TABLES ES-1, 4-1, and 5-2(Combined and Updated):
Federally Listed Threatened and Endangered Species Occurring in San Patricio and/or Nueces Counties

Common Name	*Scientific Name*	*Federal Status*[1]	*Recommended Determination of Effect*
Birds			
Eskimo curlew	*Numenius borealis*	LE[2]	No effect
Northern aplomado falcon	*Falco femoralis septentrionalis*	LE	May affect, not likely to adversely affect
Piping plover	*Charadrius melodus*	LT	May affect, not likely to adversely affect
Red knot	*Calidris canutus rufa*	PT	May affect, not likely to adversely affect
Whooping crane	*Grus Americana*	LE	May affect, not likely to adversely affect
Yellow-billed cuckoo	*Coccyzus americanus*	PT	May affect, not likely to adversely affect
Mammals			
Ocelot	*Leopardus pardalis*	LE	No effect
Gulf coast jaguarundi	*Herpailurus yagouaroundi cacomitli*	LE	No effect
Red wolf	*Canis rufus*	LE[2]	No effect
West Indian manatee	*Trichechus manatus*	LE	May affect, not likely to adversely affect
Blue whale*	*Balaenoptera musculus*	LE	N/A
Finback whale*	*Balaenoptera physalus*	LE	N/A
Humpback whale*	*Megaptera novaeangliae*	LE	N/A
Sei whale*	*Balaenoptera borealis*	LE	N/A
Sperm whale*	*Physeter macrocephalus*	LE	N/A
Reptiles			
Atlantic hawksbill sea turtle	*Eretmochelys imbricate*	LE	May affect, not likely to adversely affect
Green sea turtle	*Chelonia mydas*	LT	May affect, not likely to adversely affect
Kemp's Ridley sea turtle	*Lepidochelys kempii*	LE	May affect, not likely to adversely affect
Leatherback sea turtle	*Dermochelys coriacea*	LE	No effect
Loggerhead sea turtle	*Caretta caretta*	LT	May affect, not likely to adversely affect
Fish			
Smalltooth sawfish	*Pristis pectinata*	LE[3]	No effect
Plants			
Slender rush-pea	*Hoffmannseggia tenella*	LE[4]	No effect
South Texas ambrosia	*Ambrosia cheiranthifolia*	LE[4]	No effect

*Not carried forward for analysis
[1]LE = Endangered, LT = Threatened, C = Candidate, PT = Proposed Threatened, DLR = Delisted and in recovery
[2]Occurs on state list, but does not occur on FWS lists for San Patricio or Nueces Counties; considered extirpated or historic
[3]Occurs on state list, but does not occur on NOAA list for Texas at: http://sero.nmfs.noaa.gov/protected_resources/section_7/threatened_endangered/Documents/texas_03052014.pdf ; considered extirpated
[4]Listed for Nueces County only; No terrestrial areas of Nueces County occur in Action Area

Potential for Occurrence and Recommended Determination of Effect for Federally Listed Species

Narrative descriptions and determinations of effects for species not included in the previous submittal are provided below and correspond with Section 5.2.3 of the Biological Assessment dated January 2014.

Eskimo Curlew

The Eskimo curlew *(Numenius borealis)* is a medium sized bird approximately 12 inches in length, and has brown feathers with white speckles on its body. The undersides of their wings have cinnamon-colored feathers, and their legs are dark green, dark brown, or dark grey-blue in color. Eskimo curlews migrate from breeding grounds in the Arctic tundra through North American prairies to wintering grounds on the Pampas grasslands of Argentina. In the U.S. their preferred habitat is large open grasslands, and historic accounts indicate that they migrated in large flocks and covered large areas of ground while feeding on insects and grasshoppers. Between, 1870 and 1890, unrestricted hunting caused a rapid decline in the Eskimo curlew population. Despite hunting restrictions imposed by the Migratory Bird Treaty Act of 1916, populations of this species never recovered, and the Eskimo curlew was listed as endangered in 1967. (TPWD, 2012b)

There is little information available about the life history of the Eskimo curlew, but they are thought to breed in the Northwest Territories, Canada and possibly westward to Alaska and Russia. They nest on the ground, usually with four eggs that hatch in late June or early July. The last record confirmed by physical evidence was collected in 1963, and only 39 potential sightings have occurred since. The reliability of these sightings is variable, and none have been confirmed by physical evidence. Recently, there have been studies that suggest that this species is now extinct. (USFWS, 2011a)

Although the USFWS does not list this species as potentially occurring in San Patricio County, the TPWD lists the Eskimo curlew on the San Patricio and Nueces County lists. Eskimo curlews are thought to have historically crossed the Gulf of Mexico to stop at tallgrass prairies before travelling northward through the midwestern United States to their breeding grounds in Canada. The nearest historic occurrence recognized by the USFWS was in Galveston County. There are no open prairie grasslands within the Action Area that would provide suitable stopover or foraging habitat for this species.

A literature review did not find any published studies or information regarding the effects of GHG emissions on Eskimo curlews. Analysis of estimated heavy metals emissions data provided in Section 2.7.2 indicates that the Project will result in insignificant contributions to atmospheric deposition, thus any bioaccumulation impacts are expected to be negligible. The deposition of nitrogen, sulfur, and particulate matter from air emissions will not exceed the SIL for the areas outside the Action Area where the species may occur, and are not expected to contribute to acidification or eutrophication of the bay. Potential water intake and wastewater discharge associated with the operation of the Project are not expected to cause direct impacts to the Eskimo curlew. The Project will provide treatment for wastewater

prior to discharge in accordance with its future NPDES permit, and discharge will be monitored to prevent toxic or thermal discharges exceeding levels considered protective of aquatic resources. Additional noise will be similar to current conditions (Section 2.6) and production of dust will be minimized during construction through the implementation of best management practices (Section 2.7).

The lack of suitable open grassland habitat coupled with the evidence that the Eskimo curlew may no longer be an extant species, makes it highly unlikely that an Eskimo curlew will utilize or pass through the Action Area or Project site. The lack of impacts and unlikelihood of occurrence of this species make the possibility of adverse impacts insignificant and discountable. Therefore a determination of "*No effect*" is recommended for this species.

Red Knot

The red knot *(Calidris canutus rufa)* is a medium sized shorebird that measures approximately 9-11 inches in length, and has a short, straight, black bill. During the breeding season, the legs are dark brown to black, and the breast and belly are a characteristic russet color that ranges from salmon-red to brick-red. Males are generally brighter shades of red, with a more distinct line through the eye. When not breeding, both sexes look alike—plain gray above and dirty white below with faint, dark streaking. (USFWS 2014a)

As with most shorebirds, the long-winged, strong-flying knots fly in groups, sometimes with other species. Red knots feed on invertebrates, especially small clams, mussels, and snails, but also crustaceans, marine worms, and horseshoe crab eggs. On the breeding grounds knots mainly eat insects. (USFWS 2014a)
The red knot lays a clutch of usually 4 eggs in June or July. Incubation last 20-25 days and juveniles can fly approximately 18 days after hatching. (NatureServe 2014a)

The red knot migrates annually between its breeding grounds in the Canadian Arctic and several wintering regions, including the Southeast United States, the Northeast Gulf of Mexico, northern Brazil, and Tierra del Fuego at the southern tip of South America. During both the northbound (spring) and southbound (fall) migrations, red knots use key staging and stopover areas to rest and feed. In North America, red knots are commonly found along sandy, gravel, or cobble beaches, tidal mudflats, salt marshes, shallow coastal impoundments and lagoons, and peat banks. (USFWS 2013a) In Texas, red knots are known to occur and potentially overwinter on Padre Island and in the Laguna Madre, feeding on coquina (dwarf surf) clams (Newstead et al. 2013). Threats to the red knot include sea level rise; coastal development; shoreline stabilization; dredging; reduced food availability at stopover areas; disturbance by vehicles, people, dogs, aircraft, and boats; and climate change. (USFWS 2014a)

Although the TPWD does not list this species as potentially occurring in San Patricio or Nueces Counties, the USFWS lists the red knot as a "Proposed Threatened" species on both county lists. Proposed species currently receive no statutory protection under the ESA, but are in a period of public comment and peer review from independent specialists that provide additional data prior to a determination on whether the species should be listed as threatened or endangered or not listed.

Potential suitable habitat within the Action Area consists of the tidal flat and coastal marsh areas along the shoreline of northern Corpus Christi Bay, especially at the mouths of the La Quinta ditch and Green Lake Ditch. Although there are no recorded occurrences of the red knot available within the Action Area, known nearby occurrences and potential overwintering areas indicate that there is potential for this species to occur in the Action Area, likely as a transiting migrant or a stopover to forage.

Vertical structures such as the DRI tower for the Project, and overhead electrical supply wires have the potential to result in avian mortality due to strikes. These strikes have been shown to occur most frequently involving migratory birds striking towers utilizing steady burning, red obstruction lights during low visibility conditions, such as night, fog, and inclement weather (Patterson 2012). Due to the slight potential for red knots to traverse the Action Area during migration, there is a low risk of incidental take of this species due to striking vertical structures associated with the Project. The potential for incidental take due to strikes will be minimized by the use of mitigation strategies that may include the use of flashing lights, down-shielding any continuous night lighting, the use of bird-diverters, and utilizing construction designs that do not necessitate guy wires .

Construction of the Project will result in the loss of tidal flat and coastal marsh along the northern shore of Corpus Christi Bay, which may present potential red knot forage areas should one occur within the Action Area. However, the construction impacts in these habitats have been minimized to a narrow utility corridor. Additionally, the loss of these areas will be mitigated by the creation of the beneficial use area south of the channel planted with seagrass and cordgrass. The creation of this shallow water habitat will result in no net loss of potential red knot habitat.

A literature review did not find any published studies or information regarding the effects of GHG emissions on red knots. In the event that any red knots were to enter the Action Area, the likely transient nature of any potential occurrence would limit exposure time to any air emissions. Analysis of estimated heavy metals emissions data provided in Section 2.7.2 indicates that the Project will result in insignificant contributions to atmospheric deposition, thus any bioaccumulation impacts are expected to be negligible. The deposition of nitrogen, sulfur, and particulate matter from air emissions will not exceed the SIL for the areas of the Action Area outside the Project site where the species may occur, and are not expected to contribute to acidification or eutrophication of the bay. Potential water intake and wastewater discharge associated with the operation of the Project are not expected to cause direct impacts to the red knot. The Project will provide treatment for wastewater prior to discharge in accordance with its future NPDES permit, and discharge will be monitored to prevent toxic discharges. Given the size of the bay compared to the potential wastewater stream, no alterations to the available assemblage of forage species would be anticipated. Additional noise will be similar to current conditions (Section 2.6) and production of dust will be minimized during construction through the implementation of best management practices (Section 2.7).

The USFWS indicated during a meeting on July 24, 2013 that they did not anticipate any adverse impacts to avian species; USFWS recommended the implementation of flashing lights on the DRI tower and bird diversion devices on structures greater than 15 feet in height to minimize potential for bird strikes. The Project will light and

mark vertical structures and has created a project-specific HSSE Plan that provides management and USFWS notification procedures in the event that protected birds are sighted during construction or operation of the Project.

There is potential for red knots to enter or utilize habitat within the Action Area for foraging or as transiting migrants. However, the minimization of risk of incidental take due to striking vertical structures associated with the Project, the limited potential for air emission exposure, limited potential for wastewater discharge to affect foraging areas, and the implementation of USFWS recommendations indicate that the potential for adverse impacts is insignificant. Additionally, the creation of the 192-acre beneficial use area may create additional habitat that could be utilized by the red knot if it were to occur. Therefore, a determination of "*May affect, but is not likely to adversely affect*" is recommended for this species.

Sprague's Pipit

The Sprague's pipit *(Anthus spragueii)* is a pale, slender sparrow-sized bird that is endemic to the North American prairie. This species is approximately 3.9 to 5.9 inches in length with buff and black streaking on the crown, nape, and underparts. The Sprague's pipit has a plain buffy face with a large eye-ring. The bill is relatively short, slender, and straight, with a blackish upper mandible. The lower mandible is pale with a blackish tip. The wings and tail have two indistinct wing-bars, and the outer tail feathers are mostly white. Juveniles are slightly smaller, but similar to adults, with black spotting rather than streaking. (USFWS 2010b)

The Sprague's pipit breeds in the north-central U.S. and Canada, and winters in the south-central U.S. and northern Mexico. They construct dome-shaped nests on the ground in which the female lays 4-5 eggs that are then incubated for 11-17 days before hatching. The Sprague's pipit feeds on insects and seeds. During migration they are often found near water, and have been observed in sunflower fields. While overwintering, they exhibit a strong preference for grasslands, and are most abundant in dense and native grasslands. They have been shown not to be found in the narrow strips of grassland remaining along agricultural field borders. (USFWS 2010b)

The TPWD and USFWS each list the Sprague's pipit as a "Candidate" species on both the San Patricio and Nueces County lists. Candidate species receive no statutory protection under the ESA, but may be proposed for listing as threatened or endangered in the future. There is limited grassland habitat within the Action Area, though much of it borders agricultural land and may not be of sufficient size to represent suitable habitat. Although there are no recorded occurrences of the Sprague's pipit available within the Action Area, known nearby occurrences and potential overwintering areas indicate that there is limited potential for this species to occur in the Action Area, likely as a transiting migrant or a stopover to forage.

Vertical structures such as the DRI tower for the Project, and overhead electrical supply wires have the potential to result in avian mortality due to strikes. These strikes have been shown to occur most frequently involving migratory birds striking towers utilizing steady burning, red obstruction lights during low visibility conditions, such as night, fog, and inclement weather (Patterson, 2012). Due to the slight potential for the Sprague's pipit to traverse the Action Area during migration,

there is a low risk of incidental take of this species due to striking vertical structures associated with the Project. The potential for incidental take due to strikes will be minimized by the use of mitigation strategies that may include the use of flashing lights, down-shielding any continuous night lighting, the use of bird-diverters, and utilizing construction designs that do not necessitate guy wires .

A literature review did not find any published studies or information regarding the effects of GHG emissions on the Sprague's pipit. In the event that any individuals were to enter the Action Area, the likely transient nature of any potential occurrence would limit exposure time to any air emissions. Analysis of estimated heavy metals emissions data provided in Section 2.7.2 indicates that the Project will result in insignificant contributions to atmospheric deposition, thus any bioaccumulation impacts are expected to be negligible. The deposition of nitrogen, sulfur, and particulate matter from air emissions will not exceed the SIL for the areas of the Action Area outside the Project site where the species may occur, and are not expected to contribute to acidification or eutrophication of the bay. Potential water intake and wastewater discharge associated with the operation of the Project are not expected to cause direct impacts to the Sprague's pipit. The Project will provide treatment for wastewater prior to discharge in accordance with its future NPDES permit, and discharge will be monitored to prevent toxic discharges. Given the size of the bay compared to the potential wastewater stream, no alterations to the available assemblage of forage species would be anticipated. Additional noise will be similar to current conditions (Section 2.6) and production of dust will be minimized during construction through the implementation of best management practices (Section 2.7).

The USFWS indicated during a meeting on July 24, 2013 that they did not anticipate any adverse impacts to avian species; USFWS recommended the implementation of flashing lights on the DRI tower and bird diversion devices on structures greater than 15 feet in height to minimize potential for bird strikes. The Project will light and mark vertical structures and has created a project-specific HSSE Plan that provides management and USFWS notification procedures in the event that protected birds are sighted during construction or operation of the Project.

There is limited potential for the Sprague's pipit to enter or utilize habitat within the Action Area for foraging or as transiting migrants. However, the lack of preferred habitat, minimization of risk of incidental take due to striking vertical structures associated with the Project, the limited potential for air emission exposure, limited potential for wastewater discharge to affect foraging areas, and the implementation of USFWS recommendations indicate that the potential for adverse impacts is insignificant.

Yellow-billed Cuckoo

Yellow-billed cuckoos reach a length of 10.5 to 12.5 inches (26 to 32 cm), with a wingspan of 17 inches (43 cm). Their lower mandible (bill) is yellow, and they have a black upper bill that curves slightly downward. Head, neck, back and upper wings are brown, with a white chin, breast and belly. They also have two columns of large white spots on the underside of their long, slender tail. Two toes point forward, the other two point backward. (TPWD 2014a)

Open woodlands with dense undergrowth, overgrown orchards and pastures, moist thickets and willow groves along stream banks are the preferred habitat of the yellow-billed cuckoo. The yellow-billed cuckoo eats insects, bird eggs, snails, small frogs, lizards, berries, and some fruit. Yellow-billed cuckoos reach sexual maturity in the spring, and mate with one partner a year. Mating season lasts from mid-April through mid-September, peaking in May. Nests are saucer-shaped and flimsy, made of twigs and lined with roots and dried leaves, 4 to 8 feet (1 to 2.5 m) above the ground. Females typically lay two to four light blue eggs, about 1.2 inches (31mm) long. If food is abundant, the cuckoos will lay more eggs, and they will sometimes use other birds' nests. Chicks hatch in nine to 11 days. The chicks are altricial (they hatch helpless, blind, and featherless). Within a week of hatching, the chicks can climb into branches and within three weeks, they can fly. (TPWD 2014a)

Yellow-billed cuckoos range throughout North, Central and South America. They migrate to North America throughout the summer months, but winter in South America. They can be seen in Texas from April through November. (TPWD 2014a) The USFWS has divided their range into two distinct population segments (DPS): the Western Yellow-billed Cuckoo DPS and Eastern Yellow-billed Cuckoo DPS. The Western DPS is currently listed as "Proposed Threatened", while the Eastern DPS has no designation. The migration patterns of this species and each DPS are not well known, and the Western DPS may intermingle with the Eastern DPS during migration and overwintering (USFWS 2013b). Proposed species currently receive no statutory protection under the ESA, but are in a period of public comment and peer review from independent specialists that provide additional data prior to a determination on whether the species should be listed as threatened or endangered or not listed.

There are discrepancies between the range of the Western Yellow-billed Cuckoo DPS in Texas. The proposed rule describes the range as "west of the Rio Grande–Pecos River watershed boundary" and does not include south Texas (USFWS 2013b). However, the USFWS website lists this species as occurring in both San Patricio and Nueces Counties, as well as other areas in South Texas (USFWS 2014b). The TPWD does not list the yellow-billed cuckoo for either county. Potential suitable habitat within the Action Area is limited to the riparian woodlands around Green Lake Ditch that will not be impacted by the construction footprint of the project. Although no documented occurrences of the yellow-billed cuckoo were available within the Action Area, there is potential for this species to occur in the Action Area, likely as a transiting migrant or a stopover to forage.

Vertical structures such as the DRI tower for the Project, and overhead electrical supply wires have the potential to result in avian mortality due to strikes. These strikes have been shown to occur most frequently involving migratory birds striking towers utilizing steady burning, red obstruction lights during low visibility conditions, such as night, fog, and inclement weather (Patterson 2012). Due to the slight potential for yellow-billed cuckoos to traverse the Action Area during migration, there is a low risk of incidental take of this species due to striking vertical structures associated with the Project. The potential for incidental take due to strikes will be minimized by the use of mitigation strategies that may include the use of flashing lights, down-shielding any continuous night lighting, the use of bird-diverters, and utilizing construction designs that do not necessitate guy wires .

A literature review did not find any published studies or information regarding the effects of GHG emissions on yellow-billed cuckoos. In the event that any individuals were to enter the Action Area, the likely transient nature of any potential occurrence would limit exposure time to any air emissions. Analysis of estimated heavy metals emissions data provided in Section 2.7.2 indicates that the Project will result in insignificant contributions to atmospheric deposition, thus any bioaccumulation impacts are expected to be negligible. The deposition of nitrogen, sulfur, and particulate matter from air emissions will not exceed the SIL for the areas of the Action Area outside the Project site where the species may occur, and are not expected to contribute to acidification or eutrophication of the bay. Operational impacts related to water intake and discharge will not affect the yellow-billed cuckoo as it does not utilize Corpus Christi Bay for habitat or foraging. Additional noise will be similar to current conditions (Section 2.6) and production of dust will be minimized during construction through the implementation of best management practices (Section 2.7).

The USFWS indicated during a meeting on July 24, 2013 that they did not anticipate any adverse impacts to avian species; USFWS recommended the implementation of flashing lights on the DRI tower and bird diversion devices on structures greater than 15 feet in height to minimize potential for bird strikes. The Project will light and mark vertical structures and has created a project-specific HSSE Plan that provides management and USFWS notification procedures in the event that protected birds are sighted during construction or operation of the Project.

There is limited potential for yellow-billed cuckoo to enter or utilize habitat within the Action Area for foraging or as transiting migrants. However, the uncertainty of the range of the Western DPS that is proposed to be threatened as occurring in the Action Area, the lack of construction impacts, the minimization of risk of incidental take due to striking vertical structures associated with the Project, the limited potential for air emission exposure, and the implementation of USFWS recommendations indicate that the potential for adverse impacts is insignificant. Therefore, a determination of "*May affect, but is not likely to adversely affect*" is recommended for this species.

Red Wolf

The red wolf *(Canis rufus)* is known for its characteristic reddish color of their fur, which is most apparent behind the ears and along the neck and legs. However, they are mostly brown and buff colored, with some black along their backs. The average adult red wolf weighs 45-80 pounds, stands about 26 inches to the shoulder, and is approximately 4 feet long from nose to tail. They are typically larger than coyotes, but smaller than the gray wolf. (USFWS, 2014c)

The red wolf was considered extinct in the wild in 1980. It formerly occurred from central Texas eastward to the coasts of Florida and Georgia and north to North Carolina, as well as along the Mississippi River Valley up to southern Illinois. The last remnant population along the Texas-Louisiana cost was rendered extinct due to hybridization with coyotes. The red wolf is a habitat generalist that can utilize upland and lowland forested areas, shrublands, and coastal prairies and marshes. The red wolf mates in January or February and has only one litter per year. Gestation lasts 60-63 days and a litter of 3-12 (averaging 6-7) pups is born in March

through May. Juvenile red wolves reach sexual maturity in approximately three years. They are primarily nocturnal, and are an opportunistic predator with a diet that consists primarily of rabbits, rodents, deer, birds, nutria, etc. Although it is not considered a threat to livestock because it does not hunt in packs, it may prey upon unattended young calves, pigs, or barnyard fowl. (NatureServe, 2014b)

Prior to their extinction in the wild, the USFWS collected 400 species from coastal Texas and Louisiana. Only 17 of the 400 individuals collected were identified as pure red wolves, 14 of which became the foundation for a captive breeding program. The first litter born in captivity occurred in 1977. Captive red wolves have since been released in northeastern North Carolina, and propagation populations are maintained on National Wildlife Refuges in South Carolina and Florida. The reintroduced population in northeastern North Carolina has grown to approximately 100 individuals, but has not expanded outside of the state. Hybridization with coyotes has been recognized as a potential barrier to the expansion of the reintroduced population (USFWS 2007c)

Although the USFWS does not list this species as potentially occurring in San Patricio or Nueces Counties, the TPWD lists the red wolf on the San Patricio and Nueces County lists. The most recent occurrences in Texas occurred in the late 1970s, and the species is now considered extirpated. Although there is suitable forested, riparian, shrubland, and coastal marsh habitat for this species within the Action Area, there are no red wolves known to occur within the region.

In the very unlikely event that a red wolf was to enter into the Action Area, it would likely utilize the riparian forested areas associated with Green Lake Ditch or the La Quinta ditch that will not be impacted by the construction footprint of the Project. Operational air emissions, noise, and dust impacts related to the Project are not expected to affect the red wolf, as it is not currently known to occur in Texas, and therefore not expected to occur in the Action Area. Operational impacts related to water intake and discharge will not affect the red wolf as it does not utilize Corpus Christi Bay for habitat.

The evidence that the red wolf has been extinct in the wild for over 30 years, coupled with the lack of expansion outside North Carolina of the reintroduced population, makes it highly unlikely that a red wolf will utilize or pass through the Action Area or Project site. The lack of impacts and unlikelihood of occurrence of this species make the possibility of adverse impacts insignificant and discountable. Therefore a determination of "*No effect*" is recommended for this species.

Smalltooth Sawfish

The smalltooth sawfish *(Pristis pectinata)* is a marine and estuarine cartilaginous fish known as an elasmobranch (sharks, skates, and rays). Although the smalltooth sawfish is a ray, it appears shark-like, with only the head and trunk flattened. Their bodies are typically olive-gray on the dorsal side, and white on the ventral side. Smalltooth sawfish may grow up to 25 feet long and weigh up to 770 pounds, living up to 30 years. This species gets its name from its snout, which is a long, flattened rostral blade with a series of transverse teeth along each edge that has a saw-like appearance. Juveniles typically inhabit the shallow coastal waters of bays, banks, estuaries, and river mouths, particularly shallow mud banks and mangrove habitats.

In addition to these habitats, larger individuals can be found offshore at depths up to at least 122 meters. (NMFS 2014) (NMFS, 2009)

Smalltooth sawfish are slow-growing, late maturing, and produce few young. They are thought to be ovoviviparous, meaning the mother keeps the embryos inside her until they are ready to be born rather than laying eggs. Although there are no reproduction studies available for this species, it is very similar to the largetooth sawfish, and likely has similar reproductive biology. The largetooth sawfish has been shown to have a gestation period of five months and females likely produce litters averaging seven individuals every two years. Their diet likely consists of small schooling fish and bottom dwelling crustaceans. The smalltooth sawfish has been reported to attack schools of small fishes by slashing sideways with its saw and then feeding on the wounded individuals (NMFS 2000).

In the U.S., the smalltooth sawfish was historically reported from Texas to New York, but has contracted its range markedly in the last century. In Texas, smalltooth sawfish were observed regularly in the 1940s and 1950s, but have become rare in the last 30 years. Since 1971, only three published reports of sawfish have occurred, with the most recent being in 1984. The current range of this species is considered to be restricted to peninsular Florida, though individuals are only common to the Everglades region at the southern tip of the state. The NMFS has designated two units of critical habitat along the southwestern coast of Florida between Charlotte Harbor and Florida Bay for this species: the 221,459 acres of coastal habitat known as the Charlotte Harbor Estuary Unit and the 619,013-acre Ten Thousand Islands/Everglades Unit. The current NMFS list of threatened and endangered species for Texas does not include the smalltooth sawfish (NOAA 2014). (NMFS 2009).

Although the USFWS does not list this species as potentially occurring in San Patricio or Nueces Counties, and the NMFS does not list this species as potentially occurring in Texas, the TPWD lists the smalltooth sawfish on the San Patricio and Nueces County lists. The most recent occurrences in Texas occurred in the late 1970s and early 1980s, and the species is now considered extirpated. Although there is suitable shallow estuarine habitat for this species within the Action Area, there are no sawfish known to currently occur within Texas waters. The Action Area contains shallow nearshore areas of northern Corpus Christi Bay, the La Quinta Channel, and the tidal portions of the La Quinta ditch and Green Lake Ditch that could provide suitable habitat for the smalltooth sawfish. However, due to the lack of documented occurrences in the past 30 years, this species is considered extirpated from Texas waters and is thus very unlikely to occur.

A literature review did not find any published studies or information regarding the effects of GHG emissions on sawfish. Analysis of estimated heavy metals emissions data provided in Section 2.8.3 indicates that the Project will result in insignificant contributions to atmospheric deposition, thus any bioaccumulation impacts are expected to be negligible. The deposition of nitrogen, sulfur, and particulate matter from air emissions will not exceed the SIL for the areas outside of the Action Area where the species may occur, and are not expected to contribute to acidification or eutrophication of the bay. Potential water intake and wastewater discharge associated with the operation of the Project are not expected to cause adverse impacts to the sawfish. The Project will provide treatment for wastewater prior to

discharge in accordance with its future NPDES permit, and discharge will be monitored to prevent toxic discharges. Given the size of the bay compared to the potential wastewater stream, no alterations to the available assemblage of forage vegetation would be anticipated.

In the very unlikely event that a smalltooth sawfish was to enter into the Action Area, it would likely utilize the shallow nearshore areas of northern Corpus Christi Bay, the La Quinta Channel, and the tidal portions of the La Quinta Ditch and Green Lake Ditch. Although the shallow bay habitat may be impacted by the construction footprint of the Project, it is not expected to impact the smalltooth sawfish, as it is not currently known to occur in Texas. Accordingly, operational air emissions, noise, dust, water intake, and wastewater impacts related to the Project are not expected to affect this species.

The evidence that the smalltooth sawfish has not occurred in Texas waters in 30 years, coupled with the lack of expansion of the known populations in Florida, makes it highly unlikely that a smalltooth sawfish will utilize or pass through the Action Area or Project site. The lack of impacts and unlikelihood of occurrence of this species make the possibility of adverse impacts insignificant and discountable. Therefore a determination of "*No effect*" is recommended for this species.

Slender Rush-pea

The slender rush-pea is a perennial legume that grows 3-6 inches tall with spreading stems. The leaves are twice compound, with 3-7 primary divisions each with 5-6 pairs of oblong leaflets that are approximately 1/8-inch long and hairy on the underside. Each flowering stalk contains 3-5 salmon to orange-colored flowers that are approximately ¼-inch long. Each flower is comprised of 5 egg-shaped petals and 10 stamens, with straight seed pods measuring ½-inch long by ¼-inch wide and densely covered in fine hairs. (TPWD, 2014b)

This species flowers between March and early June, and sporadically after dependent upon rainfall. The seed pods contain 2-4 seeds that mature from March to July. The slender rush-pea grows on clayey soils of blackland prairies and creek banks in association with short and midgrasses including buffalograss, Texas wintergrass, and Texas grama. Woody plants such as mesquite, huisache, spiny hackberry, lotebush, tasajillo, and prickly pear are also common at sites with slender rush-pea. (TPWD, 2014b)

The slender rush-pea occurs only in Texas, and forms colonies. Historically, the species is only known from 10 sites in Nueces and Kleburg Counties in Texas, and currently has only 2-6 populations in the same counties. The two known populations consist of up to 10,000 plants at the St. James Cemetery near Bishop, TX and several hundred plants along the east side of Hwy 77 at the Nueces-Kleburg County Line. The four unknown populations were reported from a large private ranch in 1964 and 1993, and have not been revisited to confirm their current existence due to restricted access. The disappearance of this species from the other historic sites has been attributed to being outcompeted by non-native invasive grasses such as Kleburg bluestem. Controlling adjacent invasive grasses by mowing has been shown to keep the invasives in check so that the slender rush-pea can persist. (USFWS 2008)

A literature review did not find any published studies or information regarding the effects of GHG emissions on the slender rush-pea. Analysis of estimated heavy metals emissions data provided in Section 2.7.2 indicates that the Project will result in insignificant contributions to atmospheric deposition, thus any bioaccumulation impacts are expected to be negligible. The deposition of nitrogen, sulfur, and particulate matter from air emissions will not exceed the SIL for the areas outside the Action Area where the species may occur. Operational impacts related to water intake and discharge will not affect the slender rush-pea as it does not utilize Corpus Christi Bay for habitat. Additional noise will be similar to current conditions (Section 2.6) and production of dust will be minimized during construction through the implementation of best management practices (Section 2.7).

In the very unlikely event that the slender rush-pea was to expand its range and establish a population in the Action Area, it would likely occur in proximity to the sloped banks of the non-tidal portions of the La Quinta Ditch and Green Lake Ditch that are maintained by mowing. These areas will not be impacted by the construction footprint of the Project. However, this species is not known to occur in San Patricio County and its range has historically been decreasing, thus it is not expected to expand into an adjacent county. Although this species does occur in Nueces County, the portions of the Project in Nueces County only include aquatic areas of northern Corpus Christi Bay that are not suitable habitat for a terrestrial plant. Construction of the Project will not impact this species, as it is not currently known to occur in the Action Area. Accordingly, operational air emissions, noise, dust, water intake, and wastewater impacts related to the Project are not expected to affect this species.

The evidence that the slender rush-pea has not historically occurred in the Action Area, coupled with the decreasing range of the known populations makes it highly unlikely that this species will expand its range to colonize the Action Area or Project site. The lack of impacts and unlikelihood of occurrence of this species make the possibility of adverse impacts insignificant and discountable. Therefore a determination of "*No effect*" is recommended for this species.

South Texas Ambrosia

The South Texas ambrosia is a silvery to grayish-green perennial herbaceous plant that grows 4-12 inches tall. The leaves are simple, measuring approximately 3 inches long and 1.5 inches wide. The leaves are usually arranged opposite on the lower portion of the plant and alternate above. Each flowering stalk contains 2-20 small radial flowers that can be green, pink, cream, or yellowish in color that are approximately ¼-inch across. Female and male flowers are separate but found on the same plant. (TPWD, 2014c)

This species flowers in late summer or fall. It spreads through rhizomes, and a single individual plant may be represented by hundreds of stems forming close spaced colonies. The South Texas ambrosia grows on open grasslands and savannas on soils varying from clay loams to sandy loams. This species is found in association with the slender rush-pea as well as short and midgrasses including tobosa, buffalograss, Texas wintergrass, and Texas grama. Woody plants such as mesquite, huisache, huisachillo, brasil, granjeno, and lotebush are also common at sites with slender rush-pea. (TPWD, 2014c)

The South Texas ambrosia is historically known from Cameron, Jim Wells, Nueces and Kleburg Counties in Texas, and the state of Tamaulipas in Mexico. However, the range of this species has contracted to six locations scattered across Nueces and Kleburg Counties in Texas, and the current status in Mexico is unknown. The disappearance of this species from the other historic sites has been attributed to being outcompeted by non-native invasive grasses such as Kleburg bluestem. (USFWS 2010c)

A literature review did not find any published studies or information regarding the effects of GHG emissions on the South Texas ambrosia. Analysis of estimated heavy metals emissions data provided in Section 2.7.2 indicates that the Project will result in insignificant contributions to atmospheric deposition, thus any bioaccumulation impacts are expected to be negligible. The deposition of nitrogen, sulfur, and particulate matter from air emissions will not exceed the SIL for the areas outside the Action Area where the species may occur. Operational impacts related to water intake and discharge will not affect the slender rush-pea as it does not utilize Corpus Christi Bay for habitat. Additional noise will be similar to current conditions (Section 2.6) and production of dust will be minimized during construction through the implementation of best management practices (Section 2.7).

In the very unlikely event that the South Texas ambrosia was to expand its range and establish a population in the Action Area, it would likely occur in proximity to the sloped banks of the non-tidal portions of the La Quinta Ditch and Green Lake Ditch that are maintained by mowing. These areas will not be impacted by the construction footprint of the Project. However, this species is not known to occur in San Patricio County and its range has historically been decreasing, thus it is not expected to expand into an adjacent county. Although this species does occur in Nueces County, the portions of the Project in Nueces County only include aquatic areas of northern Corpus Christi Bay that are not suitable habitat for a terrestrial plant. Construction of the Project will not impact this species, as it is not currently known to occur in the Action Area. Accordingly, operational air emissions, noise, dust, water intake, and wastewater impacts related to the Project are not expected to affect this species.

The evidence that the South Texas ambrosia has not historically occurred in the Action Area, coupled with the decreasing range of the known populations makes it highly unlikely that this species will expand its range to colonize the Action Area or Project site. The lack of impacts and unlikelihood of occurrence of this species make the possibility of adverse impacts insignificant and discountable. Therefore a determination of "*No effect*" is recommended for this species.

Golden Orb

The golden orb is a small round freshwater mussel that is endemic to central Texas. The golden orb is small, usually less than 82 mm (3.2 in), with an oval to nearly round, smooth, and unsculptured shell, except for concentric growth rings. External shell coloration varies from yellow-brown, gold, or orangish-brown to dark brown or black, and some individuals may show faint greenish rays. Internally, the nacre is white to bluish-white. (USFWS 2011b)

There is no specific information on age, size of maturity, or host fish use for golden orb. As a group, mussels are extremely long lived, living from two to several decades, and possibly up to 200 years in extreme instances. During reproduction, males release clouds of sperm into the water column, which females draw in through their siphons. Fertilization takes place internally, and the resulting eggs develop into specialized larvae (called glochidia). The females release matured glochidia, which are obligate parasites that attach to the gills or fins of fishes. Glochidia die if they fail to find a suitable host fish. Glochidia encyst on the host's tissue and develop into juvenile mussels weeks or months after attachment. Mussels experience their primary opportunity for dispersal and movement within the stream as glochidia attached to a host fish. Upon release from the host, newly transformed juveniles drop to the substrate on the bottom of the stream. Those juveniles that drop in unsuitable substrates die because their immobility prevents them from relocating to more favorable habitat. Juvenile freshwater mussels burrow into interstitial substrates and grow to a larger size that is less susceptible to predation and displacement from high flow events. Throughout the rest of their life cycle, mussels generally remain within the same small area where they released from the host fish. (USFWS 2011b)

Adult freshwater mussels are suspension feeders, drawing in food and oxygen through their incurrent siphon. They may also feed on organic particles in sediment using their large, muscular foot. Adults feed on algae, bacteria, detritus, microscopic animals, and dissolved organic matter. For their first several months, as they inhabit interstitial spaces (small spaces between sediment particles) within the substrate, juvenile mussels feed using cilia (fine hairs) on the foot to capture suspended as well as depositional material, such as algae and detritus. Mussels tend to grow relatively rapidly for the first few years, and then slow appreciably at sexual maturity, when energy presumably is being diverted from growth to reproductive activities. (USFWS 2011b)

Other species in the genus Quadrula successfully parasitize catfish, and it is likely golden orb do as well. Gravid females have been found from May through August. Mussels in the genus Quadrula are short-term brooders, which are species that hold fertilized eggs and glochidia for a short period, usually 3 to 6 weeks, before releasing glochidia. The golden orb has been found almost exclusively in flowing waters in moderately sized rivers. It has been found in only one reservoir in the lower Nueces River (Lake Corpus Christi), where wave action may simulate flowing water conditions. This species is found in substrates of firm mud, sand, and gravel, and it does not appear to tolerate more unstable substrates such as loose sand or silt. (USFWS 2011b)

This species historically occurred throughout the Nueces-Frio and Guadalupe-San Antonio River Basins and is now known from only nine locations in four rivers. Despite mussel surveys across the historical range, since 1995 golden orb has only been found in Lake Corpus Christi and the Guadalupe, lower San Marcos, and lower San Antonio Rivers. The species has been extirpated from the entire Nueces-Frio River basin, except at the extreme downstream end of the Nueces River, where a population persists in Lake Corpus Christi. Four of the nine populations appear to be stable and reproducing, and the remaining five populations are small and isolated and show no evidence of recruitment. The populations in the middle Guadalupe and

lower San Marcos Rivers are likely connected. The remaining extant populations are highly fragmented and restricted to short reaches. (USFWS 2011b)

Although the USFWS does not list this species as potentially occurring in San Patricio or Nueces Counties, the TPWD lists the golden orb as a "candidate" species on the San Patricio County list. Candidate species receive no statutory protection under the ESA, but may be proposed for listing as threatened or endangered in the future. The only freshwater habitat within the Action Area consists of the La Quinta ditch and Green Lake Ditch. However, the golden orb requires moderately sized rivers with perennial flowing water, thus these habitats are unsuitable for this species due to their smaller size and less frequent flow regime. Additionally, the only documented occurrence in San Patricio County is within a watershed that is not hydrologically connected to these ditches in the Action Area. Therefore, the expansion of this species from the Lake Corpus Christi population to either of these ditches is very unlikely to occur.

A literature review did not find any published studies or information regarding the effects of GHG emissions on mussels. Analysis of estimated heavy metals emissions data provided in Section 2.7.2 indicates that the Project will result in insignificant contributions to atmospheric deposition, thus any bioaccumulation impacts are expected to be negligible. The deposition of nitrogen, sulfur, and particulate matter from air emissions will not exceed the SIL for the areas outside the Action Area where the species may occur. Operational impacts related to water intake and discharge will not affect the golden orb as it does not utilize Corpus Christi Bay for habitat. Additional noise will be similar to current conditions (Section 2.6) and production of dust will be minimized during construction through the implementation of best management practices (Section 2.7).

There is no suitable habitat for the golden orb in the Action Area, therefore it will not be impacted by the construction footprint of the Project. This species is not known to occur in Nueces County or outside of Lake Corpus Christi in San Patricio County and its range has historically been decreasing. Accordingly, operational air emissions, noise, dust, water intake, and wastewater impacts related to the Project are not expected to affect this species.

The evidence that the golden orb has not historically occurred in the Action Area, coupled with the lack of suitable habitat and decreasing range of the known populations makes it highly unlikely that this species will expand its range to colonize the Action Area. The lack of impacts and unlikelihood of occurrence of this species make the possibility of adverse impacts insignificant and discountable.

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