ATTACHMENT IV
BIOLOGICAL ANALYSIS FOR SPECIES LISTED UNDER THE ENDANGERED SPECIES ACT IN THE ATLANTIC OCEAN, GULF OF MEXICO AND PACIFIC OCEAN

Biological Analysis for Species Listed Under the

Endangered Species Act in the

Atlantic Ocean, Gulf of Mexico and Pacific Ocean

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For Additional Information

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CHAPTER 1 EXISTING ENVIRONMENT

1.1. MARINE MAMMALS

The marine mammals discussed here are listed under the Endangered Species Act (ESA). General marine mammal occurrence is presented for the Atlantic Ocean, Gulf of Mexico and Pacific Ocean. Information specific to the Study Areas of the proposed transit routes are presented when possible.

1.1.1. Cetaceans

1.1.1.1. Blue whale

Blue whales (*Balaenoptera musculus*) are listed as endangered and may occur in the Atlantic Ocean, Gulf of Mexico and Pacific Ocean. The blue whale inhabits all oceans and typically occurs near the coast, over the continental shelf, though it is also found in oceanic waters. Blue whales as a species are thought to summer in high latitudes and move into the subtropics and tropics during the winter (Yochem and Leatherwood 1985). Historical blue whale observations collected by Reeves et al.(2004) show a broad longitudinal distribution in tropical and warm temperate latitudes during the winter months, with a narrower, more northerly distribution in summer.

The blue whale is considered an occasional visitor in United States (U.S.) Atlantic waters, which may represent the current southern limit of its feeding range (Cetacean and Turtle Assessment Program (CETAP) 1982; Wenzel et al. 1988). Although the exact extent of their southern boundary and wintering grounds are not well understood, blue whales are occasionally found in waters off of the U.S. Atlantic coast (Waring et al. 2010). There are only two reliable records for blue whales in the Gulf of Mexico; both are strandings. This is one of the most rare cetacean species in the Gulf of Mexico (Jefferson and Schiro 1997; Würsig et al. 2000).

On the Pacific coast their range includes the California Current System and the open ocean. The majority of blue whale sightings are in nearshore and continental shelf waters; however, blue whales frequently travel through deep oceanic waters during migration. Blue whales in the north Pacific are known to migrate between higher latitude feeding grounds of the Gulf of Alaska and the Aleutian Islands to lower latitude breeding grounds of California and Baja California, Mexico (Oleson et al. 2009). The west coast is known to be a feeding area for this species during summer and fall (Bailey and Thompson 2009; Caretta et al. 2011).

Blue whales are likely to occur within the Atlantic and Pacific Study Areas but are not likely to occur within the Gulf of Mexico.

1.1.1.2. Fin whale

Fin whales (*Balaenoptera physalus*) are listed as endangered and occur in the Atlantic Ocean, Gulf of Mexico and Pacific Ocean. Fin whales are broadly distributed throughout the world's oceans, usually in temperate to polar latitudes and less commonly in warm tropical waters (Reeves et al. 2002). Therefore fin whale presence within the Gulf of Mexico is considered extralimital.

Fin whales are common in waters of the U.S. Atlantic, principally from Cape Hatteras northward (Cetacean and Turtle Assessment Program (CETAP) 1982). Their summer foraging areas are from the coast of North America to the Arctic (U.S. Department of Commerce and National Marine Fisheries Service 2010). The open ocean range of the fin whale includes the Gulf Stream, North Atlantic Gyre, and Labrador Current.

In the Pacific Ocean, fin whales have been documented from 60° North (N) to 23° N, and they have frequently been recorded in waters off the southern California coast (Mizroch et al. 2009; Caretta et al. 2011). Aggregations of fin whales are present year-round in southern and central California (Forney et al. 1995). Fin whales are distributed across the North Pacific during the summer (May through October) from the southern Chukchi Sea (69°N) south to the Subarctic Boundary (approximately 42°N) and to 30°N in the California Current (Mizroch et al. 1999). During the winter (November through April), fin whales are sparsely distributed from 60°N, south to the northern edge of the tropics, near which it is assumed that mating and calving take place (Mizroch et al. 1999).

Fin whales are likely to occur within all the Atlantic and Pacific Oceans.

1.1.1.3. Humpback whale

Humpback whales (*Megaptera novaengliae*) are listed as endangered and occur in the Atlantic Ocean, Gulf of Mexico and Pacific Ocean. Humpback whales are distributed worldwide in all major oceans and most seas. They typically are found during the summer on high-latitude feeding grounds and during the winter in the tropics and subtropics around islands, over shallow banks, and along continental coasts, where calving occurs. Most humpback whale sightings are in nearshore and continental shelf waters; however, humpback whales frequently travel through deep oceanic waters during migration (Clapham and Mattila 1990; Calambokidis et al. 2001). Humpback feeding habitats are typically shallow banks or ledges with high seafloor relief (Payne et al. 1990; Hamazaki 2002).

Their primary range in the Atlantic includes the nearshore waters of the Northeast U.S. continental shelf. Their secondary range includes the Southeast U.S. continental shelf, Caribbean Sea, Gulf of Mexico, and Gulf Stream. In the Atlantic humpbacks are most likely to occur in the mid-Atlantic between January and March; however, they may occur year-round, based on sighting and stranding data in both mid-Atlantic waters and the Chesapeake Bay (Barco et al. 2002; Swingle et al. 2008).

Humpback whales in the North Pacific are distributed in the following wintering areas: the Hawaiian Islands, the Revillagigedo Islands off Mexico, and along the coast of mainland Mexico (Calambokidis et al. 2001). During summer months, North Pacific humpback whales feed in a nearly continuous band from southern California to the Aleutian Islands (Calambokidis et al. 2001). The Central North Pacific stock of humpback whales occurs throughout known breeding grounds in Hawaii during winter and spring (November through April) (Allen and Angliss 2010). Peak occurrence around the Hawaiian Islands is from late February through early April (Au et al. 2000; Caretta et al. 2011). During the fall-winter period, primary occurrence is expected from the coast to 50 nautical miles (nm; 93 kilometers[km]) offshore (Au et al. 2000; Mobley Jr. 2004).

The California, Oregon, and Washington stock of humpback whales use the waters within Southern California as a summer feeding ground. Peak occurrence occurs in southern California from December through June (Calambokidis et al. 2001). While there are exceptions, the vast majority of humpback whales that feed off Washington, Oregon, and California breed in waters off mainland Mexico and Central America (Barlow et al. 2011).

Humpback whales are likely to occur in all of the Study Areas; however their occurrence will be associated with the nearshore waters of the continental shelf and not in waters of the high seas.

1.1.1.5. Killer whale

Killer whales (*Ocrinus orca*) occur in the Atlantic Ocean, Gulf of Mexico and Pacific Ocean. The distinct population segment of southern resident population in Puget Sound is listed as endangered. Killer whales are found in all marine habitats, from the coastal zone (including most bays and inshore channels) to deep oceanic basins and from equatorial regions to the polar pack ice zones of both hemispheres. Although killer whales are also found in tropical waters and the open ocean, they are generally most numerous in coastal waters and at higher latitudes (Dahlheim and Heyning 1999). In most areas of their range, killer whales do not show movement patterns that would be classified as traditional migrations. However, there are often seasonal shifts in density, both onshore/offshore and north/south.

Killer whales are considered uncommon in waters of the Atlantic Ocean (Katona et al. 1988) (Waring et al. 2010). Furthermore nearshore observations are rare. The open ocean range of the killer whale in the Atlantic includes the Labrador Current, Gulf Stream, and North Atlantic Gyre. Sightings of killer whales in the Gulf of Mexico on surveys from 1951 to 1995 were most frequent in the north-central region of the Gulf of Mexico. Killer whales are relatively uncommon in the northern Gulf of Mexico, with only 49 (CV=0.77) individuals estimated to occur there (Waring et al. 2010).

In the north Pacific, the recognizable geographic pods are variously known as ''residents'', ''transients" and "offshore" ecotypes (Hoelzel et al. 2007). Along the west coast of North America, all three ecotypes of killer whales are known to occur in Washington inland waterways, and along the outer coasts of Washington, Oregon, and California (Forney et al. 1995; Ford and

Ellis 1999; Calambokidis and Barlow 2004; Dahlheim et al. 2008). Although they are not commonly observed in southern California coastal areas, killer whales are found year round off the coast of Baja California (Forney et al. 1995; Caretta et al. 2011).

The southern resident killer whale distinct population segment is a trans-boundary population that resides for part of the year in the protected inshore waters of the Strait of Georgia and Puget Sound (especially in the vicinity of Haro Strait, west of San Juan Island, and off the southern tip of Vancouver Island) principally during the late spring, summer, and fall (Ford et al. 1994; Krahn et al. 2004). Pods have visited coastal sites off Washington and Vancouver Island (Ford et al. 1994) and are known to travel as far south as central California and as far north as the Queen Charlotte Islands. The overall range of the southern resident killer whale in winter is unknown.

Killer whales are likely to occur within the Pacific Study Area near Washington and in waters deeper than the continental shelf. They are not likely to occur in the Atlantic and Gulf of Mexico Study Areas.

1.1.1.6. North Atlantic right whale

North Atlantic right whales (*Eubalaena glacialis*) are listed as endangered and occur in the Atlantic Ocean. The North Atlantic right whale has been sighted in the Gulf of Mexico but the sighting records probably are of extralimital strays from wintering grounds off the Southeastern U.S. (Jefferson and Schiro 1997). New England waters are an important feeding habitat for right whales, which feed primarily on copepods in this area.

The western North Atlantic right whale population ranges primarily from calving grounds in coastal waters of the southeastern U.S. to feeding grounds in New England waters. The coastal waters of Georgia and Florida in the southeastern U.S. were designated as critical habitat by NMFS in 1994 (50 CFR 226 1994). However, movements within and between habitats are extensive. Systematic surveys conducted off the coast of North Carolina suggest that calving grounds may extend as far north as Cape Fear (McLellan et al. 2004). Since 2004, consistent aerial survey efforts have been conducted during the migration and calving season (15 November to 15 April) in coastal areas of Georgia and South Carolina, to the north of currently defined critical habitat (Glass and Taylor 2006; Khan and Taylor 2007; Sayre and Taylor 2008); Schulte and Taylor 2010). Results suggest that this region may not only be part of the migratory route but also a seasonal residency area. Results from an analysis by Schick et al. (2009) suggest that the migratory corridor of North Atlantic right whales is broader than initially estimated and that suitable habitat exists beyond the 20 nm (37 km) coastal buffer presumed to represent the primary migratory pathway (National Oceanic Atmospheric Administration).

North Atlantic right whales are likely to occur within the Atlantic Study Area, and not likely to occur in the Gulf of Mexico. This species is not expected within the Pacific Study Area.

1.1.1.7. North Pacific right whale

North Pacific right whales (*Eubalaena japonica*) are listed as endangered and occur in the Pacific Ocean. The likelihood of a North Pacific right whale being present in the proposed Study Area is extremely low as this species has only been observed rarely in the Bering Sea and Gulf of Alaska in recent years. The only recorded sighting of a right whale in the southern California area occurred in March 1992 approximately 43 mi (70 km) off the southern end of San Clemente Island (Carretta et al. 1994). Based on this information, it is highly unlikely for this species to be present in the Study Area.

North Pacific right whales are not likely to occur in the Pacific Study Area. This species is not expected within the Atlantic or Gulf of Mexico Study Areas.

1.1.1.8. Sei whale

Sei whales (*Balaenoptera borealis*) are listed as endangered and occur in the Atlantic Ocean, Gulf of Mexico and Pacific Ocean. Sei whales are most often found in deep, oceanic waters of the cool temperate zone and are rarely observed near the coast (Jefferson et al. 2008; Horwood 2009). They appear to prefer regions of steep bathymetric relief, such as the continental shelf break, canyons, or basins situated between banks and ledges (Kenney and Winn 1987; Schilling et al. 1992; Gregr and Trites 2001; Best and Lockyer 2002). These areas are often the location of persistent hydrographic features, which may be important factors in concentrating zooplankton, especially copepods. On the feeding grounds, the distribution is largely associated with oceanic frontal systems (Horwood 1980).

Sei whales spend the summer feeding in subpolar high latitudes and return to lower latitudes to calve in winter. They are generally found between 10° N and 70° N latitudes. Satellite tagging data indicate sei whales feed and migrate east to west across large sections of the North Atlantic (Olsen et al. 2009); they are not often seen within the equatorial Atlantic. There are only five reliable sei whale records for the Gulf of Mexico (Würsig et al. 2000). Sei whales are uncommon in most tropical regions, and based on the scarcity of records for this species in the Gulf, any sightings there would be considered extralimital for this species (Jefferson and Schiro 1997). Sei whales, therefore, are not expected to occur in the Gulf of Mexico portion of the Study Area.

In the North Pacific, sei whales are thought to occur mainly south of the Aleutian Islands. They are present all across the temperate North Pacific north of 40° N (National Marine Fisheries Service 1998) and are seen at least as far south as 20° N (Horwood 1980). Whaling data suggest that the northern limit for this species is about 55° N (Gregr et al. 2000). In the east, they range as far south as Baja California, Mexico (National Marine Fisheries Service 1998). They are generally found feeding along the California Current (Perry et al. 1999). There are records of sightings in California waters as early as May and June, but primarily are encountered there during July to September and leave California waters by mid-October.

Sei whales are likely to occur within the Atlantic and Pacific Study Areas. Their occurrence in the Gulf of Mexico is uncommon and they are not likely to occur within the Gulf of Mexico Study Area.

1.1.1.9. Sperm whale

Sperm whales (*Physeter macrocephalus*) are listed as endangered and occur in the Atlantic Ocean, Gulf of Mexico and Pacific Ocean. Sperm whales are found in polar to tropical waters in all oceans, from approximately 70°N to 70°S (Rice 1998). Females are normally restricted to areas with sea-surface temperatures greater than 15°C, whereas males, especially the largest males, can be found in waters bordering pack ice (Rice 1989). Sperm whale distribution can be variable, but is generally associated with waters over the continental shelf edge, continental slope, and offshore waters (Cetacean and Turtle Assessment Program (CETAP) 1982; Hain et al. 1985; Fiscus et al. 1989; Rice 1989; Smith et al. 1996; Reeves and Whitehead 1997; Waring et al. 2001; Davis et al. 2002).

Distribution along the east coast of the U.S. is centered along the shelf break and over the slope. During winter, high densities occur in inner slope waters east and northeast of Cape Hatteras, North Carolina (National Marine Fisheries Service (NMFS) 2006; Palka 2006; Waring et al. 2010). Waring et al. (1993) suggest that this offshore distribution is more commonly associated with the Gulf Stream edge and other features. In spring, distribution shifts northward to Delaware and Virginia, and the southern portion of Georges Bank. Summer and fall distribution is similar, extending to the eastern and northern portions of Georges Bank and north into the Scotian Shelf. Occurrence south of New England on the continental shelf is highest in the fall (Waring et al. 2010).

The sperm whale is the most common large cetacean in the northern Gulf of Mexico (Palka and Johnson 2007). The distribution of sperm whales in the Gulf of Mexico is strongly linked to surface oceanography, such as loop current eddies that locally increase production and availability of prey (O'Hern and Biggs 2009). Sperm whales aggregate at the mouth of the Mississippi River and along the continental slope in or near cyclonic cold-core eddies (counterclockwise water movements in the northern hemisphere with a cold center) (Davis et al. 2007). In the north-central Gulf of Mexico, sperm whales are especially common near the Mississippi Canyon, where some are present year-round. The Mississippi River Delta is an area of known sperm whale occurrence as the continental shelf is very narrow and extends the nutrient-rich river plume into deep waters where primary productivity and zooplankton abundance are amplified (Baumgartner et al. 2001; Davis et al. 2002).

Sperm whales are found year round in California waters (Forney and Barlow 1993; Barlow 1995). Sperm whales are known to reach peak abundance from April through mid-June and from the end of August through mid-November (Carretta et al. 2010). Two occurrences of sperm whale stranding in Oregon were recorded in 1970 and 1979. Based on habitat preference, the sperm whale is expected to occur seaward of the 1,000 m isobaths in the Pacific Northwest. Secondary occurrence between the 200 m and 1,000 m isobaths, accounts for the possibility of sightings in more shallow waters. Sperm whale occurrence in waters between the shore and the 200 m isobath is expected to be rare since this species prefers deep waters (Department of the Navy 2006).

Sperm whales are likely to occur within all the Study Areas especially along the portions of the transit located along the continental shelf and slope.

1.1.2. Pinnipeds

1.1.2.1. Guadalupe fur seal

Guadalupe fur seals (*Arctocephalus townsendi*) are listed as endangered and occur in the Pacific Ocean near Southern California. The Guadalupe fur seal is typically found on shores with abundant large rocks, often at the base of large cliffs. They are also known to inhabit caves, which provide protection and cooler temperatures, especially during the warm breeding season (Belcher and Lee Jr. 2002). Guadalupe fur seals are most common at Guadalupe Island, Mexico, their primary breeding ground (Melin and Delong 1999). A second rookery was found in 1997 at the San Benito Islands off Baja California (Maravilla-Chavez and Lowry 1999). Adult and juvenile males have been observed at San Miguel Island, California (Melin and Delong 1999). Sightings have also occurred at Santa Barbara, San Nicolas, and San Clemente Islands (Stewart 1981; Stewart et al. 1993).

Guadalupe fur seals can be found in deeper waters of the California Current System (Hanni et al. 1997; Jefferson et al. 2008). Adult males, juveniles, and nonbreeding females may live at sea during some seasons or for part of a season (Reeves et al. 1992). Several observations suggest that this species travels alone or in small groups of fewer than five (Seagars 1984; Belcher and Lee Jr. 2002). The movements of Guadalupe fur seals at sea are generally unknown, but strandings have been reported in northern California and as far north as Washington (Etnier 2002). The northward movement of this species possibly has resulted from an increase in its population (Etnier 2002).

The Guadalupe fur seal is most likely in coastal areas and is not likely to occur in the open ocean of the Pacific Study Area. This species is not expected in the Atlantic or Gulf of Mexico Study Areas.

1.1.2.2. Stellar sea lion

Stellar sea lions (*Eumetopias jubatus*) are listed as threatened and occur in the northwest Pacific Ocean year round. Peak abundance occurs on land during the spring breeding season and at sea during the fall (Bonnell et al. 1992). In Washington State, steller sea lions primarily haul out along the coast from the Columbia River to Cape Flattery and on the southern coast of Vancouver Island near the Strait of Juan de Fuca (Jeffries et al. 2000). Primary rookery sites in Oregon are located along the southern coast at Orford and Rogue Reefs, while main haulout sites are also in Sea Lion Caves, Three Arch Rocks, Ecola Point, and the Columbia River jetty

(Bonnell et al. 1992; Brown 1997). St. George Reef is the primary haulout and rookery site in northern California (Loughlin et al. 1992).

Stellar sea lions are most likely in coastal areas in the Pacific Northwest and is not likely to occur in the open ocean of the Pacific Study Area. This species is not expected in the Atlantic or Gulf of Mexico Study Areas.

1.1.3. Sea Turtles

1.1.3.1. Green sea turtle

The green sea turtle (*Chelonia mydas*) occurs in the Atlantic Ocean, Gulf of Mexico and Pacific Ocean. The green sea turtle is listed as two populations under the ESA: the Florida and Mexico Pacific coast breeding colonies, and sea turtles from all other populations. The breeding colonies on the Pacific coast of Florida and Mexico are designated as endangered and all other colonies are designated as threatened (43 FR 32800-32811 1978). In 1998, critical habitat was designated for green sea turtles in coastal waters around Culebra Island, Puerto Rico, from the mean high water line seaward to 3 nm (5.5 km) to include Culebra's outlying Keys (Fish et al. 1998).

The green sea turtle is distributed worldwide across tropical and subtropical coastal waters between 45° N and 40° S (The State of the World's Sea Turtles Team 2011). After emerging from the nest, green turtle hatchlings swim to offshore areas where they float passively in major current systems. Post-hatchling green turtles forage and develop in floating *Sargassum* habitats of the open ocean. At the juvenile stage (estimated at 5 to 6 years) they leave the open-ocean habitat and retreat to protected lagoons and open coastal areas that are rich in seagrass or marine algae (Bresette et al. 2006), where they will spend most of their lives (Bjorndal and Bolten 1988). The optimal developmental habitats for late juveniles and foraging habitats for adults are warm shallow waters 9.8 – 16 feet (ft; 3 – 5 meters [m]) deep with abundant submerged aquatic vegetation and close to nearshore reefs or rocky areas (Seminoff et al. 2002; Holloway-Adkins 2006).

During the winter, the highest concentration of green turtles occurs just north of Cape Canaveral, a known wintering area for juveniles. Juvenile green turtles are the second-most abundant sea turtle species in North Carolina summer developmental habitats, occurring year-round within continental shelf waters, while adults are restricted to more southern latitudes (Epperly et al. 1995b). Most green sea turtle sightings north of Florida are of juveniles and occur during late spring to early fall (Lazell Jr. 1980; Burke et al. 1992; Epperly et al. 1995a).

Juveniles use the estuarine and nearshore waters of central Florida throughout the year, including Pensacola Bay, St. Joseph Bay, Charlotte Harbor, Cedar Keys, Homosassa Springs, Crystal River, and Tampa Bay (Renaud et al. 1995). In the northern Gulf of Mexico, green sea turtles prefer the coastal habitats of southern Texas (e.g., lagoons, channels, inlets, bays) including Texas' Laguna Madre (Renaud et al. 1995). As water temperatures rise from April to June, green sea turtle numbers increase in the continental shelf waters off Galveston Bay and in those waters associated with the continental shelf break northeast of Corpus Christi. The sparse sighting records in Louisiana and Texas waters, as well as nesting records on the southern Texas coast, indicate that green turtles are found in the northwestern Gulf of Mexico during spring but in far fewer numbers than in the northeastern Gulf. Suitable nesting beaches are located throughout the Gulf region, from the shores of northern Mexico and southern Texas in the western Gulf of Mexico to southern Florida and the Florida panhandle in the eastern Gulf of Mexico.

Green sea turtles are widely distributed in the subtropical coastal waters of southern Baja California, Mexico, and Central America (Cliffton 1995); (National Marine Fisheries Service et al. 1998b). The main group of eastern Pacific Ocean green sea turtles is found on the breeding grounds of Michoacán, Mexico, from August through January and year-round in the feeding areas, such as those on the western coast of Baja California, along the coast of Oaxaca, and in the Gulf of California (the Sea of Cortez) (National Marine Fisheries Service et al. 1998b). Bahía de Los Angeles in the Gulf of California has been identified as an important foraging area for green sea turtles (Seminoff et al. 2003). The western coasts of Central America, Mexico, and the U.S. constitute a shared habitat for this population (National Marine Fisheries Service et al. 1998b). The green sea turtle is not known to nest on Southern California beaches. Ocean waters off Southern California and northern Baja California are also designated as areas of occurrence because of the presence of rocky ridges and channels and floating kelp habitats suitable for green sea turtle foraging and resting (Stinson 1984); however, these waters are often at temperatures below the thermal preferences of this primarily tropical species. Due to the warm water habitat preference the green sea turtle is not expected to occur off the coasts of Oregon or Washington, but will occur off the coast of California.

Green turtles are likely to occur in the continental shelf and warm shallow waters of all Study Areas. They are not likely to occur in the high seas.

1.1.3.2. Hawksbill sea turtle

Hawksbill sea turtles (*Eretmochelys imbricata*) are listed as endangered and occur in the Atlantic Ocean, Gulf of Mexico and Pacific Ocean. The hawksbill is the most tropical of the world's sea turtles, rarely occurring above 35° N or below 30° S (Seminoff et al. 2003). Critical habitat was designated for hawksbill terrestrial nesting areas in Puerto Rico in the year 1982 (50 CFR § 17 1982). Critical marine habitat was designated in the year 1998 for the coastal waters surrounding Mona and Monito Islands, Puerto Rico from the mean high water line seaward to 3 nm (5.55 km) (National Marine Fisheries Service et al. 1998a).

Hatchlings are believed to occupy open-ocean waters, associating themselves with surface algal mats in the Atlantic Ocean (Parker 1995; Seminoff et al. 2003; Witherington and Hirama 2006). Juveniles leave the open-ocean habitat after 3 to 4 years and settle in coastal foraging areas, typically coral reefs but occasionally seagrass beds, algal beds, mangrove bays, and creeks (Mortimer and Donnelly 2009). Juveniles and adults share the same foraging areas, including tropical nearshore waters associated with coral reefs, hardbottoms, or estuaries with mangroves

(Musick and Limpus 1997). In nearshore habitats, resting areas for late juvenile and adult hawksbills are typically in deeper waters, such as sandy bottoms at the base of a reef flat (Houghton et al. 2003). As they mature into adults, hawksbills move to deeper habitats and may forage to depths greater than 295 ft (90 m). During this stage, hawksbills are seldom found in waters beyond the continental or insular shelf unless they are in transit between distant foraging and nesting grounds (Renaud et al. 1995; Shaver et al. 2005; Shaver and Rubio 2008).

While hawksbills are known to occasionally migrate long distances in the open ocean, they are primarily found in coastal habitats and use nearshore areas more exclusively than other sea turtles. Despite a lack of information regarding the hawksbill turtle's use of the open ocean in all life stages, they have been reported rarely off of Cape Cod and in North Carolina (Seminoff et al. 2003). Due to these sightings and the relative warmth of the Gulf Stream into the higher latitudes of the North Atlantic, hawksbills are assumed to be present in the North Atlantic, Gulf Stream and Open Ocean.

Hawksbill turtles occur regularly in the nearshore waters of southern Florida and the Gulf of Mexico (National Marine Fisheries Service et al. 2007b). The greatest hawksbill turtle numbers in the southeastern U.S. are found in the fall off southern Florida. There, hawksbills are documented from winter to summer from Palm Beach to the Florida Keys, and to coastal waters just northwest of Tampa Bay, where the northernmost stranding records typically occur (National Marine Fisheries Service et al. 2007b). Hawksbill turtle sightings in waters off the Florida Panhandle, Alabama, Mississippi, Louisiana, and Texas (Rabalais and Rabalais 1980; Rester and Condrey 1996; Seminoff et al. 2003), though rare, are likely of early juveniles born on nesting beaches in Mexico that have drifted north with the dominant currents (National Marine Fisheries Service et al. 1993).

Water temperature in the Pacific Northwest and southern California region of the Study Area is generally too low for hawksbills, and their occurrence is rare. Nesting is rare in the eastern Pacific Ocean region, and does not occur along the U.S. west coast (National Marine Fisheries Service et al. 1998a; Seminoff et al. 2003). If hawksbills were to occur in the southern California region, it would most likely be during an El Niño event, when waters along the California current are unusually warm (National Marine Fisheries Service et al. 2007b).

Hawksbill sea turtles are likely to occur in all the Study Areas and may occur in the open ocean. The highest density is expected within the Gulf of Mexico and along the Straits of Florida.

1.1.3.3. Kemp's ridley sea turtle

Kemp's ridley sea turtles (*Lepidochelys kempii*) are listed as endangered and occur in the Atlantic Ocean and Gulf of Mexico. Habitats frequently used by Kemp's ridley sea turtles in U.S. waters are warm-temperate to subtropical sounds, bays, estuaries, tidal passes, shipping channels, and beachfront waters, where their preferred food, the blue crab, is abundant (Lutcavage and Musick 1985; Seney and Musick 2005). Adult female Kemp's ridley sea turtles take part in mass synchronized nesting emergences known as "arribadas" on only a few nesting beaches; this nesting strategy is unique to *Lepidochelys* spp. The nesting season in the Atlantic and Gulf of Mexico Study Areas occur from April through July.

Evidence suggests that post-hatchling and small juvenile Kemp's ridley sea turtles, similar to loggerhead and green sea turtles of the same region forage and develop in floating *Sargassum* habitats of the North Atlantic Ocean. Juveniles migrate to habitats along the Atlantic continental shelf from Florida to New England (Morreale et al. 1992; Peña 2006) at around two years of age. Migrating juvenile Kemp's ridleys travel along coastal corridors in waters generally shallower than 164 ft (50 m) in bottom depth (U.S. Department of Commerce and National Marine Fisheries Service 2010). Suitable developmental habitats are seagrass beds and mud bottoms in waters of less than 33 ft (10 m) bottom depth and with sea surface temperatures between 72°F and 90°F (22°C and 32°C) (Coyne et al. 2000).

In the spring, Kemp's ridleys in south Florida begin to migrate northward. As waters become warmer Kemp's ridley turtle travel as far north as Long Island Sound and even Nova Scotia (Bleakney 1955). Satellite telemetry data suggest that turtles migrate south in October and November within the Southeast United States—from Georgia and northern Florida to the waters south of Cape Canaveral—and return to their summer foraging grounds in March and April. The offshore waters south of Cape Canaveral are identified as an important overwintering area for turtles foraging in Atlantic coastal waters (Henwood and Ogren 1987; Schmid 1995).

The Kemp's ridley occurs year-round in the coastal waters of the Gulf of Mexico from the Yucatán peninsula to south Florida (Lazell Jr. 1980; Morreale et al. 1992). The entire population nests in the Gulf of Mexico, along a stretch of beaches from southern Texas to the Yucatán peninsula. Key foraging sites on the west coast of Florida include Charlotte Harbor and Gullivan Bay (Witzell and Schmid 2005). Important year-round developmental habitats in the northern Gulf of Mexico include the western coast of Florida (particularly the Cedar Keys area), the eastern coast of Alabama, and the mouth of the Mississippi River (Lazell Jr. 1980; Lutcavage and Musick 1985; Márquez-Millán 1990; National Marine Fisheries Service et al. 1992b; Márquez-Millán 1994; Weber 1995; Schmid et al. 2002). Coastal waters off western Louisiana and eastern Texas also provide adequate habitats for bottom feeding.

As adults, many turtles remain in the Gulf of Mexico, with only occasional occurrence in the Atlantic Ocean (Caretta et al. 2011). Recent analysis of sightings and strandings from the eastern Atlantic Ocean may indicate that as the population increases, the range of Kemp's ridley sea turtles may be expanding into the eastern Atlantic Ocean (Witt et al. 2007).

Kemp's ridley sea turtles are likely to occur within the Atlantic and Gulf of Mexico Study Areas. They are not expected in the Pacific Study Area.

1.1.3.4. Leatherback sea turtle

Leatherback sea turtles (*Lepidochelys kempii*) are listed as endangered and occur in the Atlantic Ocean, Gulf of Mexico and Pacific Ocean. The leatherback turtle is the most widely distributed of all sea turtles, found from tropical to subpolar oceans, and nests on tropical and occasionally subtropical beaches (National Marine Fisheries Service et al. 1992a; Gilman et al. 2006; Myers and Hays 2006). Found from 71° N to 47° S, it has the most extensive range of any adult turtle (Eckert 1995). Adult leatherback turtles forage in temperate and subpolar regions in all oceans, and migrate to tropical nesting beaches between 30° N and 20° S. Leatherbacks have a wide nesting distribution, primarily on isolated mainland beaches in tropical oceans (mainly in the Atlantic and Pacific Oceans, with few in the Indian Ocean) and temperate oceans (southwest Indian Ocean) (National Marine Fisheries Service et al. 1992a), and to a lesser degree on some islands.

Limited information is available on the habitats used by post-hatchling and early juvenile leatherback sea turtles (National Marine Fisheries Service et al. 1992a). These life stages are restricted to waters warmer than 79°F (26°C); consequently, much time is spent in the tropics (Eckert 2002). Upwelling areas, such as equatorial convergence zones, serve as nursery grounds for post-hatchling and early juvenile leatherback sea turtles because these areas provide a high biomass of prey (Musick and Limpus 1997).

Late juvenile and adult leatherback sea turtles are known to range from mid-ocean to the continental shelf and nearshore waters (Schroeder and Thompson 1987; Shoop and Kenney 1992; Grant and Ferrell 1993). Juvenile and adult foraging habitats include both coastal and offshore feeding areas in temperate waters and offshore feeding areas in tropical waters (Frazier 2001). The movements of adult leatherback sea turtles appear to be linked to the seasonal availability of their prey and the requirements of their reproductive cycles (Collard 1990; Davenport and Balazs 1991).

In the Atlantic Ocean, female leatherback sea turtles have been tracked traveling from nesting beaches in the southern Caribbean due north to waters off Cape Breton Island, Nova Scotia, where they forage for many months (James et al. 2005). Most turtles left during October and all migrated south. Some turtles moved to waters near nesting beaches in Central and South America, while others migrated to open-ocean waters between 5° N and 23° N, or to continental shelf waters off the southeastern U.S. In February and March, these turtles migrated back to the North Atlantic Ocean, typically arriving in June (James et al. 2005).

Aerial surveys off the southeastern U.S. coast indicate that leatherback sea turtles occur in these waters throughout the year, with peak abundance in summer (Turtle Expert Working Group 2007). Leatherback sea turtles occur regularly in the northern Gulf of Mexico, inhabiting deep offshore waters in the vicinity of DeSoto Canyon for feeding, resting, and migrating (Landry Jr. and Costa 1999; Davis et al. 2000). Leatherback sea turtles may also occur in shallow waters on the continental shelf and have been observed feeding on dense aggregations of jellyfish in nearshore waters off the Florida Panhandle, the Mississippi River Delta, and the Texas coast (Collard 1990).

In the eastern North Pacific Ocean, leatherback turtles are broadly distributed from the tropics to as far north as Alaska (Eckert 1993; Hodge and Wing 2000). Stinson (1984) concluded that the leatherback was the most common sea turtle in U.S. waters north of Mexico. While the leatherback is known to occur throughout the California Current System, it is not known to nest anywhere along the U.S. Pacific Ocean coast. Leatherback turtles are regularly seen off the western coast of the U.S., with the greatest densities found off central California. Off central California, sea surface temperatures are highest during the summer and fall, and oceanographic conditions create favorable habitat for prey species. There is some evidence that they follow the 61°F (16°C) isotherm into Monterey Bay (Starbird et al. 1993).

Leatherback sea turtles are likely to occur within all the Study Areas. The highest density is expected over the continental shelf and shallower coastal waters.

1.1.3.5. Loggerhead sea turtle

Loggerhead sea turtles (*Caretta caretta*) occur in the Atlantic Ocean, Gulf of Mexico and Pacific Ocean. Nine distinct population segments exist for loggerhead sea turtles. The North Pacific Ocean, South Pacific Ocean, North Indian Ocean, Northeast Atlantic Ocean, and Mediterranean Sea distinct population segments are listed as endangered. The Southeast Indo-Pacific Ocean, Southwest Indian Ocean, Northwest Atlantic Ocean, and South Atlantic Ocean distinct population segments are listed as threatened.

Loggerhead sea turtles occur in U.S. waters in habitats ranging from coastal estuaries to waters far beyond the continental shelf (Dodd Jr. 1988). Loggerheads typically nest on beaches close to reef formations and next to warm currents (Dodd Jr. 1988), preferring beaches facing the ocean or along narrow bays (National Marine Fisheries Service et al. 1998b). Nesting occurs from April through September, with a peak in June and July (Williams-Walls et al. 1983; Dodd Jr. 1988; Weishampel et al. 2006). At emergence, hatchlings swim to offshore currents and remain in the open ocean, often associating with floating mats of *Sargassum* (Carr 1986,1987; Witherington and Hirama 2006). Migration between oceanic and nearshore habitats occurs during the juvenile stage as turtles move seasonally from open-ocean current systems to nearshore foraging areas (Bolten 2003; Mansfield 2006). Once adults, loggerheads continue to migrate seasonally from feeding areas to mating and, for females, nesting areas (Bolten 2003). After reaching sexual maturity, adult turtles settle in nearshore foraging habitats (Musick and Limpus 1997; Godley et al. 2003).

After reaching a length of approximately 16 in. (40 cm) (Carr 1987), early juvenile loggerheads make a transoceanic crossing, swimming back to nearshore feeding grounds near their beach of origin in the western Atlantic Ocean (Musick and Limpus 1997; Bowen et al. 2004). Juvenile loggerhead sea turtles inhabit offshore waters in the North Atlantic Ocean, where they are often associated with natural and artificial reefs (Fritts et al. 1983). Subadult and adult loggerhead turtles tend to inhabit deeper offshore feeding areas along the western Atlantic coast, from mid-Florida to New Jersey (Hopkins-Murphy et al. 2003; Roberts et al. 2005).

Shoop and Kenney(1992) estimated that a minimum of 8,000–11,000 loggerheads are present in the Northeast U.S. Continental Shelf waters each summer, with the highest summer occurrence in waters over the mid-continental shelf, roughly from Delaware Bay to Hudson Canyon. Juveniles are frequently observed in developmental habitats, including coastal inlets, sounds, bays, estuaries, and lagoons with depths less than 100 m (Turtle Expert Working Group 1998; Hopkins-Murphy et al. 2003). Long Island Sound, Cape Cod Bay, and Chesapeake Bay are the most frequently used juvenile developmental habitats along the Northeast U.S. Continental Shelf (Burke et al. 1991; Prescott 2000; University of Delaware Sea Grant 2000; Mansfield 2006).

Coles and Musick (2000) identified preferred sea surface water temperatures to be between 56°F and 82°F (13.3°C and 28°C) for loggerhead turtles off North Carolina. As water temperatures drop from October to December, most loggerheads emigrate from their summer developmental habitats and eventually return to warmer waters south of Cape Hatteras, where they spend the winter (Morreale and Standora 1998). The nesting population of the Northwest Atlantic Ocean loggerhead sea turtle distinct population segment is concentrated along the U.S. east coast and Gulf of Mexico from southern Virginia to Alabama (Conant et al. 2009). The greatest proportion of that nesting occurs on the Florida Atlantic coast, below latitude 29° N (Ehrhart et al. 2003).

Loggerhead sea turtles can be found during all seasons in both continental shelf and slope waters of the Gulf of Mexico (Fritts et al. 1983; Davis et al. 2000). Nesting is infrequent in this region, and juvenile loggerheads appear to primarily use the developmental habitats found in the northwestern Gulf (Pitman 1990; Bowen et al. 1995; Zug et al. 1995; Musick and Limpus 1997; Bolten 2003). The occurrence of loggerhead sea turtles during winter is likely concentrated in the northeastern Gulf, in Alabama and Florida Panhandle shelf waters, and in the deeper off-shelf waters from Texas to Florida, although not as abundantly as in shelf waters.

Pacific Ocean loggerheads appear to use the entire North Pacific Ocean during development. There is substantial evidence that the North Pacific Ocean stock makes two transoceanic crossings. Offshore, juvenile loggerheads forage in or migrate through the North Pacific Subtropical Gyre as they move between North American developmental habitats and nesting beaches in Japan. The North Pacific Transition Zone is defined by convergence zones of high productivity that stretch across the entire north Pacific Ocean from Japan to California (Polovina et al. 2001). These turtles, whose oceanic phase lasts a decade or more, have been tracked swimming against the prevailing current, apparently to remain in the areas of highest productivity. Juvenile loggerheads originating from nesting beaches in Japan migrate through the North Pacific Transition Zone en route to important foraging habitats in Baja California (Bowen et al. 1995).

The loggerhead turtle is known to occur at sea in the Southern California, but does not nest on Southern California beaches. Southern California waters are considered an area of occurrence during the warm-water period. The area of occurrence during the cold-water period is cut along the 64°F (18°C) isotherm. Loggerheads are generally not found in waters colder than 60.8°F (16°C), so the area north of the 60.8°F (16°C) isotherm is depicted as an area of rare occurrence (NMFS 2003). Loggerhead turtles primarily occupy areas where the sea surface temperature is between 59°F and 77°F (15°C and 25°C). The loggerhead embarks on transoceanic migrations, and has been reported as far north as Alaska and as far south as Chile.

Loggerhead sea turtles are likely to occur within all the Study Areas. They are primarily concentrated in warmer waters but may conduct open ocean migrations which could potentially cross the proposed transit route once in the high seas.

1.1.3.6. Olive ridley sea turtle

Olive ridley sea turtles (*Lepidochelys olivacea*) occur south of Florida in the Atlantic Ocean, Gulf of Mexico and Pacific Ocean. The Olive ridley sea turtle is listed as threatened, except the breeding populations of Mexico's Pacific coast are listed as endangered. Most olive ridley turtles lead a primarily open ocean existence (National Marine Fisheries Service et al. 1998c). Outside of the breeding season, the turtles disperse, but little is known of their foraging habitats or migratory behavior. Neither males nor females migrate to one specific foraging area, but tend to roam and occupy a series of feeding areas in the open ocean (Plotkin et al. 1994). The olive ridley has a large range in tropical and subtropical regions in the Pacific Ocean, and is generally found between 40° N and 40° S. Both adult and juvenile olive ridley turtles typically inhabit offshore waters, foraging from the surface to a depth of 490 ft (149 m) (National Marine Fisheries Service et al. 1998c). Groups of more than 100 turtles have been observed as far offshore as 120° W, at about 1,620 nm from shore (Arenas and Hall 1992). Sightings of large groups of olive ridley turtles at sea reported by Oliver in 1946 (National Marine Fisheries Service et al. 1998c) may indicate that turtles travel in large flotillas between nesting beaches and feeding areas (Márquez-Millán 1990). Specific post- breeding migratory pathways to feeding areas do not appear to exist, although olive ridley turtles swim hundreds to thousands of kilometers over vast oceanic areas.

The olive ridley sea turtle (*Lepidochelys olivacea*) in the Atlantic is considered extralimital. Western Atlantic olive ridley sea turtle populations are centered near Suriname/French Guiana and Brazil. Between 1999 and 2001, three individuals were reported in coastal south Florida; however, all were strandings (Foley et al. 2003). These are the first known sightings in Florida and the northernmost occurrences of olive ridleys in the western North Atlantic. These sightings are considered extralimital occurrences, and genetic analysis confirmed that these three turtles were members of the Suriname/French Guiana population (Foley et al. 2003). Currently, there are no olive ridley nesting beaches in the eastern U.S., and there are no known feeding, breeding, or migration areas.

A significant nesting area for olive ridley turtles, globally, occurs in the eastern Pacific Ocean, along the western coast of southern Mexico and northern Costa Rica, with reported nesting as far north as southern Baja California (Fritts et al. 1982). In the open ocean of the eastern Pacific Ocean, olive ridley turtles are often seen near flotsam (floating debris), possibly feeding on associated fish and invertebrates (Pitman 1992). The olive ridley turtle occurs off the coast of southern and central California, but is not known to nest on California beaches. Olive ridley turtles are occasionally seen in shallow waters less than 165 ft (50 m), although these sightings are relatively rare (National Marine Fisheries Service et al. 1998c). In general, turtle sightings increase during summer as warm water moves northward along the coast (Stinson 1984; Steiner and Walder 2005).

Olive ridley sea turtles are likely to occur within all Study Areas. Densities are expected to be highest in warm waters.

CHAPTER 2 ENVIRONMENTAL CONSEQUENCES

2.1. IMPACTS TO THE BIOLOGICAL ENVIRONMENT

The primary issue regarding the biological environment is vessel movement which could result in collision between the tug, tow cable or tow and marine mammals or sea turtles.

2.1.1. Marine Mammals

Interactions between surface vessels and marine mammals have demonstrated that surface vessels represent a source of acute and chronic disturbance for marine mammals (Hewitt 1985; Kraus et al. 1986; 63 FR 46693 1998; Au et al. 2000; Magalhães et al. 2002; Richter et al. 2003; Nowacek et al. 2004; Bejder et al. 2006; Richter et al. 2006; Richter et al. 2008; Jefferson et al. 2009; Williams et al. 2009). In some circumstances, marine mammals respond to vessels with the same behavioral repertoire and tactics they employ when they encounter predators, although it is not clear what environmental cue or cues marine animals might respond to - the sounds of water being displaced by the ships, the sounds of the ships' engines, or a combination of environmental cues surface vessels produce while they transit.

These studies establish that marine mammals engage in avoidance behavior when surface vessels move toward them. It is not clear whether these responses are caused by the physical presence of a surface vessel, the underwater noise generated by the vessel, or an interaction between the two, although the noise generated by the vessels is probably an important contributing factor to the responses of cetaceans to the vessels. In one study, North Atlantic right whales were documented to show little overall reaction to the playback of sounds of approaching vessels, but they did respond to an alert signal by swimming strongly to the surface, which may increase their risk of collision (Nowacek et al. 2004). Aside from the potential for an increased risk of collision addressed below, physical disturbance from vessel use is not expected to result in more than a momentary behavioral response.

Vessel speed, size, and mass are all important factors in determining potential impacts of a vessel strike to marine mammals (Vanderlaan and Taggart 2007). For large vessels, speed and angle of approach can influence the severity of a strike. Silber et al. (2010) found, based on hydrodynamic modeling, that whales at the surface experienced impacts that increased in magnitude with the ship's increasing speed. Results of the study also indicated that potential impacts were not dependent on the whale's orientation to the path of the ship, but that vessel speed may be an important factor. At ship speeds of 15 knots or higher, there was a marked increase in intensity of centerline impacts on whales. Results also indicated that when the whale was below the surface (about one to two times the vessel draft), there was a pronounced propeller suction effect. This suction effect may draw the whale into the hull of the ship, increasing the probability of propeller strikes (Silber et al. 2010).

Vessel collisions are well known source of mortality in marine mammals, and can be a significant factor affecting some large whale populations (Knowlton and Kraus 2001; Laist et al. 2001; Van Waerebeek et al. 2007). During a review of data on the subject, Laist et al. (2001) compiled historical records of ship strikes, which contained 58 anecdotal accounts. It was noted that in the majority of cases, the whale was either not observed or seen too late to maneuver in an attempt to avoid collision. Right whales have been observed to exhibit little reaction to approaching vessels (Nowacek et al. 2004). Logging sperm whales, recovering on the surface from deep foraging dives, are also particularly susceptible to being struck (Watkins et al. 1999).

The speed of the ship is an important factor in predicting the lethality of a strike. Laist et al. (2001) noted that most severe and fatal injuries occurred when the vessel was traveling in excess of 14 knots (kts) with no recorded mortalities at speeds less than 10 kts. Although the tug and tow will be traveling at 10 kts or less, slow speed does not eliminate the chance that a collision will result in fatal injury. Vanderlaan & Taggert (2007) analyzed this question and concluded that at speeds below 8 kts there was still a 20% risk of death from blunt trauma. Additionally, there is a possibility a marine mammals could be struck by the tug's propeller, which even at low speeds greatly increases the chance of a mortal wound (Knowlton and Kraus 2001; Woodward et al. 2004). The towed ship would pose the same threat for blunt trauma as the tug, but not possess the added danger of a rotating propeller.

The effect of encountering a tow cable has not been widely analyzed. It is 2,000 ft (610 m) in length with a relatively narrow diameter (2.25 inches [5.72 centimeters]). The tow cable was evaluated for the potential to injure marine mammals because it will be at a depth of up to 100 ft (30 m) and have tension of up to 75 tons. Nowacek et al. (2001) used data recording tags to investigate the diving and surfacing behavior of right whales. It was concluded that during ascent in particular, the animal's positive buoyancy reduced its ability to maneuver, even if a threat was perceived overhead. Studies on tissue injuries in both right and humpback whales resulting from interaction with 6.5 millimeter (mm) and 9.5 mm diameter polypropylene lines used on lobster gear concluded that elasticity of the line, tension applied and the length that was drawn over the skin were factors in how deeply the line penetrated the epidermis. More elastic lines and shorter draw lengths were less damaging than those lines with minimal stretch and greater length (Winn et al. 2008). Should a large whale surface from beneath the tow cable, the lack of elasticity of wire rope under great strain combined with up to 2,000 ft of draw length has the potential to cause lacerations and injury.

2.1.2. Sea Turtles

Sea turtles can detect approaching vessels, likely by sight rather than by sound (Bartol and Ketten 2006; Hazel et al. 2007). Sea turtles seem to react more to slower moving vessels (2.2 knots) than to faster vessels (5.9 knots or greater). During an interaction with sea turtles and a 6m aluminum boat at 10 kts, turtles were not able to dive and achieve a depth sufficient to avoid collision with a larger craft (Hazel et al. 2007).

Vessel-related injuries to sea turtles are more likely to occur in areas with high boating traffic. For example, propeller wounds on loggerhead sea turtles are found often in southeast Florida, from Palm Beach County to Miami-Dade County, likely due to the prevalence of recreational boating in that region (National Marine Fisheries Service et al. 2007a). A study in Queensland, Australia produce similar results (Hazel and Gyuris 2006).

Minor strikes may cause temporary reversible impacts, such as diverting the turtle from its previous activity or causing minor injury. Major strikes are those that can cause permanent injury or death from bleeding/trauma, paralysis and subsequent drowning, infection, or inability to feed. Apart from the severity of the physical strike, the likelihood and rate of a turtle's recovery from a strike may be influenced by its age, reproductive state, and general condition. Much of what is written about recovery from vessel strikes is inferred from observing individuals some time after a strike. Numerous sea turtles bear scars that appear to have been caused by propeller cuts or collisions with vessel hulls (Lutcavage et al. 1997; Hazel et al. 2007), suggesting that not all vessel strikes are lethal. Conversely, fresh wounds on some stranded animals may strongly suggest a vessel strike as the cause of death. The actual incidence of recovery versus death is not known, given available data.

Any of the sea turtle species found in the Study Area can occur at or near the surface in open ocean and coastal areas, whether feeding or periodically surfacing to breathe. Sea turtles spend most of their time submerged (Renaud and Carpenter 1994; Sasso and Witzell 2006). Leatherback turtles are more likely to feed at or near the surface in open ocean areas. Green, hawksbill, Kemp's ridley, and loggerhead turtles are more likely to forage nearshore, and although they may feed along the seafloor, they surface periodically to breathe while feeding and moving between nearshore habitats. These species are distributed widely in all offshore portions of the Study Area.

2.2. RISK ASSESSMENT

Preventing collision with marine mammals and sea turtles depends on detecting the animal in time to take effective action. The NOAA "Vessel Strike Avoidance Measures" are based upon sighting animals and taking action to avoid them, including maneuvering and shifting engines into neutral. In the case of a tug and tow, the ability to take such actions is considerably constrained. Additionally, it is difficult to sight whales or sea turtles during periods of poor visibility.

Although the tug, tow cable and tow may affect endangered species encountered along the proposed tow routes, the chance that such an encounter would result in serious injury is extremely remote. The relatively low speed of the tug and tow reduces the chance that a fatal injury to listed whales will occur (Vanderlaan and Taggart 2007). The most susceptible species are North Atlantic right whales and sperm whales that may be logging at the surface. All species of sea turtles are considered vulnerable.

There has been speculation that at low speeds animals may be afforded more time to take action to avoid contact with the vessel. There have been few reported collisions of whales with ships at speeds under 10 kts (Laist et al. 2001; Jensen and Silber 2003; Vanderlaan and Taggart 2007), but whether it is related to avoidance on the part of the animal or operators being able to take action is unclear in the available literature.

The amount of time that the tug and tow spends in habitats associated with these species is another important consideration. The route planned for the ex-CONSTELLATION from Bremerton around South America has the tug and tow traveling south through the U.S. Exclusive Economic Zone (EEZ) between 50 and 100 nm (92 and 185 km) from the coast, then far out at sea in the open ocean, through the Straits of Magellan before turning north toward the Gulf of Mexico or the East Coast of North America. There will be a relatively short period of time during which the tug and tow will transit southern resident killer whale habitat as it travels out of Puget Sound, remaining within the U.S. EEZ as it parallels the coast before moving further offshore until it approaches the Straits of Magellan. The proposed route then takes the tug and tow well offshore of the eastern South American Coast. The vessels will not likely encounter significant densities of listed species until the Gulf of Mexico where sea turtles become more abundant. The route to Baltimore will mostly occur off the continental shelf, but cross the shelf break near Virginia, passing through the North Atlantic right whale migratory corridor as it enters the Chesapeake Bay at Hampton Roads. Right whales may be present in this area from November through April, with peak abundance during March and April (Knowlton et al. 2002). All recorded sightings were within 35 nm of shore (Knowlton et al. 2002). At a speed of 8 kts, the tug and tow would transit this area in less than four and a half hours.

The ex-FORREST SHERMAN will transit to either New Orleans, LA or Brownsville, TX after departing from Philadelphia and heading east from Delaware Bay until beyond the main axis of the Gulf Stream before turning south. Right whale occurrence in the vicinity of Delaware Bay is similar to what is noted for Hampton Roads, with the exception that they may range slightly further offshore (Knowlton et al. 2002). However, all sightings have been within 40 nm of the coast. Again, using an 8 knot average speed it will take the tug and tow five hours to clear this corridor. Sea turtles are more abundant in the Straits of Florida and the Gulf of Mexico. The potential route into New Orleans passes through a few areas of high sperm whale density approaching the shelf break off the Mississippi Delta (Baumgartner et al. 2001; Davis et al. 2002). The general region stretches for approximately 100 nm, which would take 12.5 hours to transit at 8 kts. In all cases, when viewed within the broad context of the action proposed, the amount of time the tug and tow will occur in areas where listed species may been encountered is minimal.

In conclusion, based upon the low speed of the tug and tow along with the relatively short periods they will be transiting habitats where the most susceptible species (North Atlantic right whales, sperm whales and sea turtles) are most likely to be encountered, the Navy concludes that this action may affect but is not likely to adversely affect endangered species.

CHAPTER 3 REFERENCES

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ATTACHMENT V
U.S. NAVY TUGS AND TOWING

Towing would be performed in accordance with requirements of Appendix H of the U.S. Navy Towing Manual SI740-AA-MAM-010, Rev 3, July 2002. The contractor would be responsible for making all applicable notifications associated with the towing activity and would adhere to all applicable safety requirements for towing the inactive ships. Commercial pilots would be utilized for departures from and entries into ports.

Tugs

The characteristics of the tugs used for the towing of vessels to be disposed of by dismantling would depend on the contractor ultimately hired to perform the task, route chosen and size of the tow. Within the harbors where the ships are berthed, smaller harbor tugs would be used to move the inactive ship away from the piers and into position where the cable could be passed from the towing tug and attached to the vessel.

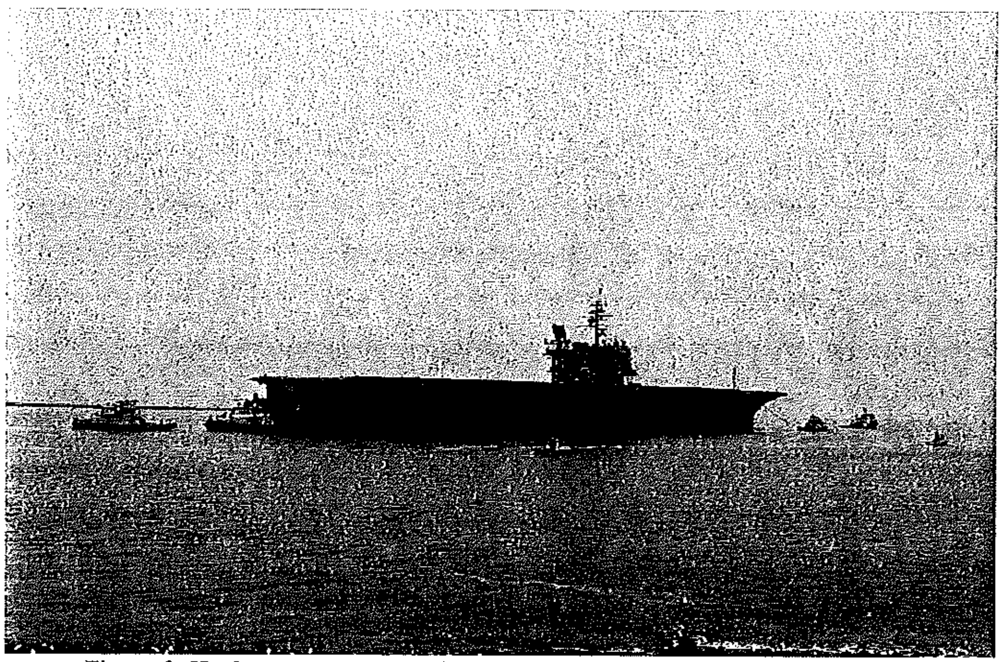

Figure 9. Harbor tugs maneuvering the Ex-CONSTELLATION in Bremerton WA

The size of the tug employed to move the inactive vessel depends on the factors previously mentioned. For example, moving ex-FORREST SHERMAN from Philadelphia, through the Chesapeake and Delaware Canal to Baltimore would require less power than towing the same ship in the open ocean. Similarly, a tug involved in open-ocean towing of the ex-CONSTELLATION around South America would necessarily be among the largest and most seaworthy class of these vessels, generally referred to as a salvage tug.

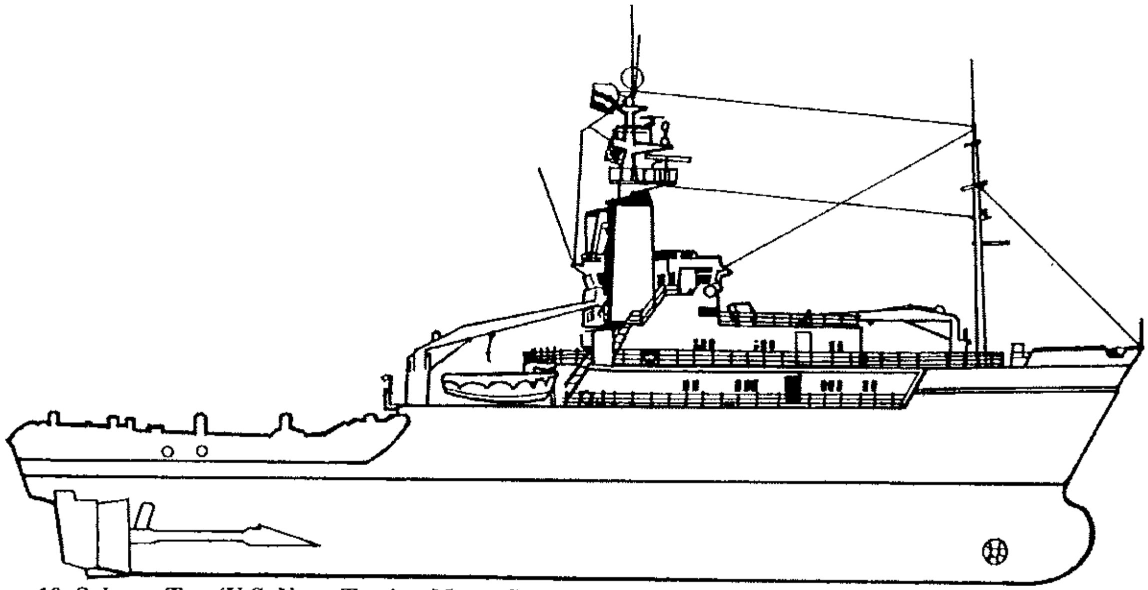

Figure 10. Salvage Tug (U.S. Navy Towing Manual)

Figure 11. Atlantic Service, a modern offshore commercial tug (Hornbeck Offshore Transportation)

The following chart from the U.S. Navy Towing Manual compares a variety of available commercial tugs with a Navy salvage ship and provides examples of their differing capabilities.

Table 1.Typical Commercial Salvage/Towing Vessels for Hire Compared with a U.S. Navy Salvage Ship.

Name	***USS Safeguard***	***Atlantic Salvor***	***Fotiy Krilov***	***Baraka II***
Type	USN Salvage and Rescue	Towing and Salvage	Salvage	Salvage
Year	1985	1975	1989	1994
LOA (ft)	255	254	321.5	227
Beam (ft)	51	43.25	64	51
Draft (ft)	15.5	21.5	23.5	24.25
Horse Power	4200	8800	24482	16000
Bollard Pull (tons)	54	127	250	161
Max Speed (kts)	13.5	16	18	17

Table 2. Typical Commercial Salvage/Towing Vessels for Hire

Name	***Smit Singapore***	***Otto Candies***	***Star Sirius***	***Salvigour***
Type	Towing and Salvage	Anchor Handling	Anchor Handling	Salvage
Year	1984	1985	1985	1990
LOA (ft)	247	140	213	218.1
Beam (ft)	50.1	42	47.5	48.2
Draft (ft)	25	20.1	24.25	20.7
Horse Power	13500	7200	9180	6600
Bollard Pull (tons)	188	100	112	110
Max Speed (kts)	13	14	12	16

Once in the open sea, the length of the tow cable will depend upon the size of the tow and weather conditions encountered. In the case of towing a large ship depicted below, the cable may be 2000' long and dip 100' below the surface while maintaining 75 tons of towline tension.

RIGGING FOR A TOW

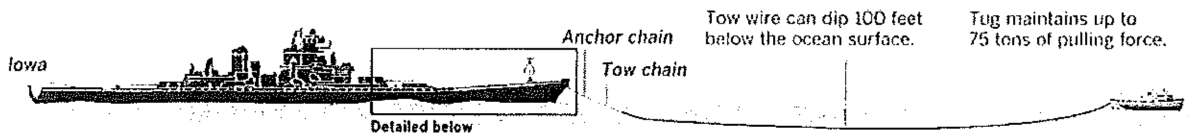

Figure 12. Typical tug and tow configuration for a large ship, in this case Ex-IOWA.

The Ex-CONSTELLATION would have similar rigging while the smaller Ex-FORREST SHERMAN would require less cable and towing force.