

Appendix H
Evaluation of Federally Listed Species in Texas

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Appendix H Evaluation of Federally Listed Species in Texas

H.1 INTRODUCTION

This evaluation of federally listed species was prepared in conjunction with the environmental impact statement (EIS) for expansion of the Strategic Petroleum Reserve (SPR). The EIS evaluates the expansion of the SPR by developing additional storage capacity at up to three existing sites (West Hackberry and Bayou Choctaw in Louisiana and Big Hill in Texas) or developing one of four new sites (Chacahoula in Louisiana; Richton and Bruinsburg in Mississippi; and Stratton Ridge in Texas).

This appendix analyzes potential effects on federally listed endangered and threatened species, and marine mammals protected under the Endangered Species Act (ESA) and Marine Mammal Protection Act (special status species), respectively, from the development of the proposed new and expansion sites in Texas. Potential effects on endangered and threatened species and marine mammals from development of the proposed new and expansion sites in Louisiana and Mississippi are analyzed in appendices F and G, respectively.

The Department of Energy (DOE) prepared this evaluation of federally listed species to review and document its findings of “no effect” and “may affect” in accordance with the definitions found in the Final ESA Section 7 Consultation Handbook dated March 1998 (Consultation Handbook), a letter from U.S. Fish and Wildlife Service (USFWS) dated September 29, 2005, and consultations with the USFWS field offices. The evaluation was based on the definitions of the effects to endangered or threatened species in the Handbook and letter, as provided in the following list:

- **No effect.** The proposed action would not affect federally listed species or critical habitat (i.e., suitable habitat for the species occurring in the project county is not present in or adjacent to the action area).
- **Is not likely to adversely affect.** The project may affect listed species or critical habitat, or both; however, the effects would be discountable, insignificant, or completely beneficial. Certain avoidance and minimization measures may need to be implemented to reach this level of effects.
- **Is likely to adversely affect.** Adverse effects to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect would not be discountable, insignificant, or beneficial. If the overall effect of the proposed action would be beneficial to the listed species, but it also would be likely to cause some adverse effects to individuals of that species, then the proposed action “is likely to adversely affect” the listed species.

DOE is evaluating the impacts associated with four proposed new sites and three proposed expansion sites, some of which would have more than 100 miles (160 kilometers) of new pipelines, new tank farms, and brine disposal systems (offshore diffuser or injection wells) associated with them. When DOE issues a record of decision, it will select an alternative with either one new site and either two or three expansion sites for future development, or the no-action alternative. For these reasons, DOE has not conducted comprehensive field surveys and can reach only “no effect” or “may affect” conclusions for this evaluation of special status species instead of using all of the classifications described earlier. For the finding of “may affect,” DOE has not completed onsite surveys to support a finding of “is not likely to adversely affect” or “is likely to adversely affect”; therefore, a finding of “no effect” or “may affect” is the conclusion that DOE can reach at this time.

After the record of decision is issued that specifies the new site or sites and the expansion sites that would be developed, DOE would perform site- and species-specific surveys for all the federally listed species that received a finding of “may affect.” DOE would perform the evaluation of the federally listed species in consultation with USFWS and section 7 of the ESA and the Final ESA section 7 Consultation Handbook dated March 1998.

H.1.1 Purpose

This evaluation analyzes the potential effects on federally listed threatened and endangered species of construction, operation, and maintenance of additional SPR storage capacity. In Texas, this additional capacity could be added by developing one new site (Stratton Ridge) and expanding capacity at one existing site (Big Hill). For the proposed new Stratton Ridge site, the proposed activities would include: construction of underground storage caverns and surface facilities at the storage site; construction of pipelines for crude oil distribution, raw water supply, and brine disposal; surface water withdrawal to support solution mining of new caverns; discharge of brine in the Gulf of Mexico; and construction of the Texas City terminal. The proposed Big Hill expansion would use the existing raw water intake (RWI) system, brine disposal pipeline and Gulf of Mexico brine discharge, and existing crude oil distribution system; in addition to cavern construction, a new 21-mile (34-kilometer) crude oil pipeline to the Sun Terminal in Nederland would be constructed.

H.1.2 Threatened and Endangered Species Terminology

The USFWS lists a species on the Federal Endangered Species List as “threatened” when it is likely to become endangered throughout all or a significant portion of its range in the foreseeable future, and lists a species as “endangered” when it is in danger of extinction throughout all or a significant portion of its range. In addition, the USFWS maintains a list of what are called “candidate species” that are being considered for listing under the Endangered Species Act. A candidate species is a species that the USFWS has on file sufficient information to support a proposal to list as endangered or threatened, but for which preparation and publication of a proposal is precluded by higher-priority listing actions. Federal agencies are encouraged to consider these species in preparing environmental impact analysis done under NEPA in order to alleviate threats to them and thereby possibly eliminate the need to list the species as endangered or threatened.

To define all the species that are required to be addressed in the biological assessment, DOE contacted and obtained information from the USFWS and the Texas Parks and Wildlife Department (TPWD). Appendix K contains the consultation letters and lists the consultation meetings held.

H.1.3 Organization

This appendix includes the following information: a brief literature review for each of the species addressed (section H.2); observations made during site visits (section H.3); an assessment of the potential effects of the proposed action on the threatened, endangered, and candidate species (section H.4); and recommendations for minimizing potential adverse effects on the subject species and on other biological resources (section H.5). References cited in this appendix are identified in section H.6.

H.2 LITERATURE REVIEW

The literature review describes the natural histories of all species federally listed as threatened or endangered *and* identified as present or potentially present (e.g., based on historical records) by the USFWS (2006) in at least one county where proposed new and expanded SPR facilities and associated infrastructure would be located. Although candidate species (i.e., those listed as candidates for Federal listing as threatened or endangered) are within the scope of this assessment, there were no candidate species identified in the literature review for the Texas counties with proposed SPR facilities. Table H.2-1 lists the species evaluated in this appendix.

Table H.2-1: Federally Listed Threatened or Endangered Species in Texas Counties Where SPR Development is Proposed

Common Name	Scientific Name	Federal Status	Texas Status	County Where Species May Exist ^a
Birds				
Attwater's Greater Prairie Chicken	<i>Tympanuchus cupido attwateri</i>	Endangered	Endangered	Galveston
Bald Eagle	<i>Haliaeetus leucocephalus</i>	Threatened	Threatened	Brazoria
Brown Pelican	<i>Pelecanus occidentalis</i>	Endangered	Endangered	Brazoria, Galveston
Eskimo Curlew	<i>Numenius borealis</i>	Endangered	Endangered	Galveston (P) ^b
Piping Plover	<i>Charadrius melodus</i>	Threatened	Threatened	Brazoria, Galveston, Jefferson
Whooping Crane	<i>Grus americana</i>	Endangered	Endangered	Brazoria (P)
Marine Mammals				
Gervais Beaked Whale	<i>Mesoplodon europaeus</i>	Protected	Threatened	Brazoria, Galveston, Jefferson
Goose-Beaked Whale	<i>Ziphius cavirostris</i>	Protected	Threatened	Brazoria, Galveston, Jefferson
Pygmy Sperm Whale	<i>Kogia breviceps</i>	Protected	Threatened	Brazoria, Galveston, Jefferson
Dwarf Sperm Whale	<i>Kogia simus</i>	Protected	Threatened	Brazoria, Galveston, Jefferson
Sperm Whale	<i>Physeter macrophalus</i>	Endangered	Endangered	Brazoria, Galveston, Jefferson
Atlantic Spotted Dolphin	<i>Stenella frontalis</i>	Protected	Threatened	Brazoria, Galveston, Jefferson
Rough-Toothed Dolphin	<i>Steno bredanensis</i>	Protected	Threatened	Brazoria, Galveston, Jefferson
Killer Whale	<i>Orcinus orca</i>	Protected	Threatened	Brazoria, Galveston, Jefferson
False Killer Whale	<i>Pseudorca crassidens</i>	Protected	Threatened	Brazoria, Galveston, Jefferson
Short-Finned Pilot Whale	<i>Globicephala macrorhynchus</i>	Protected	Threatened	Brazoria, Galveston, Jefferson
Pygmy Killer Whale	<i>Feresa attenuata</i>	Protected	Threatened	Brazoria, Galveston, Jefferson
West Indian Manatee	<i>Trichechus manatus</i>	Endangered	Endangered	Brazoria, Galveston, Jefferson

Table H.2-1: Federally Listed Threatened or Endangered Species in Texas Counties Where SPR Development is Proposed

Common Name	Scientific Name	Federal Status	Texas Status	County Where Species May Exist ^a
Bottlenose Dolphin	<i>(Tursiops truncatus)</i>	Protected	Not Listed	All Coastal Counties
Reptiles				
Atlantic Hawksbill Sea Turtle	<i>Eretmochelys imbricate</i>	Endangered	Endangered	Brazoria, Galveston, Jefferson
Green Sea Turtle	<i>Chelonia mydas</i>	Threatened	Threatened	Brazoria, Galveston, Jefferson
Kemp's Ridley Sea Turtle	<i>Lepidochelys kempii</i>	Endangered	Endangered	Brazoria, Galveston, Jefferson
Leatherback Sea Turtle	<i>Dermochelys coriacea</i>	Endangered	Endangered	Brazoria, Galveston, Jefferson
Loggerhead Sea Turtle	<i>Caretta caretta</i>	Threatened	Threatened	Brazoria, Galveston, Jefferson

^a Includes only counties in Texas where SPR facilities are proposed for development or expansion.

^b Potentially or historically present in the county.

H.2.1 Birds

H.2.1.1 Attwater's Greater Prairie Chicken

Attwater's greater prairie chicken (*Tympanuchus cupido attwateri*) is a heavily barred, chunky, chicken-sized bird with dark brown, cinnamon, and pale buff feathers (NGS 1983). The average weight for males and females is 35.8 and 25.6 ounces (1,014 grams and 730 grams), respectively (Dunning 1993). Their diet consists primarily of insects, particularly grasshoppers, during the summer and fruit, leaves, flowers, shoots, seeds, and grain during other times of the year (NatureServe 2005).

The historical range of these birds was in the Gulf Coast prairies of southwestern Texas and Louisiana, south of the Rio Grande (NatureServe 2005). Currently, Attwater's greater prairie chicken is found only in a narrow band of coastal prairie along the Texas coast, including some offshore islands, and as of 1991, several remnant inland populations existed in Goliad, Refugio, Austin, Colorado, Fort Bend, and Victoria Counties (Matthews and Moseley 1990). Beginning in early April, males gather for communal courtship (10 to 30 birds). Incubation lasts 23 or 24 days, after which the hatchlings leave the nest within a few hours of hatching (NatureServe 2005). Home ranges can vary widely, but they are smallest in summer and largest in winter (Horkel 1979).

H.2.1.2 Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) is a large bird of prey with an average wingspan of 7 feet (2 meters). Adult males and females are similar in appearance, with a dark brown body and wings, and a distinctive white head and tail. This species is listed as a federally threatened species, although delisting has been proposed.

Bald eagles may be found throughout the continental United States and Alaska. They are most likely found in areas with large expanses of aquatic habitat with forested shorelines or cliffs where they select supercanopy roost trees. Bald eagles are opportunistic foragers. Although they prefer fish, they eat a great variety of mammals, amphibians, crustaceans, and birds, including many species of waterfowl (Buehler 2000).

Bald eagles nest almost exclusively at the edges of lakes, rivers, or seacoasts. They generally nest in tall trees or cliffs near the water's edge, although they occasionally nest on the ground. Nests are often reused in successive years. The breeding season begins in the spring (earlier in southern states), with the young fledging after about 6 months (USFWS 1983; USFWS 1995). According to comments submitted to DOE by the USFWS (James 2005), nesting activity occurs from September to January with young fledged usually by midsummer. Nonbreeding populations occur throughout Texas; breeding populations are found primarily in eastern Texas along the Gulf Coast (NatureServe 2005; TPWD 2005).

Bald eagles are highly sensitive to human noise and interference (USFWS 1983; USFWS 1995). They are most sensitive during the first 12 weeks of the nesting cycle. Disturbance during nesting may lead to nest abandonment or reduced hatching and survival rates. Human activity near a nest late in the nesting cycle may also cause flightless birds to jump from the nest, lessening their likelihood of survival (Watson 2005).

H.2.1.3 Brown Pelican

The brown pelican (*Pelecanus occidentalis*) is a large water bird with a massive bill and throat pouch. Its wings and body are grayish-brown. Nonbreeding adults have a whitish head and neck often with some yellow. The hindnecks of breeding adults are dark chestnut (NGS 1983; Palmer 1962). Larger individuals have a wingspread of more than 7 feet (2 meters) (USFWS 2005).

The brown pelican is a fish eater. It is found almost exclusively in coastal areas along the southern east coast, the Gulf of Mexico, and throughout the west coast. It prefers to feed in shallow estuarine waters and use sand spits, offshore sand bars, and islets for nocturnal roosting. Dry roosting sites are essential to suitable habitat (NatureServe 2005). Nests usually are built on coastal islands, on the ground, or in small bushes and trees (Palmer 1962).

The brown pelican is federally listed as endangered. Populations in California, Texas, and Louisiana were devastated by pesticide poisoning from dichlorodiphenyltrichloroethane (DDT), dichlorodiphenyldichloroethylene (DDE), and other compounds throughout the 1950s and 1960s. Now eastern and Gulf Coast populations of the brown pelican appear to be stable and possibly increasing in recent years. Contaminant levels in both populations are below the threshold for reproductive failure, but the populations are still very vulnerable to pesticide pollution (Anderson and Hickey 1970). Other threats include the disturbance of nesting birds by humans, declining fish populations, increased water turbidity caused by dredging, oil and chemicals spills, entanglement in fishing gear, and extreme weather conditions. Recently, habitat degradation has affected both roosting and nesting. For example, nesting efforts have failed in the Gulf Coast because of erosion at the nesting sites (NatureServe 2005).

The brown pelican is classified as vulnerable in Texas and imperiled in Louisiana. In Texas, brown pelicans can be found along the entire coast; most of the breeding brown pelicans in Texas nest in counties near Corpus Christi (TPWD 2005).

H.2.1.4 Eskimo Curlew

The Eskimo curlew (*Numenius borealis*) is a very rare, 12- to 14-inch (30- to 36-centimeter), long-legged shorebird with a gray-brown upper body with dark eyelines, a slightly downward-curved bill, cinnamon wing linings, and white streaks on the lower body. Female Eskimo curlews are generally larger than males (NYDEC 2003). Their diet consists of grasshoppers and grasshopper eggs, crickets, grubs, ants, moths, spiders, snails, earthworms, freshwater insects, seeds, and berries (Gollop et al. 1986).

A possible sighting of four Eskimo curlews was reported in Texas in 1987 (Gollop 1988), but no recent reliable sightings have been reported for Texas, and the global population is believed to be less than 50 and possibly extinct (NatureServe 2005). Historically, Eskimo curlews arrived in Texas in early March and migrated through the Great Plains from late March to mid-May (Gollop et al. 1986; Johnson and Herter 1989) to their breeding areas further north (e.g., Alaska). Their nonbreeding habitat consists of tidal flats, herbaceous grasslands, pastures, and plowed fields within a few miles (kilometers) of the sea (AOU 1983). Preferred nesting habitat includes open arctic tundra, uplands grassy tundra, and tundra and tidal marshes near the Arctic Ocean (Harrison 1978; Johnson and Herter 1989; Matthews and Moseley 1990). Female Eskimo curlews lay a clutch of four eggs between late May and early July (NatureServe 2005).

H.2.1.5 Piping Plover

The piping plover (*Charadrius melodus*) is a small, sandy-colored shorebird similar in appearance to a sandpiper. Distinguishing field marks of this species include yellow-orange legs, a black band across the forehead from eye to eye, and a black ring around the base of its neck (USFWS 2005). The piping plover is federally listed as threatened in Texas.

A migratory species, the piping plover overwinters on beaches, mudflats, and sandflats along the Atlantic Coast and the Gulf of Mexico including barrier island beaches and spoil islands on the Gulf Intracoastal Waterway (ICW) (USFWS 2005). In Texas, piping plovers have been observed in most of the counties bordering the Gulf of Mexico (NatureServe 2005). Critical habitat for wintering piping plovers has been established for several specific locations in Brazoria and Galveston Counties in Texas (USFWS 2001):

- **Unit TX–31:** San Bernard National Wildlife Refuge Beach, 410 acres (166 hectares) in Matagorda and Brazoria Counties. This is a unit composed of Gulf beach, 5 miles (8 kilometers), and extends from the mouth of the San Bernard River to a point along the beach 8.7 miles (14 kilometers) to the southwest.
- **Unit TX–32:** Gulf Beach, 269 acres (109 hectares) of shoreline in Brazoria County. This unit is a segment of Gulf beach between the Brazos River and the San Bernard River and borders an area known as Wolf Island.
- **Unit TX–33:** Bryan Beach and adjacent beach, 388 acres (157 hectares) in Brazoria County. The boundaries enclose a length of Gulf beach between the mouth of the Brazos River and the Farm-to-Market 1495 road. A portion of this area is owned and managed by the TPWD.
- **Unit TX–34:** San Luis Pass, 272 acres (110 hectares) near the Brazoria-Galveston county line. This unit extends along the Gulf side of Galveston Island from San Luis Pass to the site of the former town of Red Fish Cove. Approximately 57 percent of the unit includes flats in the floodtide delta that are state-owned and managed by the Texas General Lands Office (TGLO).
- **Unit TX–35:** Big Reef, 117 acres (47 hectares) in Galveston County. This unit consists of beach and sandflats on the north, west, and east shore of Big Reef, down to mean lower low water (MLLW) level. South Jetty is not included. The area is managed by the City of Galveston.
- **Unit TX–36:** Bolivar Flats, 395 acres (160 hectares) in Galveston County. This unit extends from the jetties on the southwest end of the Bolivar Peninsula to a point on the Gulf beach 0.6 miles (1 kilometer) north of Beacon Bayou. It includes 3 miles (4.8 kilometers) of Gulf shoreline. The area is leased from the TGLO by Houston Audubon Society, and it is managed for its important avian resources. The uplands areas are used for roosting by the piping plover.

- **Unit TX-37:** Rollover Pass, 16 acres (6.5 hectares) in Galveston County. This unit consists of Rollover Bay on the bayside of Bolivar Peninsula. It includes tidal flats on state-owned land managed by the TGLO. This unit captures the intertidal complex of the bay, and it is bounded by the towns of Gilchrist to the east and the Gulf beach of the Bolivar Peninsula to the south.

For all of these units, the landward boundary of the critical habitat is defined as the line indicating the beginning of dense vegetation (which is not used by piping plovers as habitat) and the gulfside (or bayside) boundary is the MLLW, defined as the annual average of the lower low-water height of each tidal day. All of the units listed here include lands known as wind tidal flats that are infrequently inundated by seasonal winds.

Piping plovers begin their fall migration to wintering habitats along the Gulf Coast and elsewhere in mid to late summer, where they remain until around March when they migrate northward to breeding grounds (NatureServe 2005). Although a few plovers remain throughout the year, sightings in winter habitats are rare in late May, June, and early July (USFWS 2001).

H.2.1.6 Whooping Crane

The whooping crane (*Grus americana*) is a very tall, mostly white bird with long legs and neck, red facial skin, and a straight bill. It averages 52 inches (132 centimeters) in length (NatureServe 2005). Its summer diet consists of insects, crustaceans, and berries; its winter diet is supplemented with grains, acorns, wolfberry fruit, insects, crustaceans, mollusks, fishes, reptiles, amphibians, and marine worms (USFWS 1980; Hunt and Slack 1989).

The whooping crane's preferred habitat is typically herbaceous wetlands, lagoons, and tidal flats. It typically nests in dense emergent vegetation found in shallow ponds, fresh-water marshes, wet prairies, and lake margins in large tracts of undisturbed wilderness (NatureServe 2005). Breeding begins in early May, and pairs of whooping cranes mate for life. The crane also establishes and defends winter territories on coastal marshes in parts of Texas. Breeding territories are large, averaging 1,900 acres (769 hectares) (Johnsgard 1991). Nestlings fledge after mid-August, and they mature sexually at 4 to 6 years (NatureServe 2005).

H.2.2 Marine Mammals

At the proposed Stratton Ridge site, the onshore portion of the brine disposal pipeline construction would not affect marine mammals. That construction would include directional drilling from onshore to open water in the Gulf of Mexico. The construction and operation of the offshore brine disposal pipeline and brine diffusion system for the Stratton Ridge site may affect the marine mammal species; likewise, operation of the brine diffusion systems for both the Big Hill and Stratton Ridge sites may affect the marine mammal species. The locations of the offshore pipelines and the diffuser system would not reach the depths of the Gulf of Mexico where the majority of these species are found because the locations of the diffuser systems are at a depth of approximately 30 feet (9 meters). In addition, the dispersion of the brine discharge into the Gulf of Mexico would dissipate before reaching these depths.

H.2.2.1 Gervais Beaked Whale

The Gervais beaked whale (*Ziphius cavirostris*) is a pelagic species associated with the continental shelf and deep oceanic waters, and, in addition, it is closely associated with the Gulf Stream waters. Its diet consists mainly of squid and deepwater fishes. Little is known about this species, but it is believed sexual

maturity occurs when it measures 15 feet (4.5 meters). The Gervais beaked whale lives about 27 years (Wynne et al. 1999).

H.2.2.2 Goose-Beaked Whale

The goose-beaked whale (*Ziphius cavirostris*), also known as Cuvier's beaked whale, typically is found in waters that are greater than 3,280 feet (1,000 meters). The goose-beaked is a pelagic species associated with the continental shelf and deep oceanic waters, but it is also closely associated with the Gulf Stream waters. Little is known about the goose-beaked whale. It is believed to travel in pods of 2 to 25 animals, and it typically avoids vessels. Sexual maturity is believed to occur at 7 to 11 years, with breeding occurring in the spring. Females give birth to a calf every 2 to 3 years after a 12-month gestation. The goose-beaked whale is believed to lactate for 12 months and live more than 35 years. Its diet consists mainly of deepwater fish and squid (Wynne et al. 1999).

H.2.2.3 Pygmy Sperm Whale

The pygmy sperm whale (*Kogia breviceps*) is a pelagic, deep-water species that inhabits the areas near the continental shelf edge, slope, and deep oceanic waters. It is found throughout the Gulf of Mexico in these waters. The pygmy sperm whale is not as social as other species, and it is typically found alone or in small groups. The male reaches sexual maturity when it measures 8.9 to 9.8 feet (2.7 to 3.0 meters). The female reaches sexual maturity when it measures 8.5 to 9.1 feet (2.6 to 2.8 meters) in length. A single calf is born after an 11-month gestation period, and lactation lasts about 12 months. The pygmy sperm whale's diet consists mainly of squid, fish, and crustaceans (Wynne et al. 1999).

H.2.2.4 Dwarf Sperm Whale

The dwarf sperm whale (*Kogia simus*) is a pelagic, deep-water species that inhabits the areas near the continental shelf edge, slope, and deep oceanic waters. It is found throughout the Gulf of Mexico in these waters. The dwarf sperm whale is not as social as other species, and it typically is found alone or in small groups. It reaches sexual maturity when it measures between 6.9 and 7.2 feet (2.1 and 2.2 meters) in length. A single calf is born after a 9.5-month gestation period, and lactation lasts about 12 months. The dwarf sperm whale's diet consists mainly of squid, fish, and crustaceans (Wynne et al. 1999).

H.2.2.5 Sperm Whale

The sperm whale (*Physeter macrophalus*) is a pelagic, deep-water species that inhabits areas near the continental slope. It is found throughout the Gulf of Mexico along the continental slope and along the Atlantic seaboard associated with Gulf Stream features. Female and young sperm whales form breeding schools of 10 to 80 animals. Sexually inactive males form bachelor schools, and older males are typically solitary. Females reach sexual maturity between 7 to 11 years; males reach sexual maturity at 19 years. A single calf is born every 3 to 6 years after a 14-month gestation period, and lactation lasts 12 to 24 months. The sperm whale's diet consists mainly of squid, but the species also will eat fish (Wynne et al. 1999).

H.2.2.6 Atlantic Spotted Dolphin

The Atlantic spotted dolphin (*Stenella frontalis*) is a tropical species that can be found in a variety of areas throughout the Gulf of Mexico. It ranges from coastal to pelagic environments, typically near the continental shelf and slope, and it usually is associated with the Gulf Stream. The Atlantic spotted dolphin reaches sexual maturity at 8 to 15 years. It breeds during the fall and spring and produces one calf every 1 to 2 years after a 12-month gestation period. Lactation typically lasts 3 to 5 years. The

Atlantic spotted dolphin can live 25 to 30 years. It is a gregarious species found in groups of less than 20 other dolphins and small whales along the coast and in larger groups of less than 100 individuals offshore. The Atlantic spotted dolphin's diet consists of squid and a variety of fish (Wynne et al. 1999).

H.2.2.7 Rough-Toothed Dolphin

The rough-toothed dolphin (*Steno bredanensis*) is a tropical, pelagic species found seaward of the continental slope. Little is known about the rough-toothed dolphin, but it is thought to be sexually mature at 10 to 14 years and to live as long as 32 years. It is believed to travel in pods of 10 to more than 100 individuals and associated other species such as spinner dolphins, bottlenose dolphins, and pilot whales. Sometimes the rough-toothed dolphin can be found associated with large mats of Sargassum. The rough-toothed dolphin's diet consists of deepwater octopus, squid, and fish (Wynne et al. 1999).

H.2.2.8 Killer Whale

The killer whale (*Orcinus orca*) can be found in both coastal and oceanic waters ranging from tropical to polar. The killer whale is a highly social species that travels in a pod of 3 to 55 animals, and the pod often cooperates in hunting and feeding efforts. The whale is sexually mature at 10 to 15 years and mates year round. A single calf is born every 3 to 8 years after a 17-month gestation period. Lactation typically lasts about 12 months. The killer whale may live more than 50 years. It has a diverse diet that includes fish, birds, squid, turtle, and other marine mammals (Wynne et al. 1999).

H.2.2.9 False Killer Whale

The false killer whale (*Pseudorca crassidens*) is a pelagic species found in the deeper waters of the Gulf of Mexico, seaward of the continental shelf. The false killer whale is a social species that can be found in groups of 10 to more than 100 individuals with the same species or with other dolphin species. It is sexually mature at 8 to 14 years, and it has a single calf every 3 to 4 years after a 16-month gestation period. This species has been known to be aggressive toward smaller dolphins. The false killer whale's diet consists mainly of squid and fish (Wynne et al. 1999).

H.2.2.10 Short-Finned Pilot Whale

The short-finned pilot whale (*Globicephala macrorhynchus*) can be found in a variety of water depths. Typically it is associated with squid, its main prey. The short-finned pilot whale is a tropical species usually associated with the Gulf Stream, and it can be found in pelagic or coastal environments. It may move inshore during the summer months. The short-finned pilot whale is a social species that can be found in groups of 10 to more than 100 individuals, and it is often associated with bottlenose dolphins. It is believed to be sexually mature at 6 to 12 years and thought to breed every 3 years. A single calf is born after a 15- or 16-month gestation period. Lactation for calves lasts about 20 months. An individual short-finned pilot whale can live between 50 and 70 years. Its diet consists primarily of squid, but it also has been known to prey on fish (Wynne et al. 1999).

H.2.2.11 Pygmy Killer Whale

The pygmy killer whale (*Feresa attenuata*) is a pelagic species found in the deeper waters of the Gulf of Mexico, seaward of the continental shelf. Little is known about the life history of this whale. Its diet is believed to consist mostly of fish, but it has been observed preying on squid. The pygmy killer whale is a gregarious species that typically associates in groups of 10 to 50 individuals. The pygmy killer whale has shown aggressive tendencies, but typically it is wary of boats (Wynne et al. 1999).

H.2.2.12 West Indian Manatee

The West Indian manatee (*Trichechus manatus*), also known as the Florida manatee, is an herbivore found in the warm coastal and inland waters. This manatee has a low tolerance for cold waters below 68 °Fahrenheit (20 °Celsius), and it is typically found in warm springs and rivers. The manatee does not typically extend beyond the Florida–Alabama border, but sometimes it is found along the entire Gulf Coast. This slow swimming mammal spends its days feeding on submerged aquatic vegetation, floating vegetation, and emergent vegetation. The manatee is sexually mature at 3 to 5 years and produces a single calf every 2 to 5 years after a 12-month gestation period (Wynne et al. 1999).

H.2.2.13 Bottlenose Dolphin

The bottlenose dolphin (*Tursiops truncatus*) typically is found in coastal or offshore waters. In a coastal environment, the bottlenose dolphin can be found in warm, shallow inshore waters of bays and rivers. When offshore, it usually is in deep waters over the continental shelf and slope. The female bottlenose dolphin reaches sexual maturity at 5 to 10 years, while the male reaches maturity at 8 to 12 years. It breeds during fall and spring, and it produces one calf every 3 to 6 years after a 12-month gestation period. Lactation typically lasts 12 to 18 months. The bottlenose dolphin may live more than 50 years. It is a social species; it can be found along the coast in small groups of less than 10 individuals and offshore in larger groups of 10 to more than 100 individuals. This species usually can be found in mixed groups with pilot whales and right whales. The bottlenose dolphin's diet consists of fish, invertebrates, and squid (Wynne et al. 1999).

H.2.3 Reptiles

H.2.3.1 Atlantic Hawksbill Sea Turtle

The Atlantic hawksbill sea turtle (*Eretmochelys imbricata*) has a large brown carapace with overlapping scutes and two claws on each flipper. Some individuals have a tortoiseshell pattern of radiating streaks. The young are all black or dark brown except for raised ridges, shell edges, and areas on the neck and flippers. Mature adults usually measure 30 to 35 inches (76 to 89 centimeters) in length (Conant and Collins 1991). It feeds on the ocean bottom and reef faces close to shore on a diet consisting primarily of crab, sea urchin, shellfish, and jellyfish, and also some plant material and fish.

The Atlantic hawksbill is a local- and long-distance migrant that prefers shallow coastal waters with rocky bottoms, coral reefs, mangrove-bordered bays, and estuaries (CSTC 1990). This turtle prefers to nest on undisturbed, deep-sand beaches on the Gulf Coast of Mexico, the West Indies, the Bahamas, and the Americas (Meylan 1992; Lund 1985). The age of sexual maturity is unknown. Adult females nest only once every 2 to 3 years between May and November, laying 4 to 6 clutches of 50 to more than 200 eggs at 14- to 18.5-day intervals (NatureServe 2005). Incubation lasts approximately 2 months (CSTC 1990).

H.2.3.2 Green Sea Turtle

The green sea turtle (*Chelonia mydas*) turtle has a brown carapace covered in dark, wavy markings, radiating mottled markings, or large dark brown blotches; young are black or dark brown with white undersides. Mature adults are usually 35 to 48 inches (90 to 122 centimeters), but they can reach more than 60 inches (153 centimeters) in length. The length of a hatchling carapace is usually between 1.6 and 2.4 inches (4.1 and 6.1 centimeters) (Conant and Collins 1991). This turtle most commonly feeds in shallow, low-energy waters containing abundant submerged vegetation. Adults are primarily herbivores, while juveniles are more invertivorous.

The green sea turtle is a long-distance migrant preferring tidal flats, pelagic zones, and isolated sand dunes. It prefers to nest on high-energy beaches with deep sand (NatureServe 2005). Every 2 to 4 years, the female lays between 1 and 8 clutches, each averaging 90 to 140 eggs, at approximately 2-week intervals. Nesting occurs between March and October in the Caribbean–Gulf of Mexico region, with a peak nesting rate during May and June (Ehrhart and Witherington 1992).

H.2.3.3 Kemp's Ridley Sea Turtle

Kemp's Ridley sea turtle (*Lepidochelys kempii*) is a small endangered sea turtle found in shallow coastal and estuarine waters including those of the Gulf of Mexico. The adult is olive green above and yellow below, and young are gray above and yellow below. The shell is nearly round, and its limbs are flattened flippers. The shell length is usually between 23 and 28 inches (58 and 70 centimeters) for adults and 1.5 to 1.7 inches (3.8 to 4.4 centimeters) for hatchlings (Conant and Collins 1991).

In coastal waters, the Kemp's Ridley sea turtle is usually found over sand or mud bottoms where it feeds on crabs. Nests are built on elevated dunes, especially on beaches backed up by large swamps or bodies of open water having seasonal, narrow ocean connections (NatureServe 2005).

During the nesting season from April to July, the female lays 1 to 4 clutches of about 100 eggs at intervals of 10 to 28 days. Eggs hatch after an average of 50 to 55 days (CSTC 1990).

H.2.3.4 Leatherback Sea Turtle

The leatherback sea turtle (*Dermochelys coriacea*) has a black or dark blue carapace, often with irregular white or pink blotches, and seven prominent longitudinal ridges. The adult is usually 53 to 70 inches (135 to 178 centimeters) in length. Leatherback hatchlings are about 2.4 to 3 inches (6 to 7.5 centimeters) long, and they are black and white and covered with small beady scales that are later shed (Conant and Collins 1991). The leatherback sea turtle feeds primarily on jellyfish.

Mainly pelagic, the leatherback tends to approach land exclusively for nesting (Eckert 1992). This long-distance migrant prefers the open ocean, particularly along the edge of continental shelves, but it is also found in seas, gulfs, bays, and estuaries. When nesting, the leatherback seeks moist sand on sloping sandy beaches backed by vegetation near deep water and rough seas (CSTC 1990). Every 2 to 3 years, the female leatherback lays 10 or possibly more clutches of 50 to 170 eggs at intervals of about 1 to 2 weeks. Nesting occurs between March and August in the Western hemisphere. Eggs hatch in 8 to 10 weeks (Eckert 1992).

H.2.3.5 Loggerhead Sea Turtle

The loggerhead (*Caretta caretta*) is a reddish-brown sea turtle found in a variety of habitats including open seas more than 500 miles (805 kilometers) from shores, bays, estuaries, lagoons, creeks, and mouths of rivers in warm, temperate, and subtropical regions (NatureServe 2005). Adults have a carapace length typically between 28 and 49 inches (70 and 125 centimeters). Hatchlings have a shell length of 1.5 to 2 inches (4 to 5 centimeters) (Dodd 1988, 1992; Conant and Collins 1991).

The female loggerhead sea turtle nests on open sandy beaches above the high-tide mark, seaward of well-developed dunes. High-energy and steeply sloped beaches with gradually sloped offshore approaches are favored (CSTC 1990). In southeastern states, females deposit between 50,000 to 70,000 clutches each year (Meylan et al. 1995). Despite some natural fluctuation in the size of the loggerhead population, numbers appear to be declining in some areas largely due to habitat destruction and incidental take by

shrimp trawlers. The nesting population in the southeastern United States is believed to be declining (CSTC 1990; Taylor 1992).

Every 2 to 3 years, a mature female lays between 1 and 9 clutches of around 120 eggs at intervals of 2 weeks. Nesting occurs mainly at night, often at high tide, from April to early September. In the southeastern states, eggs hatch in 8 to 9 weeks. The sex of the hatchlings is determined by incubation temperatures, with the ratio strongly biased toward females in Atlantic coastal waters. Hatchlings emerge from the nest a few days after hatching, typically during darkness (Wibbels et al. 1991; Mrosovsky and Provancha 1992).

H.3 FIELD OBSERVATIONS

This section reports the observations made during field visits to the proposed Stratton Ridge SPR site.

On October 6 and 7, 2005, four biologists from ICF International conducted pedestrian surveys of the proposed Stratton Ridge SPR site. The inspectors walked over the proposed site and RWI structure. The survey included limited portions of the proposed pipeline right-of-way (ROW).

H.3.1 Stratton Ridge Storage Site

The proposed Stratton Ridge storage site encompasses 273 acres (102 hectares) west of Highway 523. Cattle and feral pigs roam and graze throughout the site, influencing the vegetative communities. The biologists observed perennial streambeds in the northeastern portion of the site and culverts along the pipeline that bisects the site from east to west. They observed no permanent streams in the site, but they did see three areas of standing water and emergent and potentially submergent vegetation.

The study area includes the following principal habitat types:

- Evergreen forest (primarily forested wetlands),
- Deciduous forest,
- Emergent wetlands, and
- Open and old fields.

A description of each principal habitat type in the study area follows. Plant species observed on the site are identified in table H.3.1-1.

Table H.3.1-1: Plant Species Observed at the Stratton Ridge Site

Common name	Scientific Name	Vegetative Layer
Evergreen Forest		
Live Oak	<i>Quercus virginiana</i>	Canopy
Water Oak	<i>Q. phellos</i>	Canopy
Holly	<i>Ilex</i> spp.	Understory
Yaupon	<i>Ilex vomitoria</i>	Understory
Dahoon	<i>Ilex cornuta</i>	Understory
Devil's Walking Stick	<i>Aralia spinosa</i>	Understory
Chinese Tallow Tree	<i>Sapium sebiferum</i>	Canopy/Understory (invasive)
Viburnum	<i>Viburnum</i> spp.	Understory/Ground cover
Rattlebush	<i>Symplocos tinctoria</i>	Understory/Ground cover
Saw Palmetto	<i>Serenoa repens</i>	Understory/Ground cover
Greenbriar	<i>Smilax</i> spp.	Understory/Ground cover

Table H.3.1-1: Plant Species Observed at the Stratton Ridge Site

Common name	Scientific Name	Vegetative Layer
Blackberry	<i>Rubus argutus</i>	Understory/Ground cover
Butterweed	<i>Packera glabella</i>	Understory/Ground cover
Pigweed	<i>Amaranthus</i> spp.	Understory/Ground cover
Trumpet Creeper	<i>Campsis radicans</i>	Understory/Ground cover
Deciduous Forest		
Winged Elm	<i>Ulmus alata</i>	Canopy
Chinese Tallow Tree	<i>Sapium sebiferum</i>	Canopy
Pigweed	<i>Amaranthus</i> spp.	Understory/Ground cover
Rattlebush	<i>Symplocos tinctoria</i>	Understory/Ground cover
Saw Palmetto	<i>Serenoa repens</i>	Understory/Ground cover
Viburnum	<i>Viburnum</i> spp.	Understory/Ground cover
Emergent Wetlands		
Sedge	<i>Carex</i> spp.	Ground cover
Soft Rush	<i>Juncus marginatus</i>	Ground cover
Legume	<i>Fabaceae</i>	Ground cover
Bulrush	<i>Scirpus</i> spp.	Ground cover
Spike Rush	<i>Eleocharis quadrangulata</i>	Ground cover

Evergreen Forest: Approximately 85 percent of the evergreen forest is forested wetlands with upland portions consisting of scattered isolated islands and berms. The evergreen forest is dominated by live oak and an understory that includes holly, yaupon holly, devil’s walking stick, and vibernum. The ground cover varies based on the amount of sunlight reaching the forest floor and the level of grazing.

Deciduous Forest: Deciduous hardwood forests are present in higher elevation areas at the southern portion of the site. The dominant species are winged elm and Chinese tallow tree.

Emergent Wetlands: The largest emergent wetland area is in the central-eastern area of the site. Standing water was present at all of the emergent wetlands observed during the site visit. The biologists observed a variety of sedge, rush, and bulrush, along with legumes, rattlebush, and Chinese tallow tree along the edges of the wetlands.

Open and Old Fields: The observed open fields are associated with power line and pipeline ROWs. The old fields adjacent to the proposed site were for cattle grazing. The entire site is now grazed by cattle.

H.3.2 Stratton Ridge RWI Structure

The proposed RWI structure for the Stratton Ridge site is on the ICW. The surrounding area is flat brackish to saltwater marshland with some tidal influence.

H.4 HABITAT ASSESSMENT AND POTENTIAL IMPACTS

This section evaluates whether the proposed SPR development activities would take place in areas where threatened, endangered, and candidate species are known to exist or where they may exist based on the natural history information reported in chapter 2 of the EIS. For any element of the proposed new Stratton Ridge site or proposed Big Hill expansion site located in known or potential threatened,

endangered, or candidate species habitat, the nature and potential for effects on that species are described. The assessment considers potential avoidance and minimization measures that DOE would implement for each element of the proposed action.

In the following sections, a separate assessment is provided for the proposed new Stratton Ridge site and the Big Hill proposed expansion site.

H.4.1 Stratton Ridge

This assessment for the proposed Stratton Ridge site evaluates the potential effects on threatened, endangered, and candidate species by each of the elements of the proposed new site listed in Table H.4.1-1.

Table H.4.1-1: Elements of the Proposed Action and Location on Stratton Ridge Candidate Site

Element of Proposed Action	Location by County or Offshore Area
Stratton Ridge site	Brazoria
Oil distribution pipeline ROW from Stratton Ridge to the Texas City terminal	Brazoria and Galveston
RWI structure, RWI pipeline ROW, brine disposal pipeline ROW, and RWI power line ROW to the ICW	Brazoria
Brine disposal ROW from ICW to Gulf of Mexico	Brazoria
Offshore brine pipeline and diffuser	Gulf of Mexico

The following paragraphs describe the evaluation findings for each species that could result from the elements of the proposed action at the Stratton Ridge candidate site.

H.4.1.1 Birds

H.4.1.1.1 Attwater’s Greater Prairie Chicken

Attwater’s greater prairie chickens are recorded in Galveston County, where part of the crude oil distribution pipeline for the Stratton Ridge site would be located. Woodrow (2005) listed the species as a species of concern for the proposed new Stratton Ridge site. As of 2003, two fragments of habitat were recorded for Attwater’s greater prairie chicken in Texas, including one in Galveston County at the Texas City Prairie Preserve and the other in Colorado County (TPWD 2005; Nature Conservancy 2005). The element of the proposed action in Galveston County associated with the proposed new Stratton Ridge site is construction of the crude oil distribution pipeline along the existing ROW to the Texas City terminal. The existing ROW where the new pipeline would be built passes through the southern part of Texas City; the Prairie Reserve is to the north of Texas City, at least 4 miles (6.4 kilometers) away. Because this is an existing ROW that does not pass through the Prairie Reserve, the construction of the pipeline and the subsequent operation and maintenance activities would have no effect on the existing population of Attwater’s greater prairie chickens.

H.4.1.1.2 Bald Eagle

Eastern Texas including Brazoria County has breeding and wintering-over populations of bald eagles (TWPD 2005). Construction on the proposed Stratton Ridge site; the ROW for the RWI pipeline, brine disposal pipeline, and power lines to the RWI structure; and the crude oil distribution pipeline ROW

would occur in or near areas with potentially suitable habitat for the bald eagle. These suitable habitats include open water or wetlands adjacent to forested area.

Construction Impacts

A pair of bald eagles is known to nest northwest of the proposed Stratton Ridge site near Ash Lake, approximately 2 miles (3.2 kilometers) from the Stratton Ridge site. Research has shown that most nests are not disturbed by development activities that are farther than 0.25 miles (0.4 kilometers) away. Although this nest location is further than 0.25 miles (0.4 kilometers) from the proposed site, these bald eagles may be affected by the Stratton Ridge site development because the habitat at the site may provide suitable foraging area. Tree removal onsite and in the 300-foot (91-meter) security area around the site, construction noise, and human activity may affect bald eagles foraging in the area, although the construction would be a temporary impact. There are no known bald eagle nests at the proposed Stratton Ridge site, but the bottomland hardwood forest (palustrine forested wetlands) and emergent wetlands habitat at the site may be suitable for nesting and foraging or roosting habitat. If one of the Stratton Ridge alternatives is selected for development, a biologist would survey the site for bald eagle nests. If a nest is identified, DOE would consult with USFWS and TPWD. DOE would implement appropriate mitigation strategies. For example, construction of the pipeline would be completed to avoid the time when nesting bald eagles are particularly sensitive to human activity. Bald eagles are particularly sensitive to human activity during the period when they nest in Texas from October to July, with peak egg-laying in December and hatching in January (Watson 2005).

The construction of the proposed RWI and brine disposal pipelines and power lines leading to the RWI structure may affect habitat that is potentially suitable for foraging and nesting bald eagles; however, no known nests have been identified along these ROWs. If one of the Stratton Ridge alternatives is selected for development, a biologist would survey the area for nests and suitable habitat along the ROWs and RWI construction site. If a nest is identified, DOE would consult with USFWS and TPWD, as described earlier. If no nests are identified, construction still may have an effect on bald eagles because the suitable foraging area would be disrupted. It is also possible that habitats may exist for bald eagle nesting and foraging along the existing pipeline ROW to the Texas City terminal. The new construction would have no effect on bald eagles because the area currently is disturbed by the existing ROW from ongoing maintenance activities (mowing and tree trimming). As a result, eagles that would frequent the area would be tolerant of human disturbances.

Operation and Maintenance Impacts

Operation and maintenance activities at the site and at the RWI may affect foraging bald eagles because they are sensitive to human noise and interference (USFWS 1983; USFWS 1995). At the RWI, DOE would downshield lights to minimize the impacts of artificial lighting and use noise attenuation barriers to minimize the impact to wildlife, including bald eagles. But for the pipeline ROW, the pipelines would be a static structure and would not produce noise that would disturb the eagles. Maintenance activities along the ROW and at the RWI structure would be infrequent and minor. In addition, the crude oil pipeline would be constructed in an existing pipeline ROW; therefore, operation and maintenance activities for this element of the proposed action would closely resemble existing conditions, and would have no effect on foraging or nesting bald eagles.

H.4.1.1.3 Brown Pelican

The brown pelican has been recorded in both Brazoria and Galveston Counties in Texas (TPWD 2005). Brown pelicans are found almost exclusively in coastal areas where they feed in shallow estuarine waters; thus, the elements most likely to affect brown pelicans are the RWI structure, the brine disposal pipeline

ROW to the Gulf of Mexico, and brine discharge. Most of the known breeding nests for brown pelicans in Texas are south of Brazoria County in Corpus Christi Bay, Sundown Island, Matagorda Bay, and Aransas Bay (TPWD 2005). There are no known nesting sites for brown pelicans in the proposed Stratton Ridge site development areas; however, the habitat near the RWI structure and along the proposed brine pipeline ROW is suitable, particularly because the ROW crosses the Brazoria National Wildlife Refuge that provides isolated coastal wetlands habitat for many birds. Part of the brown pelican population spends the nonbreeding and breeding seasons along the Texas coast.

Construction Impacts

No known brown pelican nests are located near the proposed location for the RWI structure or the brine disposal pipeline ROW. In addition, the brine disposal pipeline would be directionally drilled under the beach into the Gulf of Mexico, and total area of construction would be relatively small compared to the entire area available for feeding brown pelicans. Therefore, it is expected that the proposed Stratton Ridge site development would have no effect on the brown pelican species.

Operation and Maintenance Impacts

Operation and maintenance of the proposed Stratton Ridge site would have no effect on brown pelicans because there are no known nests nearby. For the pipeline ROW, the pipeline would be a static structure and would not produce noise that would disturb the pelicans. Maintenance activities along the ROW and at the RWI structure would be infrequent and minor.

H.4.1.1.4 Eskimo Curlew

In the past, the Eskimo curlew has been recorded in Galveston County where the crude oil distribution pipeline would be built along an existing ROW to the Texas City terminal. Historically, the Eskimo curlew migrated through Texas in early March, but it did not breed there. The species is thought to be extinct, and the last sightings in Texas occurred in 1987 (Gollop 1988). Because this species is not known to currently inhabit the area, construction, operation, and maintenance of the crude oil distribution pipeline for the Stratton Ridge development would have no effect on Eskimo curlew.

H.4.1.1.5 Piping Plover

The piping plover has been recorded in both Brazoria and Galveston Counties. All of the proposed development for the Stratton Ridge site would take place within these counties; however, only the brine disposal pipeline ROW and the RWI structure potentially would affect habitat suitable for the piping plover. The ROW for the brine and RWI pipelines would be directionally drilled under the ICW and the brine pipeline would be directionally drilled under the beach into the Gulf of Mexico.

Construction Impacts

More than 35 percent of the known piping plover population winters along the Texas coast from mid-July until early May, and some birds can be found in Texas year round (TPWD 2005). Several areas along the coast in Brazoria and Galveston Counties have been designated as critical habitat (see section H.2.1.5); however, the proposed route of the brine pipeline ROW does not intersect with any of these areas. The brine pipeline ROW would be located more than 6 miles (10 kilometers) northeast of critical habitat Unit TX-33 and more than 11 miles (18 kilometers) southwest of critical habitat Unit TX-34. Because the ROW falls between these two habitats and the brine pipeline would be directionally drilled under the beach to the Gulf of Mexico, there would be no effect on the piping plover from construction of the brine

disposal pipeline and RWI structure. The RWI structure would be located adjacent to the ICW, which is not considered suitable habitat for the piping plover.

Operation and Maintenance Impacts

If any piping plovers feed in the area, the pipeline operation would have no effect on the birds, their behavior, or the quality of their habitat. The pipeline would be a static structure, and it would not produce noise that would disturb the plovers. Maintenance activities along the ROW and at the RWI structure would be infrequent and minor. Overall, operations and maintenance would have no effect on piping plovers.

H.4.1.1.6 Whooping Crane

The whooping crane migratory population winters on the Gulf Coast of Texas, but it does not breed there. Suitable habitats for nonbreeding whooping cranes include herbaceous wetlands, lagoons, and tidal flats. The only wild self-sustaining population of the whooping crane in Texas is known to winter in and around the Aransas National Wildlife Refuge, which is in Aransas County more than 100 miles (160 kilometers) southwest of the proposed Stratton Ridge site (TPWD 2005). However, it is possible that some whooping cranes could potentially winter in Brazoria County and other counties nearby. Woodrow (2005) of TPWD noted that there are occurrences of whooping cranes within 1.5 miles (2.4 kilometers) of the proposed Stratton Ridge pipeline ROWs.

Construction Impacts

The RWI structure, the RWI and brine disposal pipelines ROW, the power line ROW to the RWI structure, and the crude oil distribution pipeline ROW all would be located within Brazoria County and could be sited in areas amenable to whooping crane habitat. Whooping cranes often occupy and defend discrete territories, so it would be possible to identify whether whooping crane winter habitats are near construction sites for the proposed Stratton Ridge project. Because the cranes do not nest in Texas, construction would disrupt only a small portion of feeding area at a time. Because power lines would be buried through the Brazoria National Wildlife Refuge, construction would have no effect on the species.

Operation and Maintenance Impacts

Because whooping cranes do not nest in Texas and may only infrequently use the surrounding habitat, the operation and maintenance of the site, RWI structure, and pipeline ROWs would have no effect on the birds, their behavior, or the quality of their habitat. The pipelines would be static structures and would not produce noise that would disturb the cranes. Maintenance activities would be infrequent and minor.

H.4.1.2 Marine Mammals

The construction of the brine disposal pipeline and the operation of the brine disposal system would have no effect on the Gervais beaked whale, goose-beaked whale, pygmy sperm whale, dwarf sperm whale, sperm whale, rough-toothed dolphin, killer whale, false killer whale, short-finned pilot whale, and the pygmy killer whale. These species are found in deeper waters than the terminus of the offshore pipelines and brine diffuser contours (see Appendix C, Brine Plume Modeling). The brine diffuser for the Stratton Ridge site would be located at a depth of 30 feet (9 meters).

Discussion follows on potential impacts on the Atlantic spotted dolphin, the West Indian manatee, and the bottlenose dolphin.

H.4.1.2.1 Atlantic Spotted Dolphin

The Atlantic spotted dolphin is a tropical species that can be found in a variety of areas through the Gulf of Mexico. It ranges from coastal to pelagic environments, typically over the continental shelf and slope. The Atlantic spotted dolphin is usually associated with the Gulf Stream.

Construction Impacts

The Atlantic spotted dolphin species is usually found in deeper waters than the extent of the brine disposal system and brine diffuser, but it is known to venture into shallower waters. The species would likely avoid or leave any areas of construction, and return after construction was complete. There would be no effect on the Atlantic spotted dolphin because of the limited construction time and the relatively small area of the Gulf of Mexico that would be impacted.

Operation Impacts

The Atlantic spotted dolphin may occur in the location of the brine diffuser; however, it is unlikely that the species would remain in the area for an extended period. Because the dissipation of the brine would occur in a relatively small area of the Gulf of Mexico (see Appendix C, Brine Plume Modeling) and the species would not be restricted to such areas, there would be no effect on the Atlantic spotted dolphin.

H.4.1.2.2 West Indian Manatee

The West Indian manatee, also known as the Florida manatee, is found in the warm, coastal and inland waters where it feeds. The manatee typically does not extend beyond the borders of Florida and Alabama, but sometimes it can be found along the entire Gulf of Mexico coastline.

Construction Impacts

The West Indian manatee rarely is found off the coast of Texas or in coastal inland water including the ICW. The species likely would avoid or leave any areas of construction, and return after construction was complete. There would be no effect on the West Indian manatee because it is rarely off the coast of Texas, the limited construction time, and the relatively small area of the Gulf of Mexico that would be impacted.

Operation Impacts

The West Indian manatee is rarely found off the coast of Texas or in coastal inland water including the ICW. The operation of the RWI would not affect the West Indian manatee. There would be no effect on the West Indian manatee because it is rarely off the coast of Texas, the dissipation of the brine would occur in a relatively small area of the Gulf of Mexico, and the species would not be restricted to such areas.

H.4.1.2.3 Bottlenose Dolphin

The bottlenose dolphin (*Tursiops truncatus*) typically can be found in coastal or offshore waters. In the coastal environment, the bottlenose dolphin can be found in warm, shallow inshore waters of bays and rivers. When offshore, it is usually in deep waters over the continental shelf and slope.

Construction Impacts

The bottlenose dolphin may be affected by the construction of the RWI and the brine disposal pipelines for the proposed Stratton Ridge site because it can be found in both onshore and offshore environments. The disturbance created by the construction of the RWI likely would keep the bottlenose dolphin from the immediate area, but it could return after construction was complete. The construction of the brine disposal pipeline and diffuser would create a disturbance that would keep the dolphin from the immediate area, but it would not harm the dolphin.

Operation Impacts

The bottlenose dolphin would not be adversely affected by the operation of the RWI or the brine disposal system. The intake for the raw water would create a slight current (less than 0.5 feet [0.15 meters] per second) that the dolphin could easily avoid. The operation of the brine diffusers offshore for the Stratton Ridge site would not affect the bottlenose dolphin. The dissipation of the concentrated brine would allow for ambient or near-ambient conditions to exist in a short distance. The bottlenose dolphin most likely would avoid the area directly adjacent to the diffuser ports, but this area would be limited in size compared to the area of the Gulf where they would feed.

H.4.1.3 Reptiles

H.4.1.3.1 Atlantic Hawksbill Sea Turtle

The Atlantic hawksbill sea turtle nests from May to November on sandy beaches, often in the proximity of coral reefs. The turtle is seen occasionally in Texas, including coastal areas of Brazoria and Galveston Counties, but more commonly in more tropical waters. The brine disposal pipeline would be the only element of the proposed Stratton Ridge site development with a potential to affect this species.

Construction Impacts

Construction of the brine disposal pipeline onshore would have no effect on this species because directional drilling would be used for the pipeline in the area where it would pass under the beach to the Gulf of Mexico. Offshore pipeline construction temporarily would disturb potential feeding habitat for the Atlantic hawksbill sea turtle; however, the total area affected would be a small portion of the total available area of suitable habitat, and there would be no effect.

Operation and Maintenance Impacts

Operation and maintenance of the onshore portion of the brine disposal pipeline would not affect the Atlantic hawksbill sea turtle because the pipeline would be buried. Operation of the offshore component of the brine disposal system would have no effect on the sea turtle's feeding and habitat because the dissipation of the concentrated brine would allow for ambient or near-ambient conditions to exist in a short distance (see Appendix E, Essential Fish Habitat). Maintenance of the pipeline offshore would be infrequent, and it would not affect the Atlantic hawksbill sea turtle.

H.4.1.3.2 Green Sea Turtle

The green sea turtle nest from March to October in tidal flats, pelagic zones, and isolated sand dunes. The turtle is seen occasionally in Texas, including coastal areas of Brazoria and Galveston Counties, but more commonly in more tropical waters. The brine disposal pipeline would be the only element of the proposed Stratton Ridge development with a potential to affect this species.

Construction Impacts

Construction of the brine disposal pipeline onshore would have no effect on this species because directional drilling would be used for the pipeline in the area where it would pass under the beach to the Gulf of Mexico. Offshore pipeline construction temporarily would disturb potential feeding habitat for the green sea turtle; however, the total area affected would be a small portion of the total available area of suitable habitat, and there would be no effect on the species.

Operation and Maintenance Impacts

Operation and maintenance of the onshore portion of the brine disposal pipeline would not affect the green sea turtle because the pipeline would be buried. Operation of the offshore component of the brine disposal system would have no effect on the sea turtle's feeding and habitat because the dissipation of the concentrated brine would allow for ambient or near-ambient conditions to exist in a short distance (see Appendix E, Essential Fish Habitat). Maintenance of the pipeline offshore would be infrequent, and it would not affect the green sea turtle.

H.4.1.3.3 Kemp's Ridley Sea Turtle

The Kemp's Ridley sea turtle inhabits estuarine waters of the Gulf, including coastal areas of Brazoria and Galveston Counties, with nesting occurring on coastal beaches and dunes. Woodrow (2005) of TPWD noted that the Kemp's Ridley sea turtle potentially could inhabit areas near portions of the Stratton Ridge development. The brine disposal pipeline would be the only element of the proposed Stratton Ridge site development with a potential to affect this species.

Construction Impacts

Construction of the brine disposal pipeline onshore would not affect this species because directional drilling would be used for the pipeline, and it would pass under the beach to the Gulf of Mexico. Offshore pipeline construction temporarily would disturb potential feeding habitat for the Kemp's Ridley sea turtle; however, the total area affected would be a small portion of the total available area of suitable habitat, and there would be no effect.

Operation and Maintenance Impacts

Operation and maintenance of the onshore portion of the brine disposal pipeline would not affect the Kemp's Ridley sea turtle because the pipeline would be buried. Operation of the offshore component of the brine disposal system would have no effect on the sea turtle's feeding and habitat because the dissipation of the concentrated brine would allow for ambient or near-ambient conditions to exist in a short distance (see Appendix E, Essential Fish Habitat). Maintenance of the pipeline offshore would be infrequent, and it would not affect the Kemp's Ridley sea turtle.

H.4.1.3.4 Leatherback Sea Turtle

The leatherback sea turtle inhabits open ocean waters and seeks moist sand on sloping sandy beaches backed by vegetation for nesting between March and August, and it has been recorded in Brazoria and Galveston Counties. The brine disposal pipeline would be the only element of the proposed Stratton Ridge development with a potential to affect this species.

Construction Impacts

Construction of the brine disposal pipeline onshore would not affect the leatherback sea turtle because directional drilling would be used for the pipeline, and it would pass under the beach to the Gulf of Mexico. Offshore pipeline construction temporarily would disturb potential feeding habitat for the leatherback sea turtle; however, the total area affected would be a small portion of the total available area of suitable habitat, and there would be no effect.

Operation and Maintenance Impacts

Operation and maintenance of the onshore portion of the brine disposal pipeline would not affect the leatherback sea turtle because the pipeline would be buried. Operation of the offshore component of the brine disposal system would have no effect on the sea turtle's feeding and habitat because the dissipation of the concentrated brine would allow for ambient or near-ambient conditions to exist in a short distance (see Appendix E, Essential Fish Habitat). Maintenance of the pipeline offshore would be infrequent, and it would not affect the leatherback sea turtle.

H.4.1.3.5 Loggerhead Sea Turtle

The loggerhead sea turtle can be found in both open ocean waters and along the coast and in near-shore waters (such as river mouths), and it nests on Gulf Coast beaches, including those of Brazoria and Galveston Counties. The brine disposal pipeline would be the only element of the proposed Stratton Ridge site development with a potential to affect this species.

Construction Impacts

Construction of the brine disposal pipeline onshore would not affect the loggerhead sea turtle because directional drilling would be used for the pipeline and it would pass under the beach to the Gulf of Mexico. Offshore pipeline construction would temporarily disturb potential feeding habitat for the loggerhead sea turtle. However, the total area affected would be a small portion of the total available area of suitable habitat, and there would be no effect.

Operation and Maintenance Impacts

Operation and maintenance of the onshore portion of the brine disposal pipeline would not affect the loggerhead sea turtle because the pipeline would be buried. Operation of the offshore component of the brine disposal system would have negligible impact on the sea turtle's feeding and habitat because the dissipation of the concentrated brine would allow for ambient or near-ambient conditions to exist in a short distance (see Appendix E, Essential Fish Habitat). Maintenance of the pipeline offshore would be infrequent and would not affect the loggerhead sea turtle.

H.4.2 Big Hill, Texas

This assessment for the proposed Big Hill expansion site evaluates the potential effects on threatened, endangered, and candidate species by each of the elements of the proposed site expansion listed in table H.4.2-1.

The following paragraphs describe the evaluation findings for each species that could result from the elements of the proposed action at the Big Hill site expansion.

Table H.4.2-1: Elements of the Proposed Action and Location at the Proposed Big Hill Expansion Site

Element of Proposed Action	Location by County or Offshore Area
Big Hill candidate site	Jefferson
Oil distribution pipeline ROW from Big Hill to the Sun Terminal in Nederland	Jefferson
Brine disposal pipeline ^a ROW	Jefferson
Offshore brine pipeline and diffuser	Gulf of Mexico

^a Only 7,000 feet (2,130 meters) of the brine disposal pipeline, starting from where it leaves the site, would be replaced.

H.4.2.1 Bird

The piping plover is known to inhabit Jefferson County, and the species uses beaches, mudflats, and sandflats on the Gulf of Mexico and the ICW for feeding but not nesting. The proposed expansion development would not be located in this type of habitat; therefore, construction, operation, and maintenance activities associated with the Big Hill expansion would have no effect on the piping plover.

H.4.2.2 Marine Mammals

The operation of the brine disposal system would have no effect on the Gervais beaked whale, goose-beaked whale, pygmy sperm whale, dwarf sperm whale, sperm whale, rough-toothed dolphin, killer whale, false killer whale, short-finned pilot whale, or the pygmy killer whale. These species are found in deeper waters than the brine diffuser contours (see Appendix C, Brine Plume Modeling).

The next paragraphs describe potential impacts on the Atlantic spotted dolphin and the West Indian manatee.

H.4.2.2.1 Atlantic Spotted Dolphin

The Atlantic spotted dolphin is a tropical species that can be found in a variety of areas through the Gulf of Mexico. This dolphin ranges from coastal to pelagic environments, typically over the continental shelf and slope. The Atlantic spotted dolphin is usually associated with the Gulf Stream.

Construction Impacts

No offshore construction is associated with the proposed Big Hill expansion; therefore, there would be no effect to the Atlantic spotted dolphin.

Operation Impacts

The Atlantic spotted dolphin may occur in the location of the brine diffusion; however, it is unlikely that the species would remain in the area for an extended period. Because the dissipation of the brine would occur in a relatively small area of the Gulf of Mexico and the species would not be restricted to such areas, there would be no effect on the Atlantic spotted dolphin.

H.4.2.2.2 West Indian Manatee

The West Indian manatee, also known as the Florida manatee, is found in the warm, coastal and inland waters where it feeds. The manatee typically does not extend beyond the borders of Florida and Alabama, but sometimes it is found along the entire coast of the Gulf of Mexico.

Construction Impacts

No offshore construction is associated with the proposed Big Hill expansion; therefore, there would be no effect to the West Indian manatee.

Operation Impacts

The West Indian manatee is rarely found off the coast of Texas or in coastal inland water including the ICW. The operation of the RWI would not affect the West Indian manatee. There would be no effect on the West Indian manatee because it rarely occurs off the coast of Texas, the dissipation of the brine would occur in a relatively small area of the Gulf of Mexico, and the species would not be restricted to such areas.

H.4.2.2.3 Bottlenose Dolphin

The bottlenose dolphin (*Tursiops truncatus*) typically can be found in coastal or offshore waters. In the coastal environment, the bottlenose dolphin can be found in warm, shallow inshore waters of bays and rivers. When offshore, it is usually in deep waters over the continental shelf and slope.

Construction Impacts

No offshore construction is associated with the proposed Big Hill expansion; therefore, there would be no effect to the bottlenose dolphin.

Operation Impacts

The operation of the brine diffusers offshore for the Big Hill site would not impact the bottlenose dolphin. The dissipation of the concentrated brine would allow for ambient or near-ambient conditions to exist in a short distance. The bottlenose dolphin most likely would avoid the area directly adjacent to the diffuser ports, but this area would be limited in size compared to the area of the Gulf where the species would feed.

H.4.2.3 Reptiles

H.4.2.3.1 Atlantic Hawksbill Sea Turtle

The Atlantic hawksbill turtle nests from May to November on sandy beaches, often in the proximity of coral reefs. The turtle is occasionally seen in Texas, including Jefferson County, but more commonly it is found in more tropical waters. None of the new development for the expansion of the Big Hill site would be located in this type of habitat; therefore, construction of the Big Hill expansion would have no effect on the Atlantic hawksbill sea turtle. Operation of the offshore component of the brine disposal system would result in a brine plume; however, the plume would have no effect on the sea turtle's feeding and habitat because the dissipation of the concentrated brine would allow for ambient or near-ambient conditions to exist in a short distance (see Appendix E, Essential Fish Habitat).

H.4.2.3.2 Green Sea Turtle

The green sea turtle nests from March to October in tidal flats, pelagic zones, and isolated sand dunes. The turtle is occasionally seen in Texas, including Jefferson County, but more commonly it is found in more tropical waters. No new development would be required for the expansion of the Big Hill site in this type of habitat; therefore, construction of the Big Hill expansion would have no effect on the green sea turtle. Operation of the offshore component of the brine disposal system would result in a brine plume; however, the plume would have no effect on the sea turtle's feeding and habitat because the dissipation of the concentrated brine would allow for ambient or near-ambient conditions to exist in a short distance (see Appendix E, Essential Fish Habitat).

H.4.2.3.3 Kemp's Ridley Sea Turtle

The Kemp's Ridley sea turtle inhabits estuarine waters of the Gulf Coast, including coastal areas of Jefferson County, with nesting occurring on coastal beaches and dunes. No new development for the expansion of the Big Hill site would be located in this type of habitat; therefore, construction of the Big Hill expansion would have no effect on the Kemp's Ridley sea turtle. Operation of the offshore component of the brine disposal system would result in a brine plume; however, the plume would have no effect on the sea turtle's feeding and habitat because the dissipation of the concentrated brine would allow for ambient or near-ambient conditions to exist in a short distance (see Appendix E, Essential Fish Habitat).

H.4.2.3.4 Leatherback Sea Turtle

The leatherback sea turtle inhabits open ocean waters and seeks moist sand on sloping sandy beaches backed by vegetation for nesting between March and August. The turtle is found along the Gulf, including coastal areas of Jefferson County. No new development for the expansion of the Big Hill site would be located in this type of habitat; therefore, construction of the Big Hill expansion would have no effect on the leatherback sea turtle. Operation of the offshore component of the brine disposal system would result in a brine plume; however, the plume would have no effect on the sea turtle's feeding and habitat because the dissipation of the concentrated brine would allow for ambient or near-ambient conditions to exist in a short distance (see Appendix E, Essential Fish Habitat).

H.4.2.3.5 Loggerhead Sea Turtle

The loggerhead sea turtle may nest Gulf Coast beaches, including those of Jefferson County. No new development for the expansion of the Big Hill site would be located in this type of habitat; therefore, construction of the Big Hill expansion would have no effect on the loggerhead sea turtle. Operation of the offshore component of the brine disposal system would result in a brine plume; however, the plume would have no effect on the sea turtle's feeding and habitat because the dissipation of the concentrated brine would allow for ambient or near-ambient conditions to exist in a short distance (see Appendix E, Essential Fish Habitat).

H.4.3 Assessment Summary for the Stratton Ridge and Big Hill Sites

Tables H.4.3-1 through H.4.3-4 identify the threatened, endangered, and candidate species that may be affected by each element the proposed new Stratton Ridge site and proposed expansion of the Big Hill site. DOE estimated the potential for effects based on information about the presence or absence of the species and suitable habitat in areas that would be affected by development. The evaluation also considered the potential mitigation factors. Tables H.4.3-1 and H.4.3-3 identify whether construction

Table H.4.3-1: Summary of Potential Construction-Related Impacts on Threatened and Endangered Species at the Proposed Stratton Ridge Site

Species	SPR Storage Site	Stratton Ridge to Texas City ROW	RWI and ROW to ICW	Brine Disposal Pipeline ROW to Gulf of Mexico	Offshore Brine Diffuser Discharge
Birds					
Attwater's Greater Prairie Chicken	No effect	No effect	No effect	No effect	No effect
Bald Eagle	May affect	No effect	May affect	No effect	No effect
Brown Pelican	No effect	No effect	No effect	No effect	No effect
Eskimo Curlew	No effect	No effect	No effect	No effect	No effect
Piping Plover	No effect	No effect	No effect	No effect	No effect
Whooping Crane	No effect	No effect	No effect	No effect	No effect
Marine Mammals					
Gervais Beaked Whale	No effect	No effect	No effect	No effect	No effect
Goose-Beaked Whale	No effect	No effect	No effect	No effect	No effect
Pygmy Sperm Whale	No effect	No effect	No effect	No effect	No effect
Dwarf Sperm Whale	No effect	No effect	No effect	No effect	No effect
Sperm Whale	No effect	No effect	No effect	No effect	No effect
Atlantic Spotted Dolphin	No effect	No effect	No effect	No effect	No effect
Rough-Toothed Dolphin	No effect	No effect	No effect	No effect	No effect
Killer Whale	No effect	No effect	No effect	No effect	No effect
False Killer Whale	No effect	No effect	No effect	No effect	No effect
Short-Finned Pilot Whale	No effect	No effect	No effect	No effect	No effect
Pygmy Killer Whale	No effect	No effect	No effect	No effect	No effect
West Indian Manatee	No effect	No effect	No effect	No effect	No effect
Bottlenose Dolphin	No effect	No effect	No effect	No effect	No effect
Reptiles					
Atlantic Hawksbill Sea Turtle	No effect	No effect	No effect	No effect	No effect
Green Sea Turtle	No effect	No effect	No effect	No effect	No effect
Kemps Ridley Sea Turtle	No effect	No effect	No effect	No effect	No effect
Leatherback Sea Turtle	No effect	No effect	No effect	No effect	No effect
Loggerhead Sea Turtle	No effect	No effect	No effect	No effect	No effect

Table H.4.3-2: Summary of Potential Operation and Maintenance Impacts to Affect Threatened and Endangered Species at the Proposed Stratton Ridge Site

Species	SPR Storage Site	Stratton Ridge to Texas City ROW	RWI and ROW to ICW	Brine Disposal Pipeline ROW to Gulf of Mexico	Offshore Brine Diffuser Discharge
Birds					
Attwater's Greater Prairie Chicken	No effect	No effect	No effect	No effect	No effect
Bald Eagle	May affect	No effect	May affect	No effect	No effect
Brown Pelican	No effect	No effect	No effect	No effect	No effect
Eskimo Curlew	No effect	No effect	No effect	No effect	No effect
Piping Plover	No effect	No effect	No effect	No effect	No effect
Whooping Crane	No effect	No effect	No effect	No effect	No effect
Marine Mammals					
Gervais Beaked Whale	No effect	No effect	No effect	No effect	No effect
Goose-Beaked Whale	No effect	No effect	No effect	No effect	No effect
Pygmy Sperm Whale	No effect	No effect	No effect	No effect	No effect
Dwarf Sperm Whale	No effect	No effect	No effect	No effect	No effect
Sperm Whale	No effect	No effect	No effect	No effect	No effect
Atlantic Spotted Dolphin	No effect	No effect	No effect	No effect	No effect
Rough-Toothed Dolphin	No effect	No effect	No effect	No effect	No effect
Killer Whale	No effect	No effect	No effect	No effect	No effect
False Killer Whale	No effect	No effect	No effect	No effect	No effect
Short-Finned Pilot Whale	No effect	No effect	No effect	No effect	No effect
Pygmy Killer Whale	No effect	No effect	No effect	No effect	No effect
West Indian Manatee	No effect	No effect	No effect	No effect	No effect
Bottlenose Dolphin	No effect	No effect	No effect	No effect	No effect
Reptiles					
Atlantic Hawksbill Sea Turtle	No effect	No effect	No effect	No effect	No effect
Green Sea Turtle	No effect	No effect	No effect	No effect	No effect
Kemps Ridley Sea Turtle	No effect	No effect	No effect	No effect	No effect
Leatherback Sea Turtle	No effect	No effect	No effect	No effect	No effect
Loggerhead Sea Turtle	No effect	No effect	No effect	No effect	No effect

Table H.4.3-3: Summary of Potential of Construction-Related Impacts on Threatened and Endangered Species at Proposed Big Hill Expansion Site

Species	SPR Storage Site	Big Hill Site to Shell Crude Oil Pipeline ROW	Brine Disposal Pipeline ROW	Brine Diffuser Discharge
Bird				
Piping Plover	No effect	No effect	No effect	No effect
Marine Mammals				
Gervais Beaked Whale	No effect	No effect	No effect	No effect
Goose-Beaked Whale	No effect	No effect	No effect	No effect
Pygmy Sperm Whale	No effect	No effect	No effect	No effect
Dwarf Sperm Whale	No effect	No effect	No effect	No effect
Sperm Whale	No effect	No effect	No effect	No effect
Atlantic Spotted Dolphin	No effect	No effect	No effect	No effect
Rough-Toothed Dolphin	No effect	No effect	No effect	No effect
Killer Whale	No effect	No effect	No effect	No effect
False Killer Whale	No effect	No effect	No effect	No effect
Short-Finned Pilot Whale	No effect	No effect	No effect	No effect
Pygmy Killer Whale	No effect	No effect	No effect	No effect
West Indian Manatee	No effect	No effect	No effect	No effect
Bottlenose Dolphin	No effect	No effect	No effect	No effect
Reptiles				
Atlantic Hawksbill Sea Turtle	No effect	No effect	No effect	No effect
Green Sea Turtle	No effect	No effect	No effect	No effect
Kemps Ridley Sea Turtle	No effect	No effect	No effect	No effect
Leatherback Sea Turtle	No effect	No effect	No effect	No effect
Loggerhead Sea Turtle	No effect	No effect	No effect	No effect

Table H.4.3-4: Summary of Potential Operation and Maintenance Impacts to Threatened and Endangered Species from Proposed Big Hill Site Expansion

Species	SPR Storage Site	Big Hill Site to Shell Crude Oil Pipeline ROW	Brine Disposal Pipeline ROW	Brine Diffuser Discharge
Bird				
Piping Plover	No effect	No effect	No effect	No effect
Marine Mammals				
Gervais Beaked Whale	No effect	No effect	No effect	No effect
Goose-Beaked Whale	No effect	No effect	No effect	No effect
Pygmy Sperm Whale	No effect	No effect	No effect	No effect
Dwarf Sperm Whale	No effect	No effect	No effect	No effect
Sperm Whale	No effect	No effect	No effect	No effect
Atlantic Spotted Dolphin	No effect	No effect	No effect	No effect
Rough-Toothed Dolphin	No effect	No effect	No effect	No effect
Killer Whale	No effect	No effect	No effect	No effect
False Killer Whale	No effect	No effect	No effect	No effect
Short-Finned Pilot Whale	No effect	No effect	No effect	No effect
Pygmy Killer Whale	No effect	No effect	No effect	No effect
West Indian Manatee	No effect	No effect	No effect	No effect
Bottlenose Dolphin	No effect	No effect	No effect	No effect
Reptiles				
Atlantic Hawksbill Sea Turtle	No effect	No effect	No effect	No effect
Green Sea Turtle	No effect	No effect	No effect	No effect
Kemps Ridley Sea Turtle	No effect	No effect	No effect	No effect
Leatherback Sea Turtle	No effect	No effect	No effect	No effect
Loggerhead Sea Turtle	No effect	No effect	No effect	No effect

activities for each site may affect species. Tables H.4.3-2 and H.4.3-4 summarize whether operation and maintenance activities for each site may affect species.

Table H.4.3-5 summarizes the number of species that would be affected by construction or operations and maintenance for both of the sites in Texas. This summary shows that with the current information, only one species (the bald eagle) may be affected by the construction and operation of the proposed new Stratton Ridge site, and no species would be affected by the proposed expansion of the Big Hill site.

Table H.4.3-5: Summary of the Number of Species Potentially Affected

Potential for Effect	Number of Species			
	Stratton Ridge, Texas		Big Hill, Texas	
	Construction	Operation and Maintenance	Construction	Operation and Maintenance
No effect	23	23	19	19
May affect	1	1	0	0

H.5 RECOMMENDATIONS

The evaluation of potential impacts described in section H.4 considered how some potential impacts could be minimized, avoided, or more accurately forecasted by the use of preconstruction field investigations, mitigation measures, and other precautionary measures. The following recommendations summarize the types of measures identified in section H.4 that would lessen the potential for effects caused by the development of the proposed new and expansion SPR sites in Texas. Additional measures may be identified during detailed planning if DOE were to select one of the Stratton Ridge alternatives or any alternative other than the no-action alternative, in which case the Big Hill site would be expanded.

H.5.1 Recommendations for Stratton Ridge, Texas

- Conduct a preconstruction survey to identify bald eagle nests within 0.25 miles (0.4 kilometers) of the proposed Stratton Ridge site and the proposed ROW from the site to the Gulf of Mexico for the RWI and brine disposal pipelines and power lines in Brazoria County, Texas. If any nests are found, consult with the USFWS and TPWD and implement appropriate mitigation strategies. For example, construction of the pipeline could be completed to avoid the time when nesting bald eagles are particularly sensitive to human activity. If nests or active foraging are identified near the proposed RWI structure, DOE would use noise attenuation measures such as concrete enclosures for the pumps and installation of quieter pump equipment.
- Coordinate with USFWS and TPWD if any protected species are observed or suitable habitat is determined to be present onsite.
- Use directional drilling in all beach crossings to avoid affecting sea turtles and sea birds that use the beaches.

H.5.2 Recommendations for Big Hill, Texas

Coordinate with USFWS and TPWD if any protected species are observed or suitable habitat is determined to be present onsite.

REFERENCES

- American Ornithologists' Union (AOU). 1983. "Check-list of North American Birds." 6th Edition. Allen Press, Inc. Lawrence, KS. (As cited in NatureServe 2005).
- Anderson, D.W. and J.J. Hickey. 1970. "Oological data on egg and breeding characteristics of brown pelicans." *The Wilson Bulliton*. 82(1): 14–28. (As cited in NatureServe 2005).
- Bailey, R.G. "Descriptions of the Ecoregions of the United States." United States Forest Service. Accessed December 16, 2005, at http://www.fs.fed.us/institute/ecoregions/ecoreg1_home.html
- Buehler, D.A. 2000. "Bald Eagle (*Haliaeetus leucocephalus*)." In: *The Birds of North America No. 506*. A. Poole and F. Gill (editors). The Birds of North America, Inc., Philadelphia, PA. Accessed at http://ecos.fws.gov/docs/life_histories/B008.html
- Chapman, S.S, G.E. Griffith, J.M. Omernik, J.A. Comstock, M.C. Beiser, and D. Johnson. 2004. Ecoregions of Mississippi, (color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia, U.S. Geological Survey (map scale 1:1,000,000).
- Committee on Sea Turtle Conservation (CSTC), National Research Council (U.S.). 1990. "Decline of the Sea Turtles: Causes and Prevention." National Academy Press, Washington, D.C. (As cited in NatureServe 2005).
- Conant, R. and J.T. Collins. 1991. *A field guide to reptiles and amphibians: eastern and central North America*. Third edition. Houghton Mifflin Co. Boston, MA. (As cited in NatureServe 2005).
- Dodd, C.K. 1992. "Loggerhead sea turtle *CARETTA CARETTA* (Linnaeus)." In: *Rare and endangered biota of Florida. Vol. III. Amphibians and reptiles*. P.E. Moler (editor). University Press of Florida. (As cited in NatureServe 2005).
- Dodd, C.K., Jr. 1988. "Synopsis of the biological data on the loggerhead sea turtle *CARETTA CARETTA* (Linnaeus 1758)." *U.S. Fish and Wildlife Service, Biological Report*. 88(14). (As cited in NatureServe 2005).
- Dunning, J.B., Jr. 1993. "CRC handbook of avian body masses." Boca Raton. CRC Press. (As cited in NatureServe 2005).
- Eckert, S.A. March 1992. "Bound for deep water." *Natural History*. pp 28–35. (As cited in NatureServe 2005).
- Ehrhart, L.M. and B.E. Witherington. 1992. "Green turtle *CHELONIA MYDAS* (Linnaeus)." In: *Rare and endangered biota of Florida. Vol. III. Amphibians and reptiles*. P.E. Moler (editor). Univ. Press of Florida. (As cited in NatureServe 2005).
- Gollop, J.B., T.W. Barry, and E.H. Iverson. 1986. "Eskimo Curlew: A Vanishing Species?" *Special Publication No. 17*. Regina, Saskatchewan. Saskatchewan Natural History Society. (As cited in NatureServe 2005).
- Gollop, J.B. 1988. "The Eskimo Curlew." In: *Audubon Wildlife Report 1988/1989*. W. J. Chandler (editor). Academic Press, Inc., New York. (As cited in NatureServe 2005).
- Harrison, C. 1978. "A Field Guide to the Nests, Eggs and Nestlings of North American Birds." Collins. Cleveland, Ohio. (As cited in NatureServe 2005)

- Horkel, J. D. 1979. "Cover and space requirements of Attwater's prairie chicken (TYMPANUCHUS CUPIDO ATTWATERI) in Refugio County, Texas." Ph.D. Thesis. Texas A&M University. College Station, TX. 96 pp. (As cited in NatureServe 2005).
- Hunt, H.E. and R.D. Slack. 1989. "Winter diets of whooping and sandhill cranes in south Texas." *J. Wildlife Management*. 53:1150–1154. (As cited in NatureServe 2005).
- James, C. 2005. Communication to Donald Silawsky. 10/20/2005. Curtis B. James, Assistant Field Supervisor, U.S. Fish and Wildlife Service, Mississippi Field Office, Jackson, MS.
- Johnsgard, P.A. 1991. "Crane music: a natural history of American cranes." Smithsonian Institution Press, Washington, D.C. (As cited in NatureServe 2005).
- Johnson, S.R. and D.R. Herter. 1989. "The Birds of the Beaufort Sea." BP Exploration (Alaska) Inc., Anchorage, AK. (As cited in NatureServe 2005).
- Lund, P.F. 1985. "Hawksbill turtle (ERETMOCHELYS IMBRICATA) Nesting on the East Coast of Florida." *J. Herpetology*. 19:164–166. (As cited in NatureServe 2005).
- Matthews, J.R. and C.J. Moseley (editors). 1990. *The Official World Wildlife Fund Guide to Endangered Species of North America. Volume 1. Plants, Mammals, Volume 2. Birds, Reptiles, Amphibians, Fishes, Mussels, Crustaceans, Snails, Insects, and Arachnids*. Beacham Publications, Inc., Washington, D.C. (As cited in NatureServe 2005).
- Meylan, A. 1992. "Hawksbill turtle (ERETMOCHELYS IMBRICATA) (Linnaeus)." In: *Rare and endangered biota of Florida. Vol. III. Amphibians and reptiles*. P.E. Moler (editor). pp 95–99. University Press of Florida. (As cited in NatureServe 2005).
- Meylan, A., B. Schroeder, and A. Mosier. 1995. "Sea turtle nesting activity in the state of Florida." *Florida Marine Research Publications*. 52:1–51. (As cited in NatureServe 2005).
- Mrosovsky, N. and J. Provancha. 1992. "Sex ratio of hatchling loggerhead sea turtles: data and estimates from a 5-year study." *Can. J. Zool*. 70:530–538. (As cited in NatureServe 2005).
- National Geographic Society (NGS). 1983. "Field guide to the birds of North America." Washington, DC. (As cited in NatureServe 2005).
- NatureServe. 2005. *NatureServe Explorer: An online encyclopedia of life [web application]*. Version 4.6. Arlington, Virginia. NatureServe. Accessed at <http://www.natureserve.org/explorer>
- Nature Conservancy. 2005. *Texas City Prairie Preserve*. Accessed at <http://nature.org/wherework/northamerica/states/texas/preserves/texascity.html>
- New York State Department of Environmental Conservation (NYDEC). 2003. "Checklist of the amphibians, reptiles, birds, and mammals of New York State, including their protective status." Nongame Unit, Wildlife Resources Center. Delmar, NY. (As cited in USFWS 2005).
- Palmer, R.S. (editor). 1962. *Handbook of North American birds. Vol. 1. Loons through flamingos*. Yale University Press, New Haven, CT. (As cited in NatureServe 2005).
- Taylor, B.L. 1992. *Population viability analysis for the Little Cumberland Island population of loggerhead turtles (CARETTA CARETTA)*. Abstract, 6th Annual Meeting of the Society for Conservation Biology, p.122. (As cited in NatureServe 2005).

Texas Parks and Wildlife Department (TPWD). “Endangered and Threatened Species.” Accessed November 2005 at <http://www.tpwd.state.tx.us/huntwild/wild/species/endang/index.phtml>

United States Fish and Wildlife Service (USFWS). 1980. “Selected vertebrate endangered species of the seacoast of the United States--the whooping crane.” (FWS/OBS-80/01.3). Slidell.

United States Fish and Wildlife Service (USFWS). 1983. “Northern States Bald Eagle Recovery Plan.” In cooperation with the Bald Eagle Recovery Team. Washington, D.C.

United States Department of Energy (DOE). 1992. “Draft Environmental Impact Statement on the Expansion of the Strategic Petroleum Reserve, Alabama, Louisiana, Mississippi, Texas.” (DOE/EIS-0165-D). Washington, DC.

United States Fish and Wildlife Service (USFWS). 1995. “Fact Sheet for Bald Eagle (*Haliaeetus leucocephalus*).” Accessed at http://www.fws.gov/species/species_accounts/bio_eagl.html

United States Fish and Wildlife Service (USFWS). July 10, 2001. “Endangered and Threatened Wildlife and Plants; Final Determination of Critical Habitat for Wintering Piping Plovers.” *Federal Register* 66: 36038

United States Fish and Wildlife Service (USFWS). “Threatened and Endangered Species System (TESS).” Accessed November 2005 at <http://www.fws.gov/endangered/wildlife.html>

United States Fish and Wildlife Service (USFWS). “Southwest Region Endangered Species List: Species List for Texas.” Accessed January 2006 at <http://www.fws.gov/ifw2es/endangeredspecies/lists/>

Watson, R., Supervisor, U.S. Fish and Wildlife Service, Louisiana Field Office, Lafayette, LA. October 3, 2005. Communication to Donald Silawsky.

Wibbels, T., et al. 1991. “Female-biased sex ratio of immature loggerhead sea turtles inhabiting the Atlantic coastal waters of Florida.” *Can. J. Zool.* 69: 2973–2977. (As cited in NatureServe 2005).

Woodrow, J., Director of Coastal Conservation Program, Coastal Fisheries Division, Texas Parks and Wildlife, Austin, TX. 2005. Communication to Donald Silawsky.

Wynne, Kate et al. 1999. “Guide to Marine Mammals and Turtles of the U.S. Atlantic and Gulf of Mexico.” Rhode Island Seagrant. University of Rhode Island. Narragansett, RI.