acres (534 hectares) of wetlands. The impacts associated with the above-referenced road improvement projects are unknown, but considering the project descriptions, it appears that impacts to biological resources would likely be minimal because the projects are following existing road ROW. The construction and operation of the Richton alternative would not adversely affect EFH. DOE determined that the Richton project may have a potential adverse effect on the gulf sturgeon (Federally threatened), the yellow blotched map turtle (Federally threatened), and the pearl darter (Federal candidate species) due to the possible impingement and entrainment of these fish by the Leaf River RWI and modification of the flow, water quality, and

habitat in the Leaf River. The brine discharge pipeline would also cross designated critical habitat in the Mississippi Sound for the Gulf sturgeon. The proposed Pascagoula RWI would be located in designated critical habitat for the Gulf sturgeon. The proposed ROW may affect the gopher tortoise (Federally threatened) and the black pine snake (Federal candidate species). The Richton alternative may have a cumulative adverse effect on the Gulf sturgeon, pearl darter, and yellow blotched map turtle. No cumulative adverse effect would occur to other state or federally listed rare, threatened or endangered species or designated critical habitat. The US 98 widening project parallels the crude oil pipeline but does not cross the Leaf River. Therefore, it appears that the roadway project would not affect these special status species located in the project area. The DOE would prepare a Biological Assessment required by the ESA and implement recommendations of the Biological Opinion from the NOAA Fisheries and USFWS if the Richton alternative is selected. DOE would consult with these agencies who would establish the Minimum Instream Flow in the Leaf River, water withdrawal limitations, supplemental water sources, and appropriate intake velocities and mesh size for the RWI on the Leaf River. DOE has already modified the original conceptual plan for the Leaf River RWI to reduce the potential for impingement and entrainment and identified a supplemental water source in the Gulf of Mexico as part of the Richton alternatives to reduce potential adverse effects to the Gulf sturgeon, pearl darter, and yellow blotched map turtle.

The Richton alternative would include either two or three of the SPR expansion sites, increasing the cumulative impacts to wetlands and floodplains in the region. The cumulative impacts to wetlands associated with the Richton alternative and the expansion sites would increase from 1,551 acres (628 hectares) with two expansion sites and to 1,556 acres (630 hectares) with three expansion sites. Both the Richton alternative and US 98 roadway project would have to secure regulatory permits and meet regulatory requirements, including compensation for impacts to wetlands.

The regulatory permits for filling and affecting wetlands would require compensation to ensure there is no net loss of wetlands in the ecoregion. A combination of wetland and stream restoration in the watershed and use of authorized mitigation banks or in-lieu fees would be utilized by these projects to mitigate for impacts. DOE has determined that the Richton alternative and other planned or reasonably foreseeable projects may have a cumulative adverse impact on wetland resources. However, the impacts would be mitigated through the compensation process required by the Section 404/401 permit.

4.5.3.2 Water

DOE evaluated the potential cumulative impacts to water resources, which include surface water and groundwater in the Richton ecoregion. DOE concluded that the US 98 roadway widening project is the only other project in the area that would affect surface waters, mainly as a result of stream crossings. No public information concerning water resources within the US 98 project was available, but it appears that the roadway would cross six streams or drainage ways. The Richton alternative ROWs would cross about 67 water bodies most of which are in different watersheds. Most of these crossings would be considered a temporary impact because either directional drilling would be utilized or stream banks would be restored to preexisting conditions. DOE determined that the impact of the Leaf River RWI would have a potential adverse effect on the aquatic resources in the Leaf River during drawdown activities. The impact could be mitigated by conditions in the Stream Diversion and Use of Public Waters Permit from the Mississippi DEQ and CWA Section 404 permit, which would ensure the protection of the Minimum Instream Flow. DOE has also identified a supplemental water source (Gulf of Mexico) which could provide water during low flow conditions in the Leaf River. "These permit processes would consider utilization of Leaf River water by the upstream paper mill and power plant and downstream facilities (including the Chevron refinery) would also consider unpermitted removal of water for uses such as irrigation and livestock watering, and thereby consider cumulative effects of both upstream and downstream water usage." The Richton storage site and associated facilities would affect about 49 acres (20 hectares) of 100-year floodplain and would be outside the 500-year floodplain. The area surrounding

the proposed storage site and associated infrastructure consists of several floodplains associated with various streams mostly in the Pascagoula or Pearl River drainage basins. DOE has determined that the Richton alternative and the other planned or reasonably foreseeable projects may have a cumulative adverse impact on water resources.

4.6 STRATTON RIDGE STORAGE SITE AND ASSOCIATED INFRASTRUCTURE

4.6.1 Stratton Ridge Storage Site

Although mostly forested, the Stratton Ridge site has been disturbed by human activities. Most of the site is classified as evergreen forested wetlands with pockets of emergent wetlands and deciduous forest. Open fields associated with ROWs are evident in the area. Three areas of permanent and semi-permanent standing water with emergent vegetation are located on the proposed SPR site. Cattle and feral pigs roam throughout the site. The Stratton Ridge site includes pipeline ROWs for several oil, gas, and chemical/petrochemical plants and large power lines that run across the site’s northeast corner. Agriculture is also a prominent local land use.

The proposed Stratton Ridge storage site is the last remaining major undeveloped area on the Stratton Ridge dome and there is some competition for this land for oil/gas development. There has been some discussion of use of the site as a future natural gas storage area. The Freeport LNG project is currently under construction on the Stratton Ridge salt dome, in close proximity to the proposed site of the DOE caverns. The natural gas storage cavern will be a major development in the area and will create cumulative site development changes with the potential SPR use.

4.6.2 Reasonably Foreseeable Activities Near the Associated Infrastructure for Stratton Ridge

The following projects are expected to occur within 5 miles (8 kilometers) of the proposed ROWs for the crude oil and brine pipelines associated with the Stratton Ridge site (TxDOT 2005; USACE 2006a).

Project	Description
SH 146 Expansion, Texas City, TX, crosses the crude pipeline	Construction of two-lane, southbound frontage road, and bridge across Dickinson Bayou along and parallel to existing two-lane portion of SH 146. Project would affect 1.3 acres of wetlands, and includes 10 acres of salt marsh habitat restoration as mitigation
I-45 expansion, Galveston County, TX, 1 mile from crude pipeline	Major upgrades to I-45, including widening to eight lanes and improved access ramps
SH 3 widening, Galveston County, TX, 1 mile from crude pipeline	Widening and re-surfacing of SH 3
Freeport LNG terminal, pipeline, and transfer facility	Construction of new marine terminal on Quintanna Island, a 9.6 mile (15.4 kilometers) pipeline, a transfer facility, and up to two LNG storage caverns.

Notes:

1 mile = 1.609 kilometers; 1 acre = 0.404 hectare

4.6.3 Cumulative Impacts Discussion

4.6.3.1 Biology

DOE evaluated the potential cumulative impacts to plant communities, wetlands, wildlife and fish communities, including EFH, and threatened and endangered species from the above listed projects. The projects located within the Stratton Ridge ecoregion include various roadway improvement projects and multiple USACE permit applications located near Texas City and Freeport. No detailed information of the USACE permits was available for this analysis.

The SH 146 Expansion project, which crosses the crude pipeline, is in Texas City and would affect 1.3 acres (0.5 hectares) of wetlands. Both the I-45 Expansion project and the SH 4 widening project would require upgrades and would potentially impact wetlands and other natural resources. The pipeline construction associated with the Freeport LNG facility would impact (temporary and permanent) 89.7 acres (35.6 hectares) of wetlands, would affect EFH, and would not affect any Federally-listed species. No other information concerning project impacts to natural resources is available to the public to date.

The Stratton Ridge storage site, associated facilities, and ROW would permanently impact about 613 acres (248 hectares) of wetlands and waters of the United States. The impacts associated with the other projects not previously described are unknown but considering the project descriptions it appears that impacts to natural resources would likely be minimal because the projects are following existing road ROWs. The Stratton Ridge alternative would have no adverse effect on EFH; therefore, there would be no cumulative impact. The proposed roadway projects would occur in developed areas of Texas City and follow existing ROWs and therefore it is unlikely they would affect the bald eagle and the Freeport LNG Project has no effect on the bald eagle. DOE determined that the Stratton Ridge storage site and ROWs may affect roosting and foraging habitat for the bald eagle. The bald eagle is Federally threatened, but is proposed for de-listing. DOE would initiate formal Section 7 Consultation with the USFWS if the project may adversely affect the species or designated critical habitat. DOE would prepare a Biological Assessment and implement conditions of a Biological Opinion. These actions would ensure that the cumulative impact of the projects did not interfere with the continued viability of the species or adversely affect designated critical habitat.

The SH 146 Expansion project would impact about 1 acre (0.4 hectares) of wetlands. According to the project permit, 10 acres (4 hectares) of salt marsh habitat restoration is proposed as mitigation. The Freeport LNG Project would impact 89.7 acres of wetland and would provide 111.3 acres (45 hectares) in wetland restoration or mitigation.

The Stratton Ridge alternative would include either two or three of the SPR expansion sites, increasing the cumulative impacts to wetlands and floodplains within the region. The cumulative impacts to wetlands associated with the Stratton Ridge alternative and the expansion sites would increase from 836 acres (338 hectares) with two expansion sites and to 841 acres (340 hectares) with expansion sites. The Stratton Ridge alternative and above-mentioned projects would have to secure regulatory permits and meet regulatory requirements for impacts to wetlands.

The regulatory permits for filling and affecting wetlands would require compensation to ensure there is no net loss of wetlands in the project watershed. A combination of wetland and stream restoration in the project vicinity and use of authorized mitigation sites (bank sites/creation sites or in-lieu fees) would be utilized by these projects to avoid cumulative adverse impacts. DOE has determined that the Stratton Ridge alternative and other planned or foreseeable projects would have a cumulative adverse impact on wetlands. However, the impacts would be mitigated through the wetland compensation plan.

4.6.3.2 Water

DOE evaluated the potential cumulative impacts to water resources that include surface water, floodplains, and groundwater in the Stratton Ridge area. The Stratton Ridge alternative would cross about 20 water bodies (mainly manmade channels through marshlands). The Stratton Ridge storage site and associated facilities would affect about 139 acres (56 hectares) of 100-year floodplain and about 186 acres (75 hectares) of 500-year floodplain. The floodplain surrounding the proposed storage site and associated infrastructure is large, extending over thousands of acres and is part of the San Jacinto-Brazos Coastal Basin. The above-referenced projects would have impacts to water resources in the project vicinity, but the cumulative impacts were not available. However, the projects would require a Section 404/401 permit and compensation for any permanent impacts to waters. Therefore, DOE has determined that the Stratton Ridge alternative and the other planned or reasonably foreseeable projects would not have a cumulative adverse impact on water resources.

4.7 BAYOU CHOCTAW EXPANSION SITE AND ASSOCIATED INFRASTRUCTURE

4.7.1 Bayou Choctaw Expansion Site

Bayou Choctaw is an existing SPR storage site. The extensive diversions and control structures added elsewhere to protect populated areas have made water levels at the site particularly uncertain. However, the existing SPR site is normally dry and protected from spring flooding by the site's flood control levees and pumps. The area surrounding the site is a fresh-water swamp, which includes substantial stands of bottomland hardwoods with interconnecting waterways. The original cypress wetlands at the SPR site was clear-cut long before SPR development began. The region has experienced widespread petroleum extraction activity. The Choctaw field was already a mature producer prior to the advent of SPR oil storage. Most of the wells in the area have been abandoned. Union Texas Petroleum operates seven hydrocarbon storage caverns and two brine caverns on the dome, closely interspersed with the SPR caverns.

As an existing SPR site, expansion of the Bayou Choctaw site would be a logical extension of activity. There are no known competing uses proposed for this site or in the adjacent area that would compete with or add to development of the site as SPR expansion. If the Bayou Choctaw site is not used for SPR expansion purposes, it is likely that the existing site would remain as is for the foreseeable future.

4.7.2 Cumulative Impacts Discussion

4.7.2.1 Biology

DOE evaluated the potential cumulative impacts to plant communities, wetlands, floodplains, wildlife and fish communities, including EFH, and threatened and endangered species from the Bayou Choctaw alternative. No expected activities were found to occur within close proximity to this alternative. However, the Bayou Choctaw expansion site would permanently affect 34 acres (14 hectares) of wetlands associated with the storage site expansion and upgrades.

The regulatory permits for filling and affecting wetlands would require compensation to ensure there is no net loss of wetlands in the project area. A combination of wetland and stream restoration, creation, and preservation within the watershed and use of authorized mitigation sites (bank sites/creation sites or in-lieu fees) would be utilized by these projects to avoid cumulative adverse effects. Therefore, DOE has determined that the cumulative effects to biological resources from the Bayou Choctaw expansion site and other planned or foreseeable projects would not be adverse.

4.7.2.2 Water

DOE evaluated the potential cumulative impacts to water resources, which include surface water and groundwater in the Bayou Choctaw ecoregion. No stream crossings or water body crossings would result from the alternative. Expansion of the Bayou Choctaw storage site and associated facilities would affect about 24 acres (9.7 hectares) of 100-year floodplain and would be outside the 500-year floodplain. The expansion site is located in the Louisiana portion of the Western Gulf Coastal Plain Province and is composed of the Mississippi River floodplain, which is extensive. Therefore, DOE has determined that the Bayou Choctaw expansion site would not have an adverse cumulative impact to water resources.

4.8 BIG HILL EXPANSION SITE AND ASSOCIATED INFRASTRUCTURE

4.8.1 Big Hill Expansion Site

Big Hill is an existing SPR storage site. The area surrounding the SPR expansion proposed site is primarily agricultural with rice and cattle grazing the two main land uses. The site is situated within a small area of industrial-use land with large areas of croplands and pastures to the north and west, and extensive marshlands to the south and southeast that stretch to the coast. Hunting and fishing occurs in the marsh areas. There are two historical liquid petroleum gas storage caverns just north of the proposed expansion area with access roads. Areas where brine has been either disposed of or spilled are void of vegetation. The area has water control structures including levees, and hunting, fishing, and fish and wildlife management activities occur nearby. Hurricane Rita had identifiable effects on the natural environment and infrastructure at the Big Hill site.

As an existing SPR site, expansion of the Big Hill site would be a logical extension of activity. There are no known competing uses proposed for this site or in the adjacent area that would compete with or add to development of the site as SPR expansion. If the Big Hill site is not used for SPR expansion purposes, it is likely that the existing site would remain as is for the foreseeable future.

4.8.2 Reasonably Foreseeable Activities Near the Associated Infrastructure for Big Hill

The following activities are expected to occur within 5 miles (8 kilometers) of the proposed ROWs for the crude oil and brine pipelines associated with the Big Hill site (Floyd Batiste 2006; TxDOT 2005; USACE 2006a).

Project	Description
Flood control improvements, Jefferson County, TX, near the crude pipeline	Flood control improvements to Green Pond Gully and Taylor Bayou, including regional detention and levee construction, channel improvements, and a diversion channel, affecting 700 acres of wetlands
FM 365 widening, Jefferson County, TX, 3 miles from crude pipeline	FM 365 widening, including a grade-separated intersection at W. Port Arthur Road and a grade-separated bridge at the UP railroad tracks
New land development along SR 73, Jefferson County, TX, 1 mile from crude pipeline	Construction of 81 new homes and a commercial development that includes a hotel, covering 50 acres. Impacts to wetlands are unknown

Notes:

1 mile = 1.609 kilometers; 1 acre = 0.404 hectare

4.8.3 Cumulative Impacts Discussion

4.8.3.1 Biology

DOE evaluated the potential cumulative impacts to plant communities, wetlands, floodplains, wildlife and fish communities, including EFH, and threatened and endangered species from the above-listed projects. Projects located within the Big Hill vicinity include a flood control project, the FM 365 Widening project, a residential/commercial development, and multiple USACE permits currently under review.

The flood control improvements to Green Pond Gully and Taylor Bayou are located in Jefferson County near the crude pipeline. The proposed project includes regional detention and levee construction, channel improvements, and a diversion channel, all of which would impact about 700 acres (283 hectares) of wetlands. The FM 365 widening, the new land development project and the multiple USACE permit applications could affect wetlands and other natural resources but details were not available to the public.

The Big Hill expansion site would potentially affect about 189 acres (77 hectares) of wetlands. The impacts associated with the above referenced projects include 700 acres (283 hectares) associated with the flood control improvements in Jefferson County. The remaining impacts are unknown but impacts to wetlands would be mitigated because the projects would be required to undergo the USACE Section 404/401 permitting process. The Big Hill expansion site would have no adverse effects on EFH or any state or federally listed rare, threatened or endangered species or designated critical habitat.

Both the Big Hill alternative and flood control improvement project would have to secure regulatory permits and meet regulatory requirements for impacts to wetlands and waters of the United States. The regulatory permits for filling and affecting wetlands would require compensation to ensure there is no net loss of wetlands in the project area watershed. A combination of wetland and stream restoration, creation, and preservation in the watershed and use of authorized mitigation sites (bank sites/creation sites or in-lieu fees) would be utilized by these projects to avoid cumulative adverse impacts. Therefore, DOE has determined that the Big Hill expansion site and other planned or foreseeable projects would not have a cumulative adverse impact to biological resources.

4.8.3.2 Water

DOE evaluated the potential cumulative impacts to water resources, which include surface and ground water in the Big Hill ecoregion. No information concerning the number of stream crossings that would result from the above referenced projects was available. The Big Hill expansion site ROWs would cross about 11 water bodies including open water, marsh, and the ICW. Most of these crossings would be considered a temporary impact because either directional drilling would be utilized or stream banks would be restored to preexisting conditions. Appropriate Section 404/401 permits would be secured for the impacts to waters. Expansion of the Big Hill storage site and associated facilities would affect about 11 acres (5 hectares) of 100-year floodplain and about 27 acres (11 hectares) of 500-year floodplain. The proposed Big Hill expansion site is located in a predominantly undeveloped, extensive floodplain system. Therefore, DOE has determined that the Big Hill expansion site and the other planned or reasonably foreseeable projects would not have a cumulative adverse impact to water resources.

4.9 WEST HACKBERRY EXPANSION SITE AND ASSOCIATED INFRASTRUCTURE

4.9.1 West Hackberry Expansion Site

West Hackberry is an existing SPR storage site. In addition to the SPR facilities, numerous canals and natural waterways bisect the area. The area surrounding the SPR site consists of marshland with natural ridges. The major historical land use of the area has been oil and gas exploration and development.

Exploration for oil began on the dome in 1902. Extensive exploration for sulfur also took place, but no records indicate that the dome was mined for sulfur. Olin Corporation and its predecessors have been producing brine since 1934. Hurricane Rita had identifiable effects on the natural environment and infrastructure at the West Hackberry site.

As an existing SPR site, expansion of the West Hackberry site would be a logical extension of activity. There are no known competing uses proposed for this site or in the adjacent area that would compete with or add to development of the site as SPR expansion. If the West Hackberry site is not used for SPR expansion purposes, it is likely that the existing site would remain as is for the foreseeable future.

4.9.2 West Hackberry Associated Infrastructure

No expected activities were found to occur within 5 miles (8 kilometers) of the onsite construction activities associated with the West Hackberry site. However the following LNG development activities were identified in the host Parishes of Cameron and Calcasieu: One LNG Terminal (Trunkline LNG) is operating in Calcasieu Parish and three FERC-approved LNG terminals are under development in Cameron Parish. The Trunkline LNG Terminal has been approved for expansion, and two of the LNG terminals that are under development in Cameron Parish have already applied to FERC for expansion; one of the applications has been approved by FERC. New pipelines are to be located at Hackberry, Cameron, and Calcasieu Parishes; other facilities include underground gas storage at Starks salt dome, Calcasieu Parish; and two natural gas storage caverns with associated distribution pipelines, Calcasieu Parish.

4.9.3 Cumulative Impacts Discussion

4.9.3.1 Biology

DOE evaluated the potential cumulative impacts to plant communities, wetlands, floodplains, wildlife and fish communities, including EFH, and threatened and endangered species from the ecoregion for the West Hackberry alternative. No expected activities were found to occur within the vicinity of this expansion site.

The West Hackberry expansion site would impact about 5 acres (2 hectares) of wetlands and waters of the United States. Expansion of the West Hackberry site would have no adverse effect on EFH or any state or federally listed rare, threatened or endangered species or critical habitat would result from construction and operation of the project.

The West Hackberry expansion site would have to secure Section 404/401 permits and meet regulatory requirements for impacts to wetlands.

The regulatory permits for filling and affecting wetlands would require compensation to ensure there is no net loss of wetlands in the project area. A combination of on-site wetland and stream restoration, creation, and preservation and use of authorized mitigation sites (bank sites/creation sites or in-lieu fees) would be utilized by these projects to avoid cumulative adverse impacts. Therefore, DOE has determined that the cumulative impacts to biological resources from the West Hackberry expansion site and other planned or foreseeable projects would not be adverse.

4.9.3.2 Water

DOE evaluated the potential cumulative impacts to water resources, which include surface water and groundwater in the West Hackberry ecoregion. No information concerning the number of stream crossings that would result from the above referenced projects was available. In addition, the expansion

of the West Hackberry site would not affect any 100-year or 500-year floodplains. Therefore, DOE has determined that the cumulative impact to water resources, including surface water and groundwater from the West Hackberry ecoregion alternative and the other planned or reasonably foreseeable projects would not be adverse.

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