SUMMARY OF THE FINAL BIOLOGICAL AND CONFERENCE OPINION ON THE EFFECTS TO THE ENDANGERED OCELOT (*Leopardus pardalis*), ENDANGERED GULF COAST JAGUARUNDI (*Herpailurus yagouaroundi cacomitli*), ENDANGERED NORTHERN APLOMADO FALCON (*Falco femoralis septentrionalis*), ENDANGERED KEMP'S RIDLEY SEA TURTLE (*Lepidochelys kempii*), ENDANGERED HAWKSBILL SEA TURTLE (*Eretmochelys imbricata*), ENDANGERED LEATHERBACK SEA TURTLE (*Dermochelys coriacea*), THREATENED GREEN SEA TURLTE (*Chelonia mydas*), THREATENED LOGGERHEAD SEA TURTLE (*Caretta caretta*), THREATENED PIPING PLOVER (*Charadrius melodus*) AND ITS CRITICAL HABITAT, AND PROPOSED TO BE LISTED AS THREATENED RED KNOT (*Calidris canutus rufa*) FROM THE PROPOSED ISSUANCE OF FEDERAL AVIATION ADMINISTRATION LAUNCH LICENSE AUTHORIZING SPACEX TO LAUNCH FALCON 9 AND FALCON HEAVY ORBITAL VERTICAL LAUNCH VEHICLES AND A VARIETY OF REUSABLE SUBORBITAL LAUNCH VEHICLES FROM PRIVATE PROPERTY, BOCA CHICA, CAMERON COUNTY, TEXAS

Consultation No. 02ETCC00-2012-F-0186

Date of the Final Biological and Conference Opinion: December 18, 2013

Action agency: Federal Aviation Administration

Proposed Action: Issuance of launch licenses and/or experimental permits to SpaceX

Listed and Proposed Species: ocelot, Gulf Coast jaguarundi, northern aplomado falcon, Kemp's ridley sea turtle, hawksbill sea turtle, leatherback sea turtle, green sea turtle, loggerhead sea turtle, piping plover and its critical habitat, and the proposed as threatened red knot.

Biological and Conference Opinion: It is the opinion of the Service that the proposed SpaceX project is not likely to jeopardize the continued existence of any of the above listed or proposed to be listed species nor adversely modify piping plover critical habitat.

Incidental Take Statement: The Service anticipates that despite implementation of avoidance and minimization measures throughout the term of this BCO (2025) a risk still exists, although minimal, that species and critical habitat could be taken and therefore the Service has issued the following incidental take as

The Service anticipates incidental take of an ocelot and jaguarundi in the form of harm and harassment will be difficult to detect because 1) the species is wide-ranging, 2) elusive, 3) nocturnal, and 4) finding a dead or impaired specimen that has resulted from impaired essential behavioral patterns like breeding, feeding or sheltering is unlikely. The take of an ocelot or jaguarundi, however, can be reasonably anticipated by increased risk of injury by road mortality, and/or by prevented dispersal of cats into otherwise suitable habitat. Therefore, the Service anticipates:

1) 2 endangered cats (ocelots and/or jaguarundi) would be taken in the form of harm and harassment, due to the construction and operations of SpaceX and/or injury or mortality

due to a vehicular collision, noise and human disturbance within the project area for the life of the project.

2) Sea turtle nesting habitat along 7.53 miles of beachfront will be disturbed by vehicular traffic associated with security activities; however, incidental take of sea turtles will be difficult to detect for the following reasons:
    - the loggerhead, green, leatherback and hawksbill turtles nest primarily at night and although the Kemp's ridley primarily nest during the day, some have been known to nest at night
    - all nests are not located because a) natural factors, such as rainfall, wind, and tides may obscure crawls; and b) human-caused factors, such as pedestrian and vehicular traffic, may obscure crawls, and result in nests being destroyed because they were missed during a nesting survey and egg relocation program;
    - the total number of hatchlings per undiscovered nest is unknown;
    - the reduction in percent hatching and emerging success per relocated nest over the natural nest site is unknown; and
    - an unknown number of females may avoid the project beach and be forced to nest in a less than optimal area.

However, take of these species can be anticipated because:

- sea turtles nest within the beach portion of the action area;
- project security patrols and monitoring will likely occur along the beach area during a portion of the nesting season.

Take is expected to be in the form of harassment, injury, and/or death from:

- destruction of all nests that may be constructed and eggs that may be deposited from March 15 through October 1 and missed by a nest survey and egg relocation program within the boundaries of the beach portion of the action area;
- injury or death from vehicles and/or equipment driving over an adult sea turtle, hatchling, stranded or post-hatchling washback, sea turtles from an undetected, unmarked/unprotected sea turtle nest, and
- harassment in the form of disturbing or interfering with female turtles attempting to nest during security patrols or monitoring; behavior modification of nesting females resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs.

As stated previously, approximately 91 sea turtle nests have been recorded along South Padre Island and Boca Chica beaches to the Rio Grande. The Service anticipates the proposed project could potentially "take" a maximum of 91 nesting sea turtles prior to any avoidance and minimization measures being implemented. Implementation of avoidance and minimization measures further reduces the estimated number of sea turtles that could be taken. The Kemp's ridley is the most frequently documented sea turtle occurring in the action area and the loggerhead is a very infrequent second. Thus, the potential for SpaceX related activities interacting with Kemp's ridley adults; hatchlings or eggs would be greater, thus the number of Kemp's ridley adults, hatchlings and eggs at risk of "take" would also be greater.

Therefore, the Service anticipates that despite avoidance and minimization measures implemented through the term of this BCO (2025) a risk still exists, although minimal, that adult sea turtles could be struck by vehicles and nests could go undetected by the egg relocation program surveys within the proposed action area and:

- 3 adult Kemp's ridley sea turtles and 3 nests per year, including all hatchlings and/or eggs (up to approximately 200 eggs) could be taken.
- 1 adult loggerhead sea turtle and 1 nest per year, including all hatchlings and/or eggs (up to approximately 200 eggs) could be taken.
- 1 adult green sea turtle and 1 nest per year, including all hatchlings and/or eggs (up to approximately 200 eggs) could be taken.
- 1 adult leatherback sea turtle and 1 nest per year, including all hatchlings and/or eggs (up to approximately 200 eggs) could be taken.
- 1 adult hawksbill sea turtle and 1 nest per year, including all hatchlings and/or eggs (up to approximately 200 eggs) could be taken.

If the agreed upon avoidance and minimization measures are to be deviated from or if the level of take is reached for any one of the species, FAA and SpaceX must contact the Service's Coastal Ecological Services Field Office immediately to review the circumstances and revisit the take analysis. Although incidental take is anticipated for three Kemp's ridley nests per year, if one nest is taken the Service also would appreciate the opportunity to review the circumstances and the avoidance and minimization measures.

3) 1 northern aplomado falcon to be taken by harm or harassment due to noise and human disturbance through the term of this BCO (2025).

4) Incidental take of piping plovers will be difficult to detect for the following reasons: a) harassment to the level of harm may only be apparent on the breeding grounds the following year; and b) dead plovers may be carried away by waves or predators. The level of take of this species can be anticipated by the proposed activities because: a) piping plovers migrate to and winter in the action area; b) increased levels of construction and operational disturbance is expected. Take is expected in the form of harm and harassment due to decreased fitness and survivorship of wintering plovers due to loss and degradation of foraging and roosting habitat and decreased fitness and survivorship of plovers attempting to migrate to breeding grounds due to loss and degradation of foraging and roosting habitat. Therefore, the Service anticipates direct and indirect take of an unspecified number of piping plovers.

5) The direct and indirect loss of 6.18 acres from construction and the conversion of 8.66 acres of occupied piping plover critical habitat in Critical Habitat Unit TX-1, for a total take of 14.84 acres of piping plover critical habitat.

After reviewing the current status of the red knot, the environmental baseline for the action area, the effects of the proposed issuance of a launch permit, and the cumulative effects, it is the Service's conference opinion that the project, as proposed, is not likely to jeopardize the continued existence of the proposed red knot.

Reasonable and Prudent Measures: Avoidance and minimization measures to reduce impacts to nesting adult sea turtles, their nests and hatchlings; ocelots; Gulf Coast jaguarundis; northern aplomado falcons; and piping plovers and piping plover critical habitat in Critical Habitat Units TX-1 and TX-2.

Conservation Recommendations: 1) Locate areas where there are opportunities to present or establish Service-approved workshops, signage, or other opportunities for each species in counties where study will be conducted. 2) Work with the Service to design and fund a research program to determine the population of ocelots and jaguarundis and prey species available to the cats in the south Texas counties. 3) Promote progressive range management techniques for the falcon on large expanses of grassland and coastal prairie habitat with long term cooperative arrangements such as leases, exchanges, purchases, and conservation education.

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In Reply Refer To:
FWS/R2/CCES/

December 18, 2013

Stacey Zee
Federal Aviation Administration
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Washington, DC 20591

Consultation No. 02ETCC00-2012-F-0186

Dear Ms. Zee:

This transmits the U.S. Fish and Wildlife Service's (Service) Final Biological and Conference Opinions (BCO) based on our review of the proposed issuance of Federal Aviation Administration (FAA) launch licenses and/or experimental permits to authorize Space Exploration Technologies Corp. (SpaceX) to launch Falcon 9 and Falcon Heavy orbital vertical launch vehicles and a variety of reusable suborbital launch vehicles near Boca Chica, Cameron County, Texas and the effects on the endangered ocelot (*Leopardus pardalis*), endangered Gulf Coast jaguarundi (*Herpailurus yagouaroundi cacomitli*), endangered northern aplomado falcon (*Falco femoralis septentrionalis*), endangered Kemp's ridley sea turtle (*Lepidochelys kempii*), endangered hawksbill sea turtle (*Eretmochelys imbricata*), endangered leatherback sea turtle (*Dermochelys coriacea*), threatened green sea turtle (*Chelonia mydas*), threatened loggerhead sea turtle (*Caretta caretta*), threatened piping plover (*Charadrius melodus*) and designated critical habitat, and the proposed to be listed as threatened red knot (*Calidris canutus rufa*) in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. §1531 et seq.).

This BCO is based on information provided in FAA's *Revised Final Biological Assessment, Potential Effects on USFWS-Listed Species from the Issuance of Launch Licenses and/or Experimental Permits for the Proposed SpaceX Texas Launch Site, Cameron County, Texas,* dated March 2013 (BA); the Draft Environmental Impact Statement (DEIS) dated April 2013; and other sources of information. A complete record of this consultation is on file in the Corpus Christi Office of the Texas Coastal Ecological Services Field Office.

In addition the FAA determined the proposed action "may affect, but is not likely to adversely affect," the endangered West Indian manatee (*Trichechus manatus*). We concur and understand that in order to protect these species FAA will ensure precautions and education outreach efforts will be enforced.

Consultation History: Please see Appendix A for a history of the consultation.

BIOLOGICAL AND CONFERENCE OPINION

I. Description of the Proposed Action

FAA proposes to issue launch licenses and/or experimental permits to authorize SpaceX to launch Falcon 9 and Falcon Heavy orbital vertical launch vehicles and other suborbital launch vehicles from a private launch site. SpaceX proposes to construct facilities, structures and utility connections to support and operate a vertical launch site and a control center on approximately 56.5 acres in Cameron County, Texas (Figure 1).

Location

The property is adjacent to the eastern terminus of State Highway 4 (SH4) (also known as Boca Chica Boulevard), to South Bay and to the Gulf of Mexico. It lies south of Boca Chica State Park, Brazos Island State Park, approximately 5 miles south of Port Isabel and South Padre Island, approximately 18 miles east-northeast of Brownsville/South Padre Island International Airport, and approximately 3 miles north of the U.S.-Mexico border. The Lower Rio Grande Valley National Wildlife Refuge (NWR) borders the property on either side of SH4 and the Palmito Ranch Battlefield National Historic Landmark (NHL) is approximately 8.5 miles west of the site (Figure 2).

Action Area

The action area is the geographic area in which project effects could potentially be experienced by listed species. The action area includes areas impacted by proposed construction activities at the vertical launch and control center areas, noise and disturbance from launch operations, beach closure activities on launch days, and daily activities. The action area begins at the soft checkpoint located near the junction of SH4 and N. Oklahoma Avenue, just before the Border Patrol checkpoint, and encompasses all areas south of the Queen Isabella Causeway south to the Rio Grande, east to Boca Chica Beach (Figure 3). The action area includes portions of two piping plover Critical Habitat Units, TX-1 and TX-2 (Figure 4).

Construction Activities

Construction of the launch and control center facilities is expected to be complete within 24 months. Most construction will occur during the hours of 8 a.m. to 5 p.m., Monday through Friday. Night construction will occur for approximately 2 weeks during concrete pouring and approximately 2 weeks for pile driving.

Launch Area

The proposed vertical launch area will occupy 20 of the 56.5 acres owned or leased by SpaceX. The rest of the acreage will remain undeveloped/open space. Fill material will raise land levels to minimize flooding impacts. The facilities will be constructed at an elevated level of approximately 4-5 feet and where possible, creating a natural drainage away from the facilities to two storm water retention ponds that will include valves and outlets to release accumulated storm water. Runoff will be into jurisdictional unvegetated salt flats associated with the Gulf of

Mexico. Equipment within the facility will be mounted or located above floor level to provide additional protection. Pilings will be driven to construct the larger facilities that support heavy loads. Staging areas will occur within proposed project boundaries and no additional areas will be needed. Facilities within the launch area will include the integration and processing hangar (hangar), launch pad, launch stand with flame duct, water tower, deluge water retention basin, propellant storage and handling areas, workshop and office area, parts storage warehouse, roads, parking areas, fencing, security gates, and utilities (Figure 5 and 6).

Integration and Processing Hangar
The hangar will be used to prepare launch vehicles, with final fueling and payload loading onto the vehicle. It will be approximately 43,200 square feet (360 feet by120 feet by 65 feet high), and constructed of prefabricated steel framework with steel or aluminum sheet walls. The fueling facilities will have up to two active scrubbers consisting of scrubbing towers, storage tank, service panel, circulation pump and a liquid separator, all mounted on a "low boy" trailer for easy transport.

Launch Pad
The launch vehicle will be transported via a concrete road from the hangar to the pad. The road will be approximately 75,110 square feet. The launch pad will be used to erect the launch vehicle to a vertical position prior to launch. It will cover about 17,900 square feet and be approximately 50 feet tall with a concrete and steel structure with a flame duct, launch mount, and upper deck. The flame duct will direct the heat and combustion products and the initial sound blast toward the Gulf of Mexico. The pad will also include two concrete and steel wings, pad lighting, and four lightning protection towers, not to exceed 200 feet in height.

Deluge Water System
Deluge systems are open fire sprinklers with simultaneous operation and designed for special hazards with rapid fire spread such as a rocket launch. Water for the deluge system will be withdrawn from the underlying aquifer. A 250 foot tall water tower will be installed with at least 250,000 gallons of water for cooling, sound and vibration suppression, and fire protection. Approximately 50,000-200,000 gallons will be discharged during a launch event, and all water not vaporized and expelled during the launch will go to a retention basin underneath the pad and not released into the nearby tidal flat. This water will be sampled and analyzed for controlled contaminant levels. If levels exceed the Texas Commission on Environmental Quality (TCEQ) water quality standards, the water will be removed and hauled to an approved industrial wastewater treatment facility outside of the vertical launch area. Water not exceeding levels will be pumped back to the water tower. Approximately 50% (25,000-100,000 gallons) of the deluge water discharged during a launch event is expected to be vaporized over the site and adjacent wind tidal flats. A plan will be developed to address potential vegetation changes.

Propellant Storage and Handling Areas
The propellant storage areas will be built on approximately 28,550 square feet. These areas include storage and handling equipment for propellants and gases that fuel the launch vehicle. There are four primary areas: liquid oxygen (LOX), rocket propellant-1 (RP-1), helium, and

nitrogen. Each area will include storage tanks or vessels, containment area, fluid pumps, gas vaporizers, and other components necessary to control fuel flow to the launch vehicle. Each area will include a concrete or asphalt parking area for delivery trucks to refill the storage tanks.

Workshop and Office
Both facilities will be prefabricated steel framing with steel or aluminum sheet walls. The workshop would be approximately 10,800 square feet (80 feet by 135 feet) and approximately 40 feet tall and the office is expected to be approximately 3,200 square feet (80 feet by 40 feet). The workshop will include machining and welding equipment and other tools. The office area will provide easy access to company network files and information.

Access Roads and Infrastructure
Roads and utilities will provide access, power, data, and water to the facilities within the vertical launch area. Approximately 2.45 acres will be parking and road area. Parking for the launch area and the control area will accommodate up to 250 personnel. Roads will be constructed of concrete or asphalt. The perimeter access road would be dirt/gravel. The area will also include exterior lighting, security fences, and gates.

Utilities will include power, data, water, and septic. An estimated 1,000-3,000 kilowatts per hour (kW/hr) is required by the vertical launch area during launch operations. Primary power for the vertical launch area would be provided by commercial power from the control center area, located approximately 2 miles west, to the vertical launch area. New power and data lines will be installed within the SH4 right-of-way (ROW) from the control center area to the vertical launch area. Potable water will either be delivered by truck to a holding tank at the vertical launch area or pumped from a well on the property. The septic system would consist of a mobile above ground processing unit and holding tank.

Facility Security
Two security gates and two 400 square foot guard houses will be constructed to control access to the vertical launch area. The guard houses will be staffed by a minimum of two 24 hour security personnel, with 12 hour shifts. During times of high activity or risk, the number of security offers will be scaled up appropriately and will respond via foot or vehicles suitable for the terrain. Two 6-foot tall perimeter chain-link fences will be erected around the vertical launch area and will enclose approximately 20 acres. The two fences will be approximately 10 feet apart with a 7-foot wide dirt access road inside the inner fence for security patrols. The outside perimeter fence will include a sensor system to detect unauthorized access. The control center will maintain 24 hour monitoring of all security systems.

Lighting will be positioned to illuminate the perimeter and a zone leading up to the controlled areas in hours of darkness. All building exterior lights will be lit from dusk to dawn. The exterior lights will consist of 135 watt low pressure sodium "full cutoff" wall mounted fixtures with amber sleeved, fluorescent tube fixtures on the ceiling underneath the overhangs. Site lighting will consist of high-pressure sodium (HPS), halogen, or LED (light-emitting diode) light

fixtures, or occasionally metal halide spotlights, and will be designed so that none of the lighting is visible seaward of the dunes.

Control Center Area

The proposed control center area will consist of three parcels (4.0 acres, 4.4 acres, 4.0 acres) north of SH4, adjacent to Boca Chica Village, 2 miles west of the proposed vertical launch area and north of Boca Chica Boulevard. Flooding is also likely at this location; therefore, facilities could also be physically elevated by 0-2 feet above ground level. Storm water discharge will be to unvegetated salt flats to north of the site associated with South Bay. Proposed facility and infrastructure construction at the control center area will include two launch control center buildings, two payload processing facilities, launch vehicle processing hangar, two radio frequency transmitter/receivers, generators with diesel storage facilities, roads, parking areas, fencing, and utilities, including water and septic systems, and a satellite fuels and gas storage facility. Land will be leveled and pilings sunk to support larger facilities (Figure 7).

The control center buildings will be single story and approximately 14,186 square feet and 30-45 feet in height. They will consist primarily of large rooms for control consoles, conference rooms, support rooms, and offices for site personnel. The payload processing facilities will support the final processing of two payloads simultaneously, prior to loading the launch vehicle. Each building will be approximately 14,669 square feet and 65-85 feet in height. The proposed 30,774 square foot, 50-65 foot tall launch vehicle processing hangar will be used to refurbish flown stages, or prepare launch vehicle stages before final integration. One or more antenna dishes will be located within the site fence. The antenna mounts will be approximately 20 square feet and antenna dishes will be no larger than 20 feet in diameter and 25 feet high.

Roads and utilities will provide access, power, data, and water to the facilities within the control center area. Total parking and road area is approximately 4.86 acres. Exterior lighting, security fences, and gates will be constructed throughout the site. Utilities will include commercial power, data, potable water, fire protection water, and septic systems. Power and data lines will be upgraded and buried within the SH4 ROW. The upgraded lines that are currently underground would remain underground, and lines that are currently aboveground would remain aboveground. Potable water would be from a well on site or delivered by truck to a holding tank at the control center area and vertical launch area, and water distribution lines would be installed intrasite to provide potable water to the area. If in the future, a water distribution line is determined to be necessary between the control center area and the vertical launch area that line will be placed in the same alignment as other utility lines and will be the sole property of SpaceX and will not be utilized for additional outside connecting lines.

The Dragon capsule, a satellite, typically uses hydrazine, a different fuel than the launch vehicle. The satellite fuel and gas storage facility will be approximately 20 by 20 feet (400 square feet) and 15 foot in height. It will be protected overhead by a roof, secured by floor-to-roof fencing, and include spill containment to support the expected storage volume. In addition to fuels, approximately 1,000 cubic feet of helium storage and 3,000 cubic feet of nitrogen storage would

be installed. The propellant and gas will arrive at the site in closed shipping containers and tank trucks, and be stored at the site prior to loading onto the spacecraft.

Project Operations
Falcon 9 and Falcon Heavy launches will have commercial payloads, satellites, experimental payloads, or a capsule, such as the SpaceX Dragon capsule. SpaceX may also launch smaller suborbital launch vehicles with all launch trajectories to the east and over the Gulf of Mexico. SpaceX proposes up to 12 launch operations per year through 2025, within a few days or weeks of payload arrival at the launch site. Launch operations could include Falcon 9 launches, a maximum of two Falcon Heavy launches, and associated pre-flight activities such as mission rehearsals and static fire engine tests.

Launch Vehicles
The 224-foot long Falcon 9 has a gross lift-off weight of approximately 1,100,000 pounds. The Falcon 9 uses LOX and RP-1 to carry payloads into orbit and has two stages. It uses helium gas stored in high pressure composite over-wrapped cylinders to pressurize the propellant tanks for both first and second stages. The 224-foot long Falcon Heavy has a gross lift-off weight of approximately 3,400,000 pounds (Figure 8).

Payloads
Primary commercial payload processing activities will occur at the control center area. Falcon 9 and Falcon Heavy launches will carry commercial or Department of Defense payloads, satellites, experimental payloads, and sometimes the SpaceX Dragon Capsule. Activities include payload checkout, spacecraft propellant loading, payload encapsulation, radiating, and a common standard communication check before launch. Once primary payload processing is completed, the payload will be trucked to the vertical launch area prior to launch.

Payload propellants may include hypergolic fuels that ignite on contact with an oxidizer, such as unsymmetrical dimethyl hydrazine, 4,840 to 12,000 pounds of monomethylhydrazine, and nitrogen tetroxide, as well as pressurized gasses including helium and nitrogen, and some solid propellants. Prior to use, propellants will be stored in sealed containers at the control center area. Payloads will be fueled in either the payload processing facility or the integration and processing hangar and any residual propellants would be returned to the storage facility. Helium and nitrogen gases would be required at both the vertical launch and control center areas. A small amount of ordnance, such as small explosive bolts and on-board batteries, will also be used and stored in the payload processing facility in the control center area. Any hazardous materials will be handled in accordance with Federal, State, and local laws and regulations. An emergency response team will be established, and spills will be contained and cleaned up per the procedures identified in the SpaceX Hazardous Materials Emergency Response Plan (HMERP).

Ground transportation consists of a truck to deliver a crane and four over-sized delivery trucks and two security escorts to deliver the first stage, second stage, interstage, and payload. Fuel, helium, and potentially potable water trucks will make monthly deliveries, as needed. Vertical

launch area operations and vehicle processing for the Falcon 9 and the Falcon Heavy will be virtually identical.

Propellant, Gas, Fuel, Oil, and Solvent Storage Areas
Helium will be transported via a tanker and stored in above ground tanks and LOX and RP-1 will be stored in dedicated propellant storage areas within the vertical launch area and have the appropriate level of separation and protection. All tanks and containment systems will be cleaned, tested, and certified before first use. Permanent over-ground lines will be installed to connect both the LOX and the RP-1 storage areas to the launch pad. These piping systems will be designed, installed, and tested. First and second stage fueling of LOX and RP-1 will be done with quick disconnect fittings. Gaseous nitrogen will be used on the system for cleanliness purges and liquid nitrogen would be used for cooling purges on an as-needed basis. Gaseous nitrogen will be created from liquid nitrogen delivered to the site by commercial truck.

Approximately 100 gallons of isopropyl alcohol will also be on site per launch for additional cleaning operations, though only 20 gallons will be required during launch preparation. Solvent flushes will be performed during operation of the launch vehicle programs. Small volumes (less than 300 gallons) of heavy gear oil, hydraulic oil, and cutting oil (less than 5 gallons), and a limited supply of various solvents and adhesives would be stored in the shop area in the hangar or at the pad for general use in the maintenance of ground equipment. Welding equipment and an oxygen/acetylene torch with its associated gases (carbon dioxide and argon) may also be used on a limited basis. Approximately 10,000 gallons of generator fuel (diesel/gasoline) would be stored at the vertical launch area.

Pre-Launch Activities
Pre-launch activities will include two dress rehearsals (usually within 32 days of launch) for coordination with governmental agencies, media outlets, and team training between SpaceX crew and operations personnel. These rehearsals include a dry dress rehearsal (without propellants on board) and a wet dress rehearsal (with propellants on the vehicle). A dry rehearsal would not require restricted public access. Wet dress rehearsals will require restricted access in the immediate vicinity of the vertical launch area and control center area. In addition SpaceX may conduct static fires. Static fires are identical to wet dress rehearsals except engines ignite for approximately 2 seconds then shut down. Static testing may last up to three hours.

Approximately 2 weeks in advance of a launch operation with restricted public access (i.e., actual launch, wet dress rehearsal, or static fire engine test), FAA/SpaceX will coordinate with the Cameron County Commissioner's Court, Secretariat of Communications and Transportation – Mexico, U.S. Coast Guard (USCG), Houston Air Route Traffic Control Center (ARTCC), Texas Parks and Wildlife Department (TPWD), National Park Service (NPS), the Service's Lower Rio Grande Valley NWR and Ecological Services Office, National Marine Fisheries Service, and Customs and Border Patrol regarding launch activities and ensure public safety. This will allow for the issuance of a Notice to Mariners (NOTMARs) and Notice to Airmen (NOTAMs). Approximately 3-6 days prior to a launch operation with restricted public access, the public would be notified of the upcoming launch operation and security closure through local

media and through the use of NOTMARs and NOTAMs. The notices will include the proposed date, the expected closure time and a backup closure date and time.

Security Plan Implementation

The majority of launch operations will be conducted between 7:00 a.m. and 7:00 p.m. with one nighttime launch per year, to the east over the Gulf of Mexico. Safety keep-out zones will be established for each launch operation (Figure 9). Launch operation day activities will include securing the safety zone at least 6 hours prior to a launch operation. Personnel will restrict access to unauthorized persons at the soft checkpoint on SH4, just west of the U.S. Customs and Border Protection checkpoint (approximately 14–16 miles west of the SH 4 terminus at Boca Chica Beach), and the hard checkpoint just west of the control center, approximately 1.5 miles from the coast near Massey Road. Boca Chica beach will be temporarily closed from the Brownsville Ship Channel south to the U.S./Mexico border on the Gulf side for up to 15 hours. Sweeps of the beach and closure areas will be conducted prior to a launch operation with manned or unmanned (drones) aerial assets or by vehicles or all-terrain vehicles (ATVs) along existing roads and beach areas suitable for travel to ensure the public is out of the hazard area. FAA/SpaceX will develop a plan in coordination with Padre Island National Seashore (PAIS) Sea Turtle Coordinator or Sea Turtle Inc. (STI) to notify and allow sea turtle patrollers to survey the beach for sea turtles and sea turtle nests once the beach is closed to the public and prior to beach security patrols, and also prior to the beach being reopened to the public after a launch. FAA/ SpaceX, in coordination with USCG, will also develop a plan for clearing waters offshore of Boca Chica beach and will include boat patrols to sweep the offshore area and a final sweep by helicopter. Sweeps will continue until the area is clear. No ground sweeps will be conducted on TPWD or Service lands, or tidal flats unless an emergency arises. The total number of closures and closure hours for wet dress rehearsals, static fire engine tests, and actual launches will fall within SpaceX's proposed 12 launch operations per year or annual maximum of 180 hours of closure per year.

The launch vehicle will be moved to the launch pad, connected to the launch stand, erected, and a final systems check completed. Approximately 3 hours prior to launch, propellant will be loaded, and deluge water will be sprayed on the launch pad deck for sound and vibration suppression. Once launched, FAA/SpaceX will notify law enforcement when the area is safe, and checkpoints will be raised, and the public areas will be re-opened. Prior to the opening of beach areas to the public, sea turtle patrollers will be allowed beach access and sufficient time to complete a complete survey of Boca Chica beach.

Launch Failure

A launch could fail and could result in a fire and/or explosion on the launch pad potentially spreading debris. FAA and SpaceX expect impacts will be contained within the FAA approved hazard area. In the event the vehicle veers from the planned trajectory, the vehicle is expected to break up and debris could land in the Gulf of Mexico.

Recovery Efforts
After launch, the Falcon 9's first stage will land, approximately 550 miles downrange, in the Gulf of Mexico, and be recovered by a salvage ship. The first stage will be returned to SpaceX facilities. If it is not able to be located, it will likely sink in the Gulf waters. The second stage will go into orbit.

Personnel Levels
On average, beginning in 2016, it is expected 30 full-time SpaceX employees/contractors will be present at the launch area and control center. They will work a single shift, between the hours of 8:00 a.m. to 5:00 p.m. During launch operation events, which are expected to last up to two weeks, an additional 100 local or transient workers would be onsite and will work extended hours. For two of those days, both transient and full time employees will need to be onsite for up to 24 hours per day. Average personnel levels are expected to rise from 30 to 130 and the maximum levels during a launch from 130 to 250 employees onsite between 2016 and 2025. If additional facilities are proposed in the future, supplemental analysis will be prepared to address potential impacts.

Conservation Measures
Conservation measures represent actions, pledged in the project description, correspondence and/or meetings that the action agency will implement to minimize the effects of the proposed action and further the recovery of the species under review. Such measures should be closely related to the action and should be achievable within the authority of the action agency. Since conservation measures are part of the proposed action, their implementation is required under the terms of the consultation. SpaceX and FAA have proposed the following conservation measures and FAA will condition the permits and licenses issued to the SpaceX to reflect those measures.

1. A Storm water Pollution Prevention Plan (SWPPP) that includes Best Management Practices (BMPs) for erosion and sedimentation controls, including techniques to diffuse and slow the velocity of storm water to reduce potential impacts (e.g., soil loss and sedimentation) to water quality during construction will be prepared. All construction activities with the potential of impacting water quality due to potential runoff from the site will be conducted in accordance with SWPPP requirements.

2. Uncontaminated rainwater will be allowed to drain or pumped out of containment structures only following visual inspection to determine the absence of evidence of a spill or leak of oil and/or visible seen on the surface of the water. If a spill has occurred within the last 48 hours preceding a rain event, SpaceX will conduct analytical sampling of the waters before releasing.

3. The perimeter of all areas to be disturbed during construction or maintenance activities will be clearly demarcated using flagging or temporary construction fence and no disturbance outside that perimeter will be authorized (in particular tidal flats and dunes).

4. Areas already disturbed by past activities or those that will be used later in the construction period shall be used for staging, parking, and equipment storage within the project boundary.

5. FAA/SpaceX employees and construction personnel and FAA inspectors will be educated on the potential for vehicle collisions with wildlife, particularly ocelots and jaguarundis, and mandated, with strict internal repercussions, to reduce their speeds along SH4 between and within the vertical launch and control center areas to 25 miles per hour. Vehicles will be restricted to existing paved and dirt roads, parking areas and authorized construction sites.

6. FAA/SpaceX will coordinate with the Texas Department of Transportation (TxDOT) regarding funding the installation of "Watch Out for Ocelots/Jaguarundis" or "Watch Out for Wildlife" signs along SH4. The number and placement of the signs would be determined by FAA/SpaceX in coordination with TxDOT and the Service.

7. FAA/SpaceX will coordinate with TxDOT to maintain clear shoulders on road edges to allow drivers to more easily see wildlife, such as ocelots and jaguarundis, along the road edge and reduce incidents of vehicle/wildlife collisions.

8. Roads will be designed and located where roadbed erosion into federally listed species habitat, such as sand flats, is avoided or minimized and the potential for surface water being trapped within the roadbed due to grading would also be avoided or minimized.

9. The depth of any pits created will be minimized and covered or checked daily during construction so animals do not become trapped.

10. Materials such as gravel or topsoil will be obtained from existing developed or previously used sources, not from undisturbed areas adjacent to the property.

11. Drip pans underneath equipment, containment zones in vehicle refueling areas and equipment, and other measures will be implemented.

12. Non-hazardous waste materials litter, and other discarded materials, such as construction waste, will be in placed containers until removed from the construction site. All trash containers will have predator-proof secured lids and be kept closed at all times and trash will be removed regularly to help prevent attracting predators or debris blowing into sensitive areas.

13. Prior to entry into the action area, all equipment will be cleaned on a paved surface with cleaning water appropriately contained, to prevent importation of non-native plant species, and inspected to ensure that hydraulic fittings are tight, hydraulic hoses are in good condition and replaced if damaged, and there are no petroleum leaks.

14. No excavated or fill material will be placed in delineated Clean Water Act (CWA) Section 404 waters of the U.S. except as authorized by a permit from the U.S. Army Corps of Engineers (USACE).

15. Concrete mixing and placement activities will be conducted to ensure discharge water associated with these activities does not reach surrounding water bodies or pools unless specifically authorized in a CWA discharge permit.

16. FAA/SpaceX will designate a Field Contact Representative (FCR) to be present at the beginning of the construction period to provide all construction personnel and SpaceX employees with an environmental worker-education briefing that would include but not be limited to the following:

    - Information regarding threatened and endangered species that may occur in the area, impacts that may occur, conservation measures being implemented, their responsibilities under the Endangered Species Act, and avoidance and reporting procedures.

    - Wildfire prevention measures to be implemented, including restricting smoking to areas clear of vegetation, ensuring no fires of any kind are ignited, and equipping vehicles with spark arrestors and fire extinguishers.

    - The cleaning of all equipment and vehicles at designated locations and required inspections of all vehicles to ensure absence of loose soil and that plant debris is removed before leaving the project areas to prevent the spread of noxious weeds.

    - Requirements for safe handling and disposal of hazardous wastes to be implemented.

17. FAA/SpaceX will designate an FCR who would be responsible for overseeing compliance with these conservation measures and any other required terms and conditions resulting from consultation between the FAA and the Service. The FCR will have the authority to halt construction, operation, or maintenance activities that are in violation of these requirements.

18. If construction activities occur during avian breeding season (15 February through 31 August), construction will avoid impacts to nesting migratory birds within the project area to the maximum extent practicable. Specifically, a biologist will check the proposed areas of construction activities, including laydown areas, for nests (in shrubs and on the ground) once before the construction phase has begun. If the biologist finds an active nest, construction workers would not directly or indirectly disturb the nest or adjacent areas until the biologist determines the nest is no longer in use.

19. A qualified biologist will conduct pre-, during, and post-construction monitoring for piping plovers, red knots, and aplomado falcons. A monitoring plan will be coordinated

with the Service. The monitoring would include at the minimum presence/absence surveys and would record the number and location of all candidate and federally listed species observed, including the piping plover, red knot, and aplomado falcon, as well as all migratory birds.

20. Prior to construction, the FAA will provide the Service with SpaceX developed monitoring plans tracking potential induced vegetative changes of listed species habitat as a result of proposed construction activities, fencing, security, stormwater discharge, and launch activities, including pre-, during, and post-construction. The Service will be provided a copy of the draft plan for review and approval.

21. Prior to construction and operational activities, a Draft Lighting Management Plan will be provided to the Service for review and comment. The Final Lighting Management Plan will be approved by the Service and the NPS and implemented prior to night-time construction activities at the vertical launch area to minimize overall lighting impact, including potential direct impacts and cumulative glow, on wildlife and adjacent sea turtle nesting beaches. Examples of lighting requirements that would be incorporated into the plan include:

    - FAA/SpaceX will design a training program for site personnel educating them on the effects of lighting on sensitive species in the area.

    - FAA/SpaceX will issue annual notices to all complex personnel prior to sea turtle nesting season reminding personnel of light use requirements and responsibilities.

    - The Service may conduct onsite inspections coordinated with SpaceX to verify compliance and make recommendations for changes and revisions to the plan.

    - FAA/SpaceX will direct, shield, or position the lighting of facilities to the extent possible (without decreasing safety and security) to avoid visibility from the beach, minimize lateral light spread, and decrease uplighting. Low-pressure sodium or amber LED lighting will be used where possible. A full cut-off classification of light fixture will be used for illumination of all surface level areas.

    - Lighting poles of 20 feet or higher will be painted in the same "paint, colors, schemes, or treatments" as discussed in the National Historic Preservation Act (NHPA) Programmatic Agreement.

    - Where applicable, new lighting will be installed with multiple levels of control so that lighting levels can be matched with specific activities.

    - Where lighting is not essential to safety or security, timers will be installed to switch lights off in the evening. Where applicable and not a threat to security, motion-detector switches will be installed.

- Replacement lighting will use the best available light technology to minimize sea turtle disorientations, while still meeting safety and security requirements.

- High-intensity spot lighting to illuminate elevated structures at night, such as the launch vehicle when vertical on the pad prior to lift-off, will be occasionally used and on a temporary basis. Spot lights will be focused to minimize light spread; fixtures will be located out of the direct sight from beach areas, either below ground level or behind a visual barrier.

- Building entrances will be marked with path lighting and directed downward.

- Parking areas will be illuminated with full cut-off, LED or high/low pressure sodium fixtures oriented away from beaches.

- Main gate areas may have some true white light illumination, overhead light will be downward directed, full-cutoff, low sodium lighting. Lighting inside the gate house will be directed away from windows and doorways.

- Perimeter lighting, runway lighting, launch pad lighting and propellant storage areas lighting will be full-cutoff fixtures and pole heights minimized. Fixtures will be high/low pressure sodium, halogen or LED.

- During a night launch, large wattage (1,000 watts) metal halide spotlights or high-power fixtures supported by generators will be on from 2 to 10 hours.

- Flashing red lights will be located at the top and maybe partway up the sides of the water towers.

22. Should there be the need for additional local temporary lighting to support construction activities, the following will be considered:

    - Whenever possible, lights shall be placed so that they do not shine directly towards the beach and uplighting will be utilized to the maximum extent possible,

    - Lighting will be extinguished upon completion of work in an area,

    - The size, type and number of exterior lights will be minimized and will be restricted to low pressure sodium, to the extent practicable, during sea turtle nesting season (March 15 – October 1).

    - Fixtures will be shielded or screened whenever practical, and

- Lighting will be monitored on a routine basis to insure lights cannot be seen on the beach.

23. To the maximum extent possible, FAA/SpaceX will avoid launches at dusk and dawn during the most active time for jaguarundis and ocelots, and will avoid nighttime launches during sea turtle nesting season (March 15 – October 1).

24. FAA/SpaceX will ensure compliance with the Lighting Management Plan by issuing annual notices to all complex personnel prior to sea turtle nesting season reminding personnel of light use requirements and responsibilities. FAA/SpaceX will also conduct unannounced evening inspections between 2100 hours and 0500 hours during sea turtle nesting season (March 15 – October 1).

25. FAA/SpaceX will develop an Emergency Action Plan to provide guidance to personnel in the event of an emergency. The Plan is to include an emergency call list and the list will include the South Texas Refuges Complex Office, Lower Rio Grande Valley NWR, and the Service's spill response team.

26. FAA/SpaceX will develop a Hazardous Materials Emergency Response Plan for the launch facility and the control site. The plan will include the policies, process and procedures used in handling hazardous materials during operations and in the event of an unplanned or uncontrolled release, a list of hazardous materials stored on site, and a launch vehicle failure response plan in the event of a mishap. The Service and the TCEQ will be contacted in the event impacts extend beyond the fence line and will be participants in developing the cleanup and mitigation plans. If debris or spills occur on Refuge, TPWD or NPS lands, those individual agencies will be contacted including the National Marine Fisheries Service (NMFS).

27. FAA/SpaceX will prepare a Commercial Launch Site Hurricane Preparation Plan. The plan will describe the process for preparing for and responding to hurricane conditions at the launch site. FAA/SpaceX will coordinate with local emergency management agencies and State and Federal agencies, including Cameron County Emergency Management Agency, Brownsville Local National Weather Service Forecast Office, Texas Division of Emergency Management, TCEQ, TPWD, TGLO, Brownsville Navigation District, Natural Disaster Operational Workgroup and the Service's Lower Rio Grande Valley NWR.

28. FAA/SpaceX will become a beach guardian in the Adopt-a-Beach Program organized by TGLO. It will adopt a 3-mile portion of Boca Chica Beach centered on the terminus of SH4. At a minimum, FAA/SpaceX will participate in two annual cleanups organized by TGLO and will organize and fund one more that will involve educational speakers to teach the community about the area's wildlife, sensitive areas, beach debris, beach cleanup, and collect information about trash collected.

29. In an effort to reduce impacts to Section 4(f) properties FAA/SpaceX will use non-reflective material and light color, to the extent practicable, to disguise the proposed facilities, water tower and lightning protection towers, so that they will blend in with the natural colors of the landscape. Efforts will be coordinated with the State and Federal Parks and Service refuges.

30. FAA/SpaceX will educate the public on safe and lawful areas where they may watch the launches.

Status of the Species

http://wildlifeanimalz.blogspot.com

Ocelot

In 1982, the ocelot was designated as an endangered species under the Act, a status that extended U.S. protections to the species throughout its range in 22 countries, including Texas, Mexico, and Central and South America. Ocelot populations gained greater protections in 1989, when the species was upgraded to Appendix I of the Convention on International Trade in Endangered Species of Flora and Fauna (CITES); a protection that prohibits CITES signatories from permitting any trade in the species or its parts. Two subspecies occur in the U.S.: the Texas ocelot (*L.p. albescens*) and the Sonoran ocelot (*L.p. sonoriensis*). The Texas ocelot is isolated from the Sonoran ocelot by the Sierra Madre highlands in Mexico (Tewes and Schmidly 1987, Service 1990a).

Description

The ocelot is a medium-sized cat, measuring up to 3 feet in body length and weighing twice as much as a large domestic cat. It is slender and covered with attractive, irregular-shaped rosettes and spots that run the length of its body. The ocelot's background coloration can range from light yellow, to reddish gray, to gold, to a grayish gold color. They have a white underside. The head has spots, 2 black stripes on the cheeks, 4 to 5 longitudinal black stripes on the neck and their black ears have large white spots on the back. The tail has dark bars or incomplete rings. Though it resembles the margay (*Leopardus wiedii*) the ocelot is approximately twice the size of a margay with a slightly shorter tail (Murray and Gardner 1997, de Oliveira 1998)

The ocelot is primarily nocturnal, although some diurnal activity has been recorded (Navarro-Lopez 1985, Tewes 1986, Tewes and Schmidly 1987, Laack 1991, Caso 1994). Navarro-Lopez (1985) found ocelots in Texas to have two peaks of activity, one at about midnight and the other at daybreak. Ocelots are solitary hunters and eat a wide variety of prey, but mammals, especially rodents, make up the bulk of their diet (Bisbal 1986, Emmons 1987, Service 1990a). Other prey includes birds, armadillos, marsupials, monkeys, rabbits, bats, feral hogs, reptiles, fish and crabs (Emmons 1987, Ludlow and Sunquist 1987, Service 1990a).

The reproductive season is year round, with spring or autumn breeding peaks noted in Texas and Mexico. Laack (1991) observed first reproduction in wild females between 30 and 45 months-of-age, but Eaton (1977) and Tewes and Schmidly (1987) estimated they may produce young at 18-30 months of age. Ocelots can produce young year round and have a gestation period of 70-80 days (Eaton 1977; Laack 1991). Litters contain 1, 2, and rarely 3 kittens (Eaton 1977, Laack 1991). Laack et al. (2005) reported an average of 1.2 kittens per litter for 16 litters born to 12 ocelots in Texas. Den sites are usually well hidden and include dense, thorny scrub, caves, hollows in trees or logs, and grass tussocks (Laack 1991; Tewes and Schmidly 1987). The mother provides extended parental care to the young until they become proficient at capturing prey. Males are believed to contribute little to direct parental care (Tewes 1986, Laack 1991).

Ocelots live solitary lives except when a female is with kittens or when pairs come together briefly to breed. They disperse from the natal range at approximately two years of age. Young males always disperse from their natal areas, while young females may or may not leave their natal area. Laack (1991) reported on the dispersal of five male and four female subadult ocelots at Laguna Atascosa NWR. One ocelot dispersed at 14 months-of-age, another at 20 months-of-age, and 5 at 30-35 months-of-age, but only four lived to establish home ranges. Seven to 9.5 months elapsed between the leaving the natal range and establishing an independent home range. One female moved 1.6 miles (distance between home range centers) and the males moved 4.3 to 5.6 miles. During dispersal, the ocelots used narrow (16.4- foot – 328-foot) corridors of brush along resacas and drainage ditches and small scrub patches within agricultural or pasture land. The ocelots tended to avoid areas occupied by adults.

Adults of both sexes tend to have home ranges exclusive of other adult individuals of the same sex, but there is considerable home range overlap between the sexes (Emmons 1988, Laack 1991). Adult males have larger home ranges than adult females. The home ranges of subadult males and females tend to be similar in size to the home ranges of adult females until dispersal (Laack 1991). A number of studies have looked at the home range size of ocelots in Texas and Mexico, as determined from monitoring radio-collared individuals. Home range size generally varies from 0.77 to 6.9 square miles (Caso 1994, Ludlow and Sunquist 1987, Konecny 1989, and Dillon 2005). The established adult home ranges of ocelots in Laack's study (1991) of dispersing ocelots did not include semi-isolated patches and transient home ranges were at times farther from the natal range than the animal's eventual home range.

Tamaulipan brushland is a unique ecosystem in South Texas and northeastern Mexico.

Characteristic vegetation of Tamaulipan brushland is dense and thorny. It is estimated approximately 95 percent has been cleared for agriculture, urban development, road developments and expansions, and recreation (Service 1990, Jahrsdoerfer and Leslie 1988). Tewes and Everett (1986) found less than 1 percent of South Texas supported the extremely dense thornscrub used by ocelots.

Tewes and Everett (1986) classified ocelot habitat in Texas according to the amount of foliar canopy. Class A or optimal habitat was 95 percent canopy cover, Class B or suboptimal habitat was 75 percent to 95 percent canopy cover, and Class C, with 75 percent or less canopy cover, was considered inadequate. The most crucial habitat component is probably dense cover near the ground (<3 feet in height). Jackson et al (2005) suggest that the ocelot in Texas prefers closed canopy over other land cover types, but that areas used by this species tend to consist of more patches with greater edge. The cat is reported to occur along watercourses, and will readily enter the water (Goodwyn 1970 as cited by Service 1990a), but it is unclear if this proximity to water is a habitat requisite or simply an indication of where dense cover is most likely to occur.

Species composition of shrubs used by ocelots was quantified in three plant communities, two in Texas and one in Mexico (Shindle and Tewes 1998, Caso 1994). The dominant species were granjeno (*Celtis pallida*), crucita (*Eupatorium odoratum*), Berlandier fiddlewood (*Citharexylum berlandieri*), honey mesquite (*Prosopis glandulosa*), and desert olive (*Forestiera angustifolia*) and honey mesquite and snake-eyes (*Phaulothamnus spinescens*) in Texas. In Mexico, ocelot habitat use was 97.6 percent mature forest (heavy rain forest to sparse tropical deciduous forest) and 2.4 percent pasture-grassland (Caso 1994).

Population Dynamics

Tewes and Miller (1987) suggested that several factors, including habitat islands saturated with resident ocelots, frustrated dispersal, and offspring that fail to leave parental home ranges, may indicate the possibility of inbreeding. The Service believes the fragmentation of habitat is likely reducing the ability of ocelots to interact freely, which will likely reduce the genetic viability of the species over time, and, because ocelots have to cross areas of little or no habitat to interact, may also be increasing the risk of harm to individual ocelots. Genetic studies to determine genetic differentiation were done on three populations, the Laguna Atascosa NWR in Cameron County, the Willacy County population and Tamaulipas and Vera Cruz, Mexico population. Low variability was expected within the Texas populations because of range reduction and fragmentation. Inbreeding was not detected among the three populations. The study showed the Willacy County and Mexico populations were more closely related genetically than the Laguna Atascosa population was to either. Walker (1997) suggested that Laguna Atascosa NWR and Willacy County populations have lost genetic variation when they became isolated from ocelots in Mexico and from each other. Several studies resulted in the estimation of various survival rates. Tewes (1986) reported a survival rate of 71 percent based on four mortalities while monitoring 12 radio-tagged ocelots and Haines et al. (2005b) estimated an annual survival rate at 87 percent for resident adults and 57 percent for transient ocelots. For newborn ocelots, Laack et al. (2005) estimated 68 percent annual survival rate.

Status and Distribution

Reason for listing:

Fragmentation of habitat, loss of connectivity, and habitat loss due to brush clearing are primary reasons for ocelot decline. Ocelots rely upon thick vegetation along the Lower Rio Grande and the South Texas Tamaulipan brush community for foraging, resting, and establishing dens. They require corridors, such as rivers, shorelines, and natural drainages to travel between optimal habitat areas. Destruction and fragmentation of optimal habitat and travel corridors increases threats to the ocelot, such as incidental trapping, competition from feral dogs and cats, and mortality from vehicles. In Mexico, particularly in the northeast, ocelots suffer from habitat loss due to charcoal production, agriculture, and livestock ranching. Human population increases and associated urban expansion in the lower Rio Grande Valley have resulted in brush clearing and increased pollution (Service 1986). Brushland habitats have also been converted to rangeland with herbicides (Bontrager et al. 1979), root plowing, and fire (Hanselka 1980). Industrialization has degraded water quality (Service 1986).

Range-wide Trend:

Historically, the ocelot occurred in Arkansas, Arizona, southern California, Texas, Mexico and southward through Central and South America to Peru, Uruguay, and northern Argentina (Navarro-Lopez 1985). Today it ranges from southern Texas and northern Sonora, Mexico to Central America, Ecuador and northern Argentina, but in reduced numbers (Tewes and Everett 1986; Emmons 1990; Murray and Gardner 1997).

Two U.S. breeding populations of ocelot occur in southern Texas (Tewes and Everett 1986). One population occurs in Willacy and Kenedy counties primarily on private lands (Navarro-Lopez 1985) and the other in Cameron County primarily on the Laguna Atascosa NWR (Laack 1991).

In Texas, over the past 20 years, individual ocelots have only been documented in Cameron, Hidalgo, Willacy, Kenedy and Jim Wells counties (Tewes and Hughes 2001). Laack and Rappole (1986) documented ocelot sightings in Cameron County. Shinn (2002) used camera traps and hair snares on 25 widely scattered tracts managed by the Service's South Texas Refuges Complex (STRC), and did not find evidence of ocelots west of Brownsville on the Rio Grande River. His studies did confirm the presence of the species in extreme southern Cameron County and in extreme western Willacy County.

"Occupied habitat" occurring in Jim Wells, Nueces, Live Oak, and Kleberg counties, 50 miles north of the Willacy-Kenedy population is shown in Figure 9 of the recovery plan (Service 1990a). It is presumed that ocelots may still occur there because of documented roadkills on US 77 South but no reproducing populations have been found. In 1997 and 1998, Tuovila (1999) did a trapping study in the southern half of Live Oak County and northernmost Jim Wells. He trapped 17 bobcats and 238 non-target animals, but no ocelots. No ocelots were documented at Choke Canyon Reservoir in Live Oak and McMullen counties during trapping efforts despite a 10-year increase in optimal ocelot cover (Grassman et al. 2006).

Tewes and Everett (1986) based a "crude estimate" of the total ocelot population size in South Texas from 80 to 120 individuals upon an aerial survey of brush habitat and knowledge gained from following the movements of radio-collared ocelots trapped in or near Laguna Atascosa NWR. Haines et al. (2005a) estimated the number of breeding individuals in the Laguna Atascosa NWR population was 19 ocelots with a total population of 38 ocelots in Cameron County. He estimated the population by averaging ocelot home range sizes reported by Navarro-Lopez (1985), Tewes (1986), and Laack (1991) and extrapolating this estimate to the amount of available dense thornscrub habitat and assumed adults equaled half of the total population. Today, fewer than 60 individuals may remain in South Texas and the U.S. The Cameron County ocelot population is estimated at 13 individuals (Pers. Comm., Mitch Sternberg, Zone Biologist for Region 2, 2013). A much larger population of the Texas ocelot occurs in Tamaulipas, Mexico near San Fernando, approximately 100 miles south of the U.S.-Mexico border (Caso 1994). In forested South America alone, Emmons (1988) noted that even at the lowest density estimates (one animal per 1.9 square miles) there would be approximately 800,000 ocelots.

Critical Habitat

Critical habitat has not been designated for this species.

Gulf Coast Jaguarundi

The jaguarundi was listed as endangered on June 14, 1976 (41FR24064). The jaguarundi is also listed in the CITES Appendix I of the convention which bans international commerce. CITES offers some protection over much of its range. Hunting is prohibited in Argentina, Belize, Bolivia, Columbia, Costa Rica, French Guiana, Guatemala, Honduras, Mexico, Panama, Paraguay, Surinam, Uruguay, United States, and Venezuela. Hunting is regulated in Peru, while no legal protection is offered in Brazil, Nicaragua, Ecuador, El Salvador, and Guyana.

Description

The jaguarundi has a long slender body, short legs, and sleek un-patterned fur, and looks more like a large weasel than a cat. They are roughly twice the size of a domestic cat, weighing about 7 to 22 pounds, standing 10 to 14 inches at the shoulder, and can be up to 4 feet long from nose to tail tip, with the tail taking up about a third of its length. It has a long and flat head instead of a round one. The ears are short and rounded, and this is one of the few cat species that does not have a contrasting color on the backs of the ears. Their eyes are small and set closely together.

Most information gathered on the jaguarundi comes from historical writings and information gained from studying the ocelot in South Texas and in Mexico. Caso (1994) captured and radio collared jaguarundi in Tamaulipas, Mexico from 1991 to 2005. He found home range sizes averaged 3.8 and 3.22 square miles for males and females, respectively. The study captured jaguarundi in undisturbed brush and grasslands with scattered second growth woodlands (Caso 1994). Historical accounts from Mexico suggest that jaguarundi are good swimmers and enter the water freely.

Little is known of jaguarundi reproduction in the wild. Den sites include dense thickets, hollow trees, spaces under fallen logs overgrown with vegetation, and ditches overgrown with shrubs (Tewes and Schmidly 1987; Davis and Schmidly 1994). In Mexico, they are observed as being solitary, except during November and December when they mate. Young have been born in March and August with possibly two litters per year. Usually two to four young comprise a litter, with litters being either all of one color phase or containing both the red and gray phases. Jaguarundi kittens are spotted at birth, and lose their markings as they mature. Gestation (for captive jaguarundi) varies from 63 to 75 days (Goodwyn 1970; Tewes and Schmidly 1987; Davis and Schmidly 1994). Jaguarundis communicate by calls, of which 13 have been identified in captive animals. The largest repertoire occurs during the mating season (Hulley 1976).

The jaguarundi is primarily diurnal, although some nocturnal activity has been recorded (Konecny 1989, Caso 1994). However, it appears to be less nocturnal than the ocelot. They are excellent climbers although they spend most of the time on the ground. Prey is largely birds, but bird eggs, rats, mice, rabbits, reptiles and fish are also taken (Goodwyn 1970; Tewes and Schmidly 1987; Davis and Schmidly 1994).

Habitat requirements in Texas are similar to those for the ocelot: thick, dense thorny brushlands or chaparral. Approximately 1.6 percent of the land area in South Texas is this type of habitat (Tewes and Everett 1986). The thickets do not have to be continuous but may be interspersed with cleared areas. Jaguarundis possibly show a preference for habitat near streams (Goodwyn 1970; Davis and Schmidly 1994) and may be more tolerant of open areas than the ocelot. The jaguarundi uses mature forest (i.e., brush) and pasture-grassland (Caso 1994). Jaguarundi habitat use was 53 percent mature forest and 47 percent pasture-grassland in northeast Mexico. Jaguarundis use open areas for hunting and sometimes resting, but if threatened with a potential danger they will seek cover in brush areas.

The most common plants occurring in habitats where the jaguarundi is known to occur are huisache (*Acacia farnesiana*), blackbrush acacia (*Acacia rigidula*), prairie baccharis (*Baccharis texana*), chilipiquin (*Capsicum annuum*), lotebush (*Ziziphus obtusifolia*), althorn (*Koeberlinia spinosa*), goatbush (*Castela texana*), Texas persimmon (*Diospyros texana*), coyotillo (*Karwinskia humboldtiana*), common lantana (*Lantana horrida*), berlandier wolfberry (*Lycium berlandier*), javelinabrush (*Microrhammus ericoides*), Texas pricklypear (*Opuntia lindheimeri*), retama (*Parkinsonia aculeata*), honey mesquite, cedar elm (*Ulmus crassifolia*), and lime pricklyash (*Zanthoxylum fagara*) (Goodwyn 1970).

Population Dynamics
Habitat loss and alteration due to brush-clearing activities, human encroachment, and human persecution are the main cause for the decline in jaguarundi populations (Service 1995). Tracts of at least 75 or 100 acres of isolated dense brush, brush interconnected with other habitat tracts by brush corridors, or smaller tracts adjacent to larger areas of habitat may be used by jaguarundi. Roads, narrow water bodies, and rights-of-way are not considered barriers to movements. Brush strips connecting areas of habitat, such as brushy fence lines and water courses, are very important in providing escape and protective cover.

Status and Distribution
Reason for Listing:
Loss of habitat is one of the main threats to the jaguarundi. Historically, dense mixed brush occurred along dry washes, arroyos, resacas, and the floodplains of the Rio Grande. A majority of shrub land has been converted to agriculture and urban development. Unfortunately for the jaguarundi, the best soil types used for agricultural crops also grow the thickest brush and thus produce the best habitat for the jaguarundi. Less than 5 percent of the original native brush vegetation remains in the Rio Grande Valley.

Range-wide Trend:
The jaguarundi historically occurred in southeast Arizona, South Texas, Mexico and Central and South America as far south as northern Argentina. Today this cat has a similar distribution, but in reduced numbers, although it probably no longer occurs in Arizona (Tewes and Schmidly 1987). It may also be extinct in Uruguay. They are reported to occur at Masaya National Park in Nicaragua, Soberania National Park in Panama and El Imposible National Park in El Salvador (Nowell and Jackson 1996). The presence of jaguarundis in Florida is likely the result of human introduction (Nowak and Paradiso 1983).

Goodwyn (1970) reported from interviews he conducted in 1969 that jaguarundis were thought to occur in seven specific areas: Santa Ana NWR; Laguna Atascosa NWR "Paso Real", an area along the lower Arroyo Colorado on the border between Cameron and Willacy counties; the southern part of the El Sauz Ranch in northeast Willacy County; a small area west of Olmito in southern Cameron County; an area east of Villa Nueva; and an area near the Port Isabel airport in Cameron County.

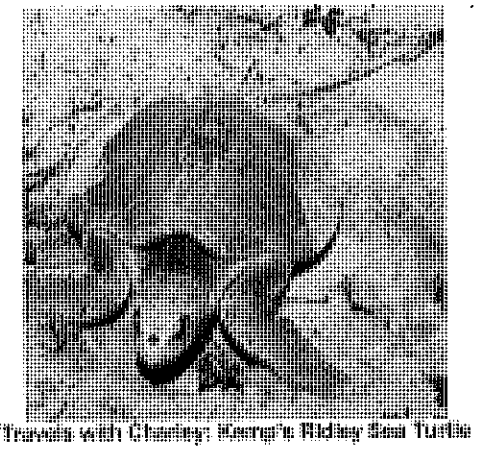
Tewes (1987) and Tewes and Everett (1986) documented several other credible reports of jaguarundis in Cameron, Willacy and Webb counties. One was a road-killed male jaguarundi found near the junction of SH4 and Farm-to-Market Road (FM) 511 (Keller's Corner) in Cameron County on April 21, 1986 (Tewes 1987; Laack and Rappole 1986). There have also been numerous unconfirmed jaguarundi sightings in Hidalgo County. In November 2010, a Service biologist saw a jaguarundi at Big Bend National Park (Pers. Comm., Ernesto Reyes, Fish and Wildlife Biologist, Ecological Services, Alamo, TX, 2013). A Service biologist also sighted a jaguarundi at Laguna Atascosa NWR, in Cameron County, on January 2005, (Pers. Comm., Ernesto Reyes, Fish and Wildlife Biologist, Ecological Services, Alamo, TX, 2013). On

November 22, 2004, two jaguarundis were sighted approximately 0.75 mile north of FM 106 and Buena Vista Road (Pers. Comm., Ernesto Reyes, Fish and Wildlife Biologist, Ecological Services, Alamo, TX, 2013).

Critical Habitat
Critical habitat has not been designated for this species.

Sea Turtles

The Service has jurisdiction for protecting sea turtles in inland waters and on nesting beaches. The NMFS has jurisdiction for protecting sea turtles in the marine environment. Five species of sea turtles are found in U.S. waters and nest on U.S. beaches: leatherback, hawksbill, loggerhead, green and Kemp's ridley. All are known to nest in Texas. The leatherback and hawksbill rarely nest in Texas but offshore waters are important feeding, resting, and migratory corridors.



Kemp's Ridley Sea Turtle

Description
The Kemp's ridley sea turtle was listed as endangered on December 2, 1970 (35 FR 18320). It is the smallest of the sea turtles, reaching about 2 feet in length and weighing up to 75-100 pounds and adults reach maturity at about 10-15 years of age. Kemp's ridley turtles nest mostly during the daytime, often in groups called "arribadas." An individual Kemp's ridley may nest as many as three times a season (Service and NMFS 1992), with an average of 2.5 clutches per season. Clutch size averages around 100 eggs. Hatchlings emerge after about 50 days of incubation and hatchling emergence occurs during the night or day. Kemp's ridleys are found in the Gulf of Mexico and Atlantic Ocean and some adjoining estuarine areas. Nesting occurs primarily near Rancho Nuevo, Tamaulipas, Mexico. Each year, some nests are also found at scattered locations between the Texas coastline and Veracruz, Mexico. Very rarely, Kemp's ridleys nest at other locations in the U.S. outside of Texas.

Population Dynamics
The Kemp's ridley sea turtle numbers have precipitously declined since 1947, when more than 40,000 nesting females were estimated in a single *arribada* or mass nesting event (Service and NMFS 1992). The reproductive strategy of sea turtles involves producing large numbers of offspring to compensate for high natural mortality through the first several years of life. Nesting in Mexico has been increasing in recent years but, despite protection for the nests, turtles have been and continue to be lost to incidental catch by shrimp trawls (Service and NMFS 1992).

Status and Distribution
Reason for listing:
For at least two decades, several factors have contributed to the decline of sea turtle populations along the Atlantic and Gulf coasts. Commercial over-utilization of eggs and turtle parts, incidental catches during commercial fishing operations, disturbance of nesting beaches by coastal housing, marine pollution, as well as entanglement and ingestion of debris threaten sea turtles (Service and NMFS 1992). Additional threats are expanding human populations adjacent to important nesting beaches, degradation of coastal foraging habitats, and the potential for global warming to skew sex ratios (NMFS and Service 2007).

Range-wide Trend:
Since 1978, an international, experimental project involving the NPS, PAIS, Service, NOAA, etc., has been on-going to establish a secondary nesting colony of Kemp's ridley turtles at the park. Since 1996, some turtles from this project have been documented returning to PAIS and nearby vicinity to lay eggs (Shaver 1997, 1998, 1999a, 1999b, 2005; Shaver and Caillouet 1998).

In 1986, a program was initiated to detect, monitor, and protect Kemp's ridley nests at PAIS. Detection involves patrols to look for nesting activity, public education, and investigation of reports from patrollers, beach workers, and the public. This on-going program has since expanded to include the four other species of sea turtles and adjacent State beaches to the north of the park. Patrollers (PAIS staff members and volunteers) use utility terrain vehicles (UTVs) to for sea turtle tracks and nesting turtles each day, from April through mid–July.

Historic nesting frequency on the South Texas coast is poorly known and only six Kemp's ridley turtles were documented prior to 1979 (Shaver and Caillouet 1998). From 1979 through 2012, 1,393 Kemp's ridley nests were found on the Texas coast (Pers. Comm., D. Shaver, PAIS, 2012), but additional nests were likely missed, especially when patrols were not conducted or were less comprehensive. Most nests were found during the months of April, May, June, and July; the months that beach surveys were conducted most intensively. Today, through conservation efforts with Mexico and commercial fisheries, the population of Kemp's ridley appears to be in the early stages of recovery (Pers. Comm. Shaver, PAIS 2008, NMFS and Service 2007).

Critical Habitat
Critical habitat has not been designated for this species.

Photo Credit: NOAA

Loggerhead Sea Turtle

Description

The loggerhead sea turtle was listed as a threatened species on July 28, 1978 (43 Federal Register [FR] 32800). Adults grow to an average weight of about 200 pounds. It occurs in temperate and tropical waters of both hemispheres. The species inhabits the continental shelves and estuarine environments along the margins of the Atlantic, Pacific, and Indian oceans. Historic nesting frequency on the Texas coast is poorly known.

Adult loggerhead sea turtles reach maturity in 25 to 30 years. Loggerheads are nocturnal nesters, although some daytime nesting occurs. They nest from one to seven times within a nesting season (average of approximately 4.1 clutches); clutch size averages 100-125 eggs along the southeastern U.S. coast (NMFS and Service, 1991b). Hatchling emergence typically occurs at night. In the Gulf of Mexico, there are distinct nesting populations on the coast of the Florida panhandle and the Yucatan Peninsula. Scattered nests can be found occasionally along other areas of the U.S. Gulf Coast from the Chandeleur Islands, Louisiana, south to the U.S./Mexico border.

From 1979 through 2012, approximately 50 nests were found on the Texas coast (Pers. Comm. Shaver, PAIS 2012), but additional nests were likely missed, especially when patrols were not conducted or were less comprehensive. Loggerhead nests are found on North Padre Island from mid-May through mid-August, although nesting has been documented in the southeastern U.S. from late-April through early September.

Population Dynamics

Florida's long-term loggerhead nesting data (1989-2013) was analyzed. Observed nest counts on 26 core index beaches peaked at 59,918 in 1998 to a low in 2007 of 28,074 (FWC 2013). Annual trends revealed a 30 percent increase between 1989 and 1998, but nest counts declined over nearly a decade. Over the last six years annual nest counts showed an increase but, no trend indicating a reversal of the post-1998 decline was observed (FWC 2013).

Status and Distribution

Reason for Listing:

From a global perspective, the southeastern U.S. nesting aggregation is second in size only to that on islands in the Arabian Sea off Oman (Ross 1982, Ehrhart 1989, NMFS and Service 1991b). The status of the Oman loggerhead nesting population, reported to be the largest in the world (Ross 1979), is uncertain because of the lack of long-term standardized nesting or foraging ground surveys and its vulnerability to increasing development pressures near major nesting beaches and threats from fisheries interactions on foraging grounds and migration routes (Service 2007). The loggerhead nesting aggregations in Oman, the southeastern U.S., and Australia have been estimated to account for about 88 percent of nesting worldwide (NMFS and Service 1991b).

Threats include incidental take from channel dredging and commercial trawling, longline, and gill net fisheries; loss or degradation of nesting habitat from coastal development and beach armoring; disorientation of hatchlings by beachfront lighting; excessive nest predation by native and non-native predators; degradation of foraging habitat; marine pollution and debris; watercraft strikes; and disease.

Range-wide Trend:

Hildebrand (1981) suggested that loggerhead nesting along the Texas coast has occurred within the last 300 years, but the earliest loggerhead nest that he was able to confirm for Texas was found in 1977. Total estimated loggerhead nesting in the U.S. is approximately 68,000 to 90,000 nests per year (NOAA 2013a). Long-term nesting data show the population is declining in southeast Florida, North Carolina, South Carolina and Georgia. However, in Texas, during the last decade, nesting has remained stable, with 1-13 nests per year (Pers. Comm., D. Shaver, PAIS, 2013). Nesting in the Caribbean is sparse. In the Mediterranean, nesting is almost exclusively confined to the eastern portion of the Mediterranean Sea. In the Indian Ocean, most trends on loggerhead nesting populations are unknown. In Honduras, Mexico, Colombia, Israel, Turkey, Bahamas, Cuba, Greece, Japan, and Panama loggerhead nesting population have been declining (NOAA 2013a).

Critical Habitat

Critical habitat has not been designated for this species.

Photo: Douglas Shea

Green Sea Turtle

Description

The green sea turtle was listed as threatened in all of its range except the waters of Florida and the Pacific coast of Mexico, where it is endangered under the Act on July 28, 1978 (43 FR 32800). Adult green sea turtles can grow to a shell length of 4 feet and range from 250 to 450 pounds. It is distributed circumglobally in tropical and sub-tropical waters.

Adult green sea turtles reach maturity at 30 to 50 years of age. Females nest at night. From one to seven clutches are deposited within a breeding season (the average number is usually two to three clutches) (NMFS and Service 1991a). Average clutch size is usually 110-115 eggs. Hatchling emergence occurs at night. In this region, nesting sites include southern Florida and scattered locations in Mexico, although a few nests are found in south Texas annually.

In 1979-2012, 40 green sea turtle nests were documented on the Texas coast (Pers. Comm., Shaver 2012), but 15 were recorded there during 2013 (Pers. Comm., D. Shaver 2013). The nests were found in Texas from June through early-September although, nesting occurs from May through September in this region.

Population Dynamics

Within the U.S., green sea turtles nest in small numbers in the U.S. Virgin Islands, Puerto Rico, and Texas, and in larger and growing numbers along the east coast of Florida (NMFS and Service 1991a). Total population estimates for the green turtle are unavailable, however, green turtle nests on index beaches ranged from 464 in 1989 to 25,553 in 2013, an increase of approximately over 10 percent per year in Florida (FWC 2013). Populations in Surinam, and Tortuguero, Costa Rica, may be stable, but there is insufficient data for other areas to confirm a trend.

Status and Distribution

Reason for Listing:

Major factors contributing to the green sea turtle's decline worldwide is commercial harvest for eggs and food, fibropapillomatosis or the development of multiple tumors on the skin and internal organs, loss or degradation of nesting habitat from coastal development and beach

armoring, disorientation of hatchlings by beachfront lighting, excessive nest predation by native and non-native predators, degradation of foraging habitat, marine pollution and debris, watercraft strikes, and incidental take from channel dredging and commercial fishing operations.

Range-wide Trend:
Globally there is a declining trend, however green turtle population growth rates are variable among nesting populations and regions (NOAA 2013b). Most green turtles in Texas waters are juveniles and their numbers are increasing (Pers. Comm. D. Shaver, PAIS 2013). The Hawaiian green turtle population has increased 53% over the last 25 years (NOAA 2013b). The Martine Turtle Specialist Group indicates populations in all major ocean basins have declined over the past 100-150 years (NOAA 2013b).

Critical Habitat
NMFS designated critical habitat for the green sea turtle on October 2, 1998. Critical habitat included waters extending seaward 3.5 miles from the mean high water line of Isla de Culebra (Culebra Island, Puerto Rico). Critical habitat has not been designated in Texas.


Photo: Caroline Rogers, USGS

Atlantic Hawksbill sea turtle

Description
The hawksbill was listed as an endangered species on June 2, 1970 (35 FR 8491). It primarily occurs in tropical and subtropical seas of the Atlantic, Pacific, and Indian oceans inhabiting coast waters of more than 108 countries. Young hawksbills occur with some regularity in Texas waters, since northern currents carry them from nesting beaches in Mexico (Hildebrand, 1981). Historic nesting by this species on the Texas coast is unknown.

Hawksbills have a hawk-like beak, from which their name originates. They are small to medium-sized marine turtles, ranging from 176 to 279 pounds. Hawksbills are usually brown with ornate shells, which are dark amber with radiating streaks of brown or black. Their shells are also known as bekko or carey. The name "tortoise shell" was also given to their carapaces, which are made into many types of objects such as tortoise shell jewelry, combs, eyeglass

frames, and tabletops. A combination of characters distinguish the hawksbill from other sea turtles: the pairs of prefrontal scales; thick, posterior overlapping scutes on the carapace; four pairs of costal scutes; two claws on each flipper; a beak-like mouth and, when on land, it has a alternating gait, unlike the leatherback and green sea turtles. They use different habitats, such as shallow coastal areas, lagoons and coral reefs, at different stages of their life cycle. Females exhibit strong fidelity in nesting sites (NMFS and Service 2013). Post hatching hawksbills take shelter in weed lines at convergence zones and later re-enter coastal waters when their carapace length reaches to approximately 8 to 10 inches. Juvenile, subadult and adult hawksbills feed primarily on sponges found on coral reefs algae, sea grasses, soft corals, crustaceans, mollusks, jellyfish and sea urchins.

The nesting season for hawksbills varies geographically and may extend from April through October in the Caribbean and along the Gulf Coast of Mexico. Female hawksbill sea turtles nest mostly during the night, but rare daytime nesting is known, usually on small isolated beaches above the high tide. They nest an average of 4.5 times per season (up to 12 clutches); clutch size averages approximately 140 eggs (NMFS and Service, 1993). Hatchling emergence occurs at night. Hawksbills nest on scattered islands and beaches between 25° North and 25° South latitudes, including beaches in southeastern Florida and the states of Campeche and Yucatan in Mexico. Nesting does not regularly occur on the Texas coast.

Population Dynamics

Since the 2007, trends and distribution of the species' nesting populations in the eastern Pacific, Nicaragua, and western Caribbean appears to have improved, but throughout the globe largely is unchanged (NMFS and Service 2013). The hawksbill turtle has declined in most areas over the last century and represents only a fraction of its historical populations (NMFS and Service 2013). The populations were analyzed by ocean basin at 88 nesting sites in 10 different regions of the world.

Historic trends for 25 sites were unknown and the remaining 63 sites declined year 20 to 100 years. Recent trend data was available at 41 sites was more optimistic with 10 (24 percent) increasing, 3 (7 percent) stable, and 28 (68 percent) decreasing (NMFS and Service 2013).

Status and Distribution

Reason for Listing:

Threats to hawksbills in their nesting environment include poaching, beach erosion, erosion control methods, sand mining, landscaping of privately owned sites, artificial lighting, beach cleaning, increased human presence, beach vehicular driving, and nest depredation. Marine threats include entanglement, ingestion of marine debris, commercial and recreational fishing, watercraft collisions, sedimentation and siltation, sewage, agricultural and industrial pollution, illegal exploitation, oil and gas exploration, development, transportation and storage, anchoring and vessel groundings, and increases in international shipping traffic.

Range-wide Trend:

Determining population trends or estimates on nesting beaches is difficult since hawksbill sea

turtles are solitary nesters. The largest populations are found in the Caribbean, the Republic of Seychelles, Indonesia, and Australia. The largest in the U.S. occurs in Puerto Rico and the U.S. Virgin Islands, with approximately 500-1000 nests on Mona Island, Puerto Rico and another 100-150 nests on Buck Island Reef National Monument off St. Croix in the U.S. Virgin Islands (NOAA 2013c). Nesting is restricted in the southeast coast of Florida and the Florida Keys. In addition a majority of nesting occurs in Mexico and Cuba with the largest nesting population of hawksbills in Australia, with approximately 2,000 nests on the northwest coast and 6,000 to 8,000 nests off the Great Barrier Reef each year (NOAA 2013c). Atlantic populations in general are doing better than in the Indian and Pacific Oceans and the Indian populations are doing better than the Pacific Ocean.

Critical Habitat

NMFS designated critical habitat for the hawksbill turtle on October 2, 1998. Critical habitat only included waters extending seaward 3.5 miles from the mean high water line of Mona and Monito Islands, Puerto Rico. No critical habitat has been designated in Texas.

Image Credit: Leather On Land via Flickr CC

Leatherback sea turtle

Description

The leatherback sea turtle is federally listed as an endangered species. It ranges throughout the tropical waters of the Atlantic, Pacific, and Indian oceans, but has also been recorded from the North Atlantic, North Pacific, South Atlantic, South Pacific and Gulf of Mexico. Leatherbacks are primarily found in the open ocean, as far north as Alaska and as far south as the southern tip of Africa and known to be active in water below 40° Fahrenheit. The leatherback is the largest and most pelagic sea turtle species and is normally found in the deeper waters of the Gulf of Mexico, where it may undertake extensive migrations.

Its shell is made of a layer of thin, tough, rubbery skin that looks like leather, thus the name leatherback. The carapace is about 1.5 inches thick, large, and elongated and strengthened by thousands of tiny bone plates. Seven narrow ridges run down the length of the carapace, which is typically black with many spots. The plastron is whitish to black and marked by five ridges.

Weight can range from 500 to 1,500 lbs. Both adults and hatchlings upper jaws have two tooth-like projections and each flanked by deep cusps. They feed almost exclusively on jellyfish.

Leatherback nesting grounds are distributed circumglobally. In the U.S. and Caribbean, nesting begins in February and continues through July. Nesting occurs primarily at night and diurnal nesting occurs only occasionally. They nest at intervals of two to three years and up to five to seven times per year, with an average clutch size between 110 to 116 eggs (NMFS and Service 1992). Eggs incubate for about 65 days. Hatchling emergence typically occurs at night.

Population Dynamics

Over the past 30 years 99.4% of all leatherback nesting was recorded in Florida (10,005 to 10,065 nests) revealing the number of nest has increased by 10.2% per year since 1979 across the state (Stewart et al 2011). An assessment of 11 Atlantic Ocean rookeries showed an increase of 3-24% per year, one had remained stable, and one was decreasing slightly (Stewart et al 2011). This increase may be due to both the implementation of conservation measures and variable ocean climates. In contrast, the eastern Pacific nesting beaches in Mexico and Costa Rica have not been as successful with populations decreasing in recent decades. This may be attributed to longer intervals between nesting years and a less consistent foraging environment.

Status and Distribution

Reason for Listing:

Threats to the leatherback nesting environment include poaching, beach erosion, beach armoring beach nourishment, artificial lighting, beach cleaning, increased human presence, recreational beach equipment, and beach vehicular driving. Threats to the marine environment included entanglement or ingestion of marine debris, commercial fishing, oil and gas exploration, development, transportation and storage, boat collisions and pollution.

Range-wide Trend:

Leatherback sea turtles frequent nest on different beaches making it difficult to estimate population trends. The International Union for Conservation notes that most leatherback populations have declined more than 80% in the Pacific (NOAA 2013d). In other areas some population trends are increasing or stable. In the U.S. nesting trends have been increasing in recent years (NOAA 2013d). In Texas one leatherback nest was located at PAIS in 2008, and prior to that in the 1930s, although it is possible that a few were undetected, especially when patrols were not conducted or were less comprehensive.

Critical Habitat

No critical habitat has been designated for this species.

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Piping Plover

On January 10, 1986, the piping plover was listed as endangered in the Great Lakes watershed and threatened elsewhere within its range, including migratory routes outside of the Great Lakes watershed and wintering grounds (Service 1985). Piping plovers were listed principally because of habitat destruction and degradation, predation, and human disturbance. Three separate breeding populations have been identified, each with its own recovery criteria: the northern Great Plains (threatened), the Great Lakes (endangered), and the Atlantic Coast (threatened). The piping plover winters in coastal areas of the U.S. from North Carolina to Texas, and along the coast of eastern Mexico and on Caribbean islands from Barbados to Cuba and the Bahamas (Haig and Elliott-Smith 2004). Piping plovers from the Great Lakes and northern Great Plains breeding populations as well as birds that nest along the Atlantic coast may winter in the same coastal areas. For the purpose of this BO, discussions will be focused on the Texas wintering piping plover population and its designated critical habitat.

Description

The piping plover is a small, pale sand-colored shorebird, about seven inches long with a wingspan of about 15 inches and weighs about 40-65 ounces (Palmer 1967). Piping plovers live an average of five years, although studies have documented birds as old as 11 (Wilcox 1959) and 15 years (Clapp *et al* 1982). Adult piping plovers can arrive on the wintering grounds with partial breeding plumage. This will consist of a single black breastband, sometimes incomplete and a black bar across the forehead. In the late summer or early autumn, they will lose the black bands and the legs will fade from orange to pale yellow and the bill turns from orange to black. Prior to returning northward, they begin their molt back into breeding plumage (Service 2012).

Southward migration to the wintering grounds along the southern Atlantic coast and Gulf of Mexico shoreline extends from late July, August, and September. Piping plovers spend up to 10 months of their life cycle on their migration and winter grounds. They leave the wintering grounds as early as mid-Feburary and as late as mid-May.

Winter Habitat
Wintering plovers are dependent on a mosaic of habitat patches and move among these patches depending on local weather and tidal conditions (Nicholls and Baldassarre 1990). Maddock et al. (2009) observed shifts to roosting habitats and behaviors during high-tide periods in South Carolina. In South Carolina, exposed intertidal areas were the dominant foraging substrate (accounting for 94 percent of observed foraging piping plovers) (Service 2009a).

Atlantic Coast and Florida studies highlighted the importance of inlets for non-breeding piping plovers. Almost 90 percent of observations of roosting piping plovers at ten coastal sites in southwest Florida were on inlet shorelines (Lott et al. 2009). Piping plovers were among seven shorebird species found more often than expected at inlet locations versus non-inlet locations in an evaluation of 361 International Shorebird Survey sites from North Carolina to Florida (Harrington 2008). In Texas, high numbers of piping plovers are typically found along the sides of unjettied inlets (Bolivar Flats, San Luis, Wolf Island, Dacros Point, Cedar Bayou, Mansfield Pass) (Pers. Comm. Cobb, Service 2010). In Texas, plovers use ocean beaches and bay shorelines and flats depending on the season and weather conditions.

This species exhibits a high degree of intra- and inter-annual wintering site fidelity (Nicholls and Baldassarre 1990, Drake et al. 2001, Noel et al. 2005, Stucker and Cuthbert 2006). On the lower Texas coast, individual plovers are known to use areas about 3,000 acres in size, moving two miles or more between foraging sites as tidal movements shift the availability of productive tidal flats (TPWD 2000). Recent studies show significantly more stringent site fidelity with individual birds returning to more precise locations (+/-400 feet in lateral distance on the beach) each year (USACE 2009b).

Foraging Habitat
Behavioral observation of piping plovers on the wintering grounds suggests that they spend the majority of their time foraging (Nicholls and Baldassarre 1990, Drake 1999a, 1999b). Feeding activities may occur during all hours of the day and night (Staine and Burger 1994, Zonick 1997), and at all stages in the tidal cycle (Hoopes 1993, Service 2009b). Wintering plovers primarily feed on invertebrates such as polychaete marine worms, various crustaceans, fly larvae, beetles, and occasionally bivalve mollusks (Bent 1929, Cairns 1977, Zonick and Ryan 1996). They peck these invertebrates on top of the sand or just beneath the surface. Plovers forage on moist substrate features such as intertidal portions of ocean beaches, washover areas, mudflats, sand flats, algal flats, shoals, wrack lines, sparse vegetation, and shorelines of coastal ponds, lagoons, ephemeral pools and adjacent to salt marshes (Service 2009a, Zivojnovich 1987, Nichols 1989, Nicholls and Baldassarre 1990, Loegering 1992, Zonick 1997, Service 2009a).

Roosting Habitat
Several studies identified wrack (organic material including seaweed, seashells, driftwood, and other materials deposited on beaches by tidal action) as an important component of roosting habitat for nonbreeding piping plovers. In South Carolina, 45 percent of roosting piping plovers were in old wrack, and 18 percent were in fresh wrack. The remainder of roosting birds used intertidal habitat (22 percent), backshore (defined as zone of dry beach from mean high water

line up to the toe of the dune)(8 percent), washover (2 percent) and ephemeral pools (1 percent) (Service 2009a).

Population Dynamics

A consistent finding of all analyses of the demographic factors affecting the persistence and/or extinction of piping plover populations (Melvin and Gibbs 1994, Plissner and Haig 2000) is that vulnerability to extinction is greatly increased by even small declines in survival rates. Since piping plovers spend 55 to 80 percent of their annual cycle associated with wintering areas, factors that affect their well-being on the wintering grounds could substantially affect their survival and recovery (Service 1996). Between 2007 and 2008, the overall estimate of Atlantic Coast breeding pairs declined approximately 2 percent. Coast wide, 2008 productivity was slightly higher than in 2007, but remained below the long-term average. In 2010 Atlantic Coast piping plover population estimate was 1,782 pairs, more than double the 1986 estimate 790 pairs, increasing 86 percent between 1989 and 2010. In the Southern recovery unit, net growth was 54 percent between 1989 and 2010, with most of the increase occurring in 2003 to 2005. Annual productivity estimates were at their lowest in 2009 due to storm events, but rebounded in 2010, but remained low in New York (Service 2011). The overall population on the U.S. Northern Great Plains remained relatively stable from 2007 to 2008. Adult numbers were down more than 10 percent in Nebraska in 2008, and the Kansas and Minnesota populations appear nearly extirpated. The 2009 reports from the Missouri River system and U.S. alkali lakes indicate a sharply declining net trend, with decreases on the Missouri River system substantially exceeding a gain on the alkali lakes.

Status and Distribution

Reason for listing:

Threats to the piping plover include degradation, alteration or loss of wide, flat sparsely vegetated barrier beaches, spits, sandbars, and bayside flats preferred by the piping plover in its migrating and wintering range. Activities that contribute to habitat loss or degradation include beach front development, inlet and shoreline stabilization, inlet dredging, beach maintenance and nourishment activities, seawall installations, and mechanical beach grooming.

Range-wide Trend:

The coast of Texas is a major wintering area for piping plovers. They spend up to 55 to 80 percent of their annual cycle along the Texas coast and account for about 55 percent of the birds documented during the winter census (Nicholls and Baldassare 1990, Haig and Plissner 1993, Drake 1999a). Four range-wide International Piping Plover censuses (late January to early February) have been conducted at five-year intervals: 1991 (Haig and Plissner 1992), 1996 (Plissner and Haig 1997), 2001 (Ferland and Haig 2002), and 2006 (Elliott-Smith et al. 2009). The Texas population censuses resulted in 1,904 wintering piping plovers counted in 1991, 1,333 in 1996, 1,042 in 2001 and 2,090 in 2006 and a preliminary number of 2,145 in 2011. Between December 2, 2008 and March 13, 2009, seventy eight locations from Marco Island, Florida to Boca Chica beach in Texas were visited to located banded piping plovers. There were 397 banded piping plover observations with 295 of those observations in Texas. Banded piping plover observations by populations were, 170 from Great Plains Canada, 176 from Great Plains

United States, 29 unknown, 22 from the Great Lakes, and 0 were from Atlantic Canada or Atlantic United States (Maddock 2009).

Total piping plover numbers have fluctuated over time, with some areas experiencing increases and others decreases. Regional and local fluctuations may reflect the quantity and quality of suitable foraging and roosting habitat, which vary over time in response to natural coastal formation processes as well as anthropogenic habitat changes (e.g., inlet relocation, dredging of shoals and spits). Fluctuations may also represent localized weather conditions (especially wind) during surveys, or unequal survey coverage. For example, airboats facilitated first-time surveys of several central Texas sites in 2006 (Cobb *in* Elliott-Smith et al. 2009). Changes in wintering numbers may also be influenced by growth or decline in the particular breeding populations that concentrate their wintering distribution in a given area. Conservation efforts at some locations have likely resulted in the enhancement of wintering habitat. The increased numbers of birds counted in Texas in 2006, may reflect a shift of birds away from areas such as the Chandeleur Islands in Louisiana that were negatively impacted by Hurricane Katrina in 2005 (Cobb 2006). Further surveys of piping plover use of seasonally emergent habitats (e.g., seagrass beds, mudflats, oyster reefs) within bays lying between the mainland and barrier islands in Texas are also needed.

Critical Habitat

Critical habitat for the Great Lakes piping plover breeding population was designated May 7, 2001 (66 FR 22938), and critical habitat for the northern Great Plains breeding population was designated September 11, 2002 (67 FR 57637). Critical habitat on the wintering grounds was designated July 10, 2001 (66 FR 36038). That designation included 142 areas totaling 173,807 acres along the coasts of North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas. The Service re-designated critical habitat in Texas and North Carolina in 2009. North Carolina acreage decreased from 21,280 acres to 19,707 acres. Texas critical habitat increased in acreage from 71,053 to 155,332 acres yielding a total wintering critical habitat acreage of 256,513 acres. These units are believed to contain the essential physical and biological elements necessary for maintaining the natural processes that provide appropriate foraging, roosting, and sheltering habitat components.

The essential physical and biological elements or primary constituent elements (PCEs) for wintering ground critical habitat are: 1) Intertidal sand beaches including sand flats or mudflats between annual low tide and annual high tide with no or very sparse emergent vegetation for feeding, 2) Unvegetated or sparsely vegetated sand, mud, or algal flats above annual high tide for roosting with debris or detritus and micro-topographic relief offering refuge from high winds and cold weather, 3) Surf-cast algae for feeding, 4) Sparsely vegetated back beach above mean high tide seaward of the dune line, 5) Spits, especially sand, running into water for foraging and roosting. 6) Unvegetated beach washover areas with little or no topographic relief for feeding and roosting, 7) Natural conditions of sparse vegetation and little or no topographic relief mimicked in artificial habitat types (e.g. dredge spoil sites).

Portions of Critical Habitat Units TX-1 and TX-2 are within the action area (Figure 4).

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Northern Aplomado Falcon

The aplomado falcon was first collected in North America in 1852 (Service 1990b) and the northern aplomado falcon (falcon) is one of three subspecies of the aplomado falcon and the only subspecies recorded in the United States. The falcon was last seen in the American southwest in the 1950s. The falcon was listed as endangered on February 25, 1986 (51 FR 6690).

Description

The falcon is a medium sized raptor that is larger than a kestrel or merlin but smaller than the peregrine. Its total length is about 15 to 18 inches with a wingspan of about 32 to 36 inches. Adults are characterized by rust colored underparts, a gray back, a long-banded tail, and a distinctive facial pattern (Campbell 1995). Males and females are similar in appearance but the males are smaller than the females (Keddy-Hector 2000).

The falcons are permanent residents in Texas and their diet consists primarily of birds, supplemented by insects, small snakes, lizards and rodents (Keddy-Hector 2000). They are monogamous. They do not construct their own nests but instead use the stick platforms built by other birds, such as other raptors, crows and ravens. The nests generally average about 1 to 3 feet in diameter and are on tall yuccas 6-10 feet off the ground. The falcons are territorial during the breeding season and some pairs will stay near and defend the sites throughout the year. The falcons historically bred from late February to October, based on egg dates from March 3 to September 12 (Oberholser 1974, Lockwood and Freeman 2004), and lay eggs mid-March to the end of April (Pers. Comm., Paul Juergens, Peregrine Fund, 8/2013). They usually lay 2 to 3 eggs and both parents (mainly female) incubate for about 31 to 32 days. Young can fly at 4 to 5 weeks of age and may remain in the nest area for several weeks more to be fed by the adults. Outside the breeding season, the falcons are often seen in pairs, hunting, perching, and even feeding together (Service 1990b).

In South Texas habitat consists of coastal prairie, coastal savannahs, marshes and tidal flats, open grassland with scattered trees or with an understory of grasslands and shrubs (Campbell 1995). They are often seen perched in trees or on taller yuccas. Birds in southern Mexico occupy river floodplains and riparian woodlands. Falcons found in Arizona, New Mexico, Trans-Pecos Texas, and central plateau of Mexico inhabit semi-desert grassland with scattered mesquite and yucca (*Yucca spp.*). Foraging released falcons in south Texas used areas with 2.6 trees per hectare and dense, lightly grazed or ungrazed grasslands (Perez et al 1996).

Population Dynamics

Northern aplomado falcon's numbers went to zero in the United States with small numbers scattered throughout Mexico. Releases of young birds into the wild and the installation of nest boxes by The Peregrine Fund have increased nesting success in South Texas. The population status is stable to increasing at present in South Texas (Pers. Comm., Chris Perez, Biologist Laguna Atascosa NWR, 2013, BirdLife International 2013).

Status and Distribution

Reason for listing:

Habitat loss and pesticide contamination may have caused the aplomado falcon's disappearance from formerly occupied areas. Conversion of rangeland to cropland has also contributed to habitat loss. Brush encroachment resulting from uncontrolled livestock grazing and fire suppression altered grassland habitat. Continuous heavy grazing pressure reduces plant diversity and leads to declines in range condition and brush invasion reducing habitat for prey species.

Range-wide Trend:

Historically, aplomado falcons were fairly common along the southern Gulf Coast of Texas and in southwest Mexico; however it had been considered extirpated from the United States until implementation of recovery actions in themed-1990s. Conservation efforts since then have contributed to establishment of approximately 40 breeding pairs in the wild along the Texas Gulf Coast (New Mexico Avian Conservation Partners 2013).

Critical Habitat

No critical habitat is designated for this species.

Photo Credit: Frank Weaver,USFWS

Red knot

Description

The rufa red knot is a 9 to 11 inch long shorebird with a small head, small eyes, short neck, and a black bill that tapers from a stout base to a relatively fine tip. Legs are short and typically dark gray to black, but sometimes greenish in juveniles or older birds in nonbreeding or wintering plumage (Harrington 2001). In breeding plumage, the bird has a face, prominent stripe above the eye, and its breast, and upper belly are a rich rufous-red to a brick or salmon red. The feathers of the lower belly and under the tail are whitish with dark flecks. Upperparts are dark brown with white and rufous feather edges; outer primary feathers are dark brown to black (Harrington 2001; Davis 1983). Females are similar in color to males. Nonbreeding plumage is dusky gray above and whitish below. Juveniles resemble nonbreeding adults.

The red knot breeds in the central Canadian Arctic. Estimated survival rates are 80.5 to 92 percent, and few red knots live for more than about 7 years (Service 2013). Age of first breeding is uncertain but for most birds is probably at least 2 years (Harrington 2001).

The red knot is a specialized molluskivore, eating hard-shelled mollusks, sometimes supplemented with easily accessed softer invertebrate prey, such as shrimp- and crab-like organisms, marine worms, and horseshoe crab eggs (Piersma and van Gils 2011, Harrington 2001). The mollusk prey is swallowed whole and crushed in the gizzard, which is the largest (relative to body size) among any shorebird species, evaluated (Piersma and van Gils 2011). Foraging activity is largely dictated by tidal conditions, as red knots rarely wade in water more than 0.8 to 1.2 inches deep (Harrington 2001).

Red knots tend to migrate in single-species flocks with departures typically occurring in the few hours before twilight on sunny days. Size of the departing flocks tends to be large (greater than 50 birds) (Niles et al. 2008). Red knots are inferred to migrate during both night and day (Normandeau Associates, Inc. 2011).

Habitats used by red knots in migration and wintering areas are similar in character, generally coastal marine and estuarine (partially enclosed tidal area where fresh and salt water mixes)

habitats with large areas of exposed intertidal sediments. 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 (Cohen et al. 2010a, Cohen et al. 2009, Niles et al. 2008, Harrington 2001, Truitt et al. 2001). In many wintering and stopover areas, quality high-tide roosting habitat (i.e., close to feeding areas, protected from predators, with sufficient space during the highest tides, free from excessive human disturbance) is limited (K. Kalasz, Pers. Com., November 26, 2012; L. Niles, Pers. Comm., November 19, 2012).

Along the Texas coast, red knots forage on beaches, oyster reefs, and exposed bay bottoms and roost on high sand flats, reefs, and other sites protected from high tides (Service 2011). In addition to using the Gulf beaches, red knots in Texas use extensive tidal flats on the bay sides of barrier islands (Newstead et al. in press).

Population Dynamics

Except for localized areas, there have been no long-term systematic surveys of red knots in Texas or Louisiana, and no information is available about the number of knots that winter in northeastern Mexico. From survey work in the 1970s, Morrison and Harrington (1992) reported peak winter counts of 120 red knots in Louisiana and 1,440 in Texas, although numbers in Texas between December and February were typically in the range of 100 to 300 birds. Records compiled by Skagen et al. (1999) give peak counts of 2,838 and 2,500 red knots along the coasts of Texas and Louisiana, respectively, between January and June over the period 1980 to 1996, but these figures could include spring migrants. Morrison et al. (2006) estimated only about 300 red knots wintering along the Texas coast, based on surveys in January 2003 (Niles et al. 2008). Higher counts of roughly 700 to 2,500 knots have recently been made on Padre Island, Texas during October, which could include wintering birds (Newstead et al. in press; Niles et al. 2009).

Foster et al. (2009) found a mean daily abundance of 61.8 red knots on Mustang Island, Texas, based on surveys every other day from 1979 to 2007. Similar winter counts (26 to 120 red knots) were reported by Dey et al. (2011a) for Mustang Island from 2005 to 2011. From 1979 to 2007, mean abundance of red knots on Mustang Island decreased 54 percent, but this may have been a localized response to increasing human disturbance, coastal development, and changing beach management practices (Newstead et al. in press; Foster et al. 2009) (i.e., it is possible these birds shifted elsewhere in the region).

At several key sites, the best available data show that numbers of red knots declined and remain low relative to counts from the 1980s, although the rate of decline appears to have leveled off since the late 2000s. There are no current estimates for the size of the Northwest Gulf of Mexico wintering group as a whole (Mexico to Louisiana). The best available current estimates for portions of this wintering region are about 2,000 in Texas (Niles 2012a), or about 3,000 in Texas and Louisiana, with about half in each State and movement between them (C. Hunter, Pers. Comm., Southern Regional Office of the Service, September 20, 2012).

Status and Distribution

Each year red knots make one of the longest distance migrations known in the animal kingdom, traveling up to 19,000 miles annually. The red knot breeds in the central Canadian Arctic and winters along the Atlantic and Gulf coasts of North America, in the Caribbean, and along the north and southeast coasts of South America including the island of Tierra del Fuego at the southern tip of Argentina and Chile. During both the northbound (spring) and southbound (fall) migrations, red knots use key staging and stopover areas to rest and feed.

Red knots wintering in Texas arrive in late July or August (Newstead et al. in press; Niles 2012a). Geolocator results show that knots wintering along the northwest Gulf of Mexico spent nearly the entire nonbreeding phase of their annual cycle (286 days, or 78 percent of the calendar year) on the Texas coast (Newstead et al. in press).

Red knots from different wintering areas appear to employ different migration strategies, including differences in timing, routes, and stopover areas. However, there is not full segregation of migration strategies, routes, or stopover areas among red knots from different wintering areas. Figure 10 shows known red knot stopover areas. Red knots wintering in Texas use a central, overland flyway through the Midwest. Birds flew 1,600 to 2,000 miles to the first stopover. All birds departed Texas in the second half of May, and spent an average of 13 to 22 days at the northbound stopover (Newstead et al. in press).

Reason for Listing:

The red knot is threatened due to loss of breeding and nonbreeding habitat from sea level rise, shoreline stabilization, and Arctic warming; reduced prey availability throughout the nonbreeding range; and increasing frequency and severity of asynchronies ("mismatches") in the timing of the birds' annual migratory cycle relative to favorable food and weather conditions. Secondary threats include hunting, predation, human disturbance, harmful algal blooms, oil spills, and wind energy development. All of these factors affect red knots across their current range (Service 2013).

Range-wide Trend:

In breeding habitats, red knots are thinly distributed across a huge and remote area of the Arctic. Despite some localized survey efforts, (e.g., Niles et al. 2008), there are no regional or comprehensive estimates of breeding abundance, density, or productivity (Niles et al. 2008). Few regular surveys are conducted in fall because southbound red knots tend to be less concentrated than during winter or spring. Some survey data are available for most wintering and spring stopover areas. For some areas, long-term data sets have been compiled using consistent survey methodology. Because there can be considerable annual fluctuations in red knot counts, longer-term trends are more meaningful. At several key sites, the best available data show that numbers of red knots declined and remain low relative to counts from the 1980s, although the rate of decline appears to have leveled off since the late 2000s.

Critical Habitat
The biological needs of the species and habitat characteristics where the species is located have been reviewed. There is sufficient biological and habitat information on the species to identify specific areas that may be essential to or for the species' conservation though we currently lack the economic information to perform the required analysis to determine the potential economic impacts of a critical habitat designation (77 FR 12955). We are in the process of gathering the necessary information to perform the economic analysis in the near future. Therefore, at this time we conclude that designation of critical habitat for the red knot is not determinable.

Environmental Baseline
Under section 7(a)(2) of the Act, when considering the effects of an action on Federally-listed species, the Service is required to take into consideration the environmental baseline. The environmental baseline includes past and ongoing natural factors and the past and present impacts of all Federal, State, or private actions and other human activities in the action area, including Federal projects in the action area that have already undergone section 7 consultation and the impacts of State or private actions which are contemporaneous with the consultation in process (50 CFR 402.02).

The SpaceX vertical launch and control center sites are in a sparsely populated coastal area off the Gulf of Mexico characterized clay lomas, wind-tidal flats and sand dunes. The land is primarily used for recreation (Boca Chica State Park, Lower Rio Grande Valley NWR, South Bay Preserve, Brazos Island State Park, Isla Blanca Park, Palmito Ranch Battlefield NHL). Surface waters near the launch and control center sites are South Bay, Laguna Madre, Rio Grande, and the Gulf of Mexico. The southern end of South Bay is approximately 0.5 mile north of the launch area and Boca Chica Bay is approximately 0.03 mile. Boca Chica Bay is a subdelta of the Rio Grande which is about 2 miles from the launch site. The property boundary of the vertical launch area is immediately adjacent to a critical dunes area and a portion of the property is designated as an undeveloped coastal barrier by the Coastal Barrier Resource Act. The vertical launch and control center areas are also located in Federal Emergency Management Agency (FEMA) designated zone A8 and V10 of the Flood Insurance Rate Map for Cameron County which is within the 100-year floodplain. V10 is designated as special hazard area which is subject to inundation by 1 percent annual chance flood events with additional hazards subject to erosion and overtopping from high tides and waves during storms. TxDOT owns and operates 200 feet on fee title ROW for SH4 from end of road at the coast to approximately 6 miles inland. The only water well is approximately 2 miles south of the vertical launch and control center areas.

Status of the Species within the Action Area

Ocelot and Jaguarundi

The ocelot and jaguarundi are treated together here, as in many publications (e.g., Service 1987; Service 1990), because, although very little is known about the ocelot, and even less about the jaguarundi, the two are thought to exhibit similar habitat preferences in South Texas. The cats

are believed to utilize tracts of brush habitat within the action area, particularly along the ditches or waterways as travel or dispersal corridors. The majority of the land within the action area is undeveloped. The area lies within the Tamaulipan Biotic Province as described by Blair (1950). The dominant landforms in the area include lomas (ridges or clay dunes) and tidal flats (Figure 11). The elevations of the lomas range from 5 to 30 feet above mean high tide and from 10 to about 250 acres in size (USDA 1977). The lomas are generally characterized by mixed thornshrub community and composed of dominant species such as Texas ebony (*Pithecellobium flexicaule*), honey mesquite, retama, brasil (*Condalia hookeri*), granjeno, lotebush, allthorn, acacias (*Acacia spp.*), and Spanish dagger (*Yucca treculeana*). The thornshrub on the lomas varies from dense thickets to nearly barren ground. The flats are broad, level and in some cases barren.

Blanton & Associates (1998) reported a young male ocelot trapped in the area in April 1998, approximately 3.5 miles west of the proposed control center area. The ocelot was captured on an unnamed loma located between SH4 and the Brownsville Ship Channel. The ocelot often traveled across extensive areas of open flats and the brush associated with the lomas along SH4 and the Service's Loma Ecological Preserve to move between lomas and north of the Brownsville Ship Channel settling into an area south of LANWR (Figure 12). A known ocelot road kill occurred approximately 2.3 miles north of SH4 in 1989.

Additional sightings of ocelots north of the action area include a 1970 sighting south-southwest of Laguna Larga, 2.5 miles north of SH48. An ocelot was killed on Farm to Market Road (FM) 510 in 1984, 1986, 1987, 1995, and two were reported killed in 2001 between the towns of Laguna Vista and Bayview, Texas. In 1989, a road-killed ocelot was found on SH48 near its intersection with San Martin Loma. The ocelot was not radio-collared, and its origin and landscape use were unknown. In 1992, an ocelot was also reported on SH48, 3 miles from Highway 100. Ocelots occur near the Holly Beach community just south of the known LANWR population of ocelots. Holly Beach and LANWR are located between 5 and 10 miles north of SH48, which is north of the action area.

A jaguarundi was killed on SH4 east of Brownsville in 1986. A cat resembling a jaguarundi was photographed in 1989 at the Audubon's Sabal Palm Sanctuary near Brownsville. The Sanctuary is located approximately 11 miles southwest of the recorded 1989 ocelot road kill found on SH48.

These documented sightings of cats and the presence of ocelots on established refuges indicate that habitat is available in the action area to support ocelots and jaguarundis. Many researchers (Ideker 1984, Tewes and Everett 1986, Tewes and Laack 1989) and the Service (1990) believe that the continued existence of the isolated ocelot and jaguarundi populations depends upon protecting travel corridors connecting the existing main coastal populations of cats to the interior subpopulations, as well as to suitable habitat that they may occupy in the future. Also, a known population of jaguarundis exists in the coastal state of Tamaulipas, Mexico, lending importance of maintaining a north/south travel corridor between the Mexico and Texas jaguarundi populations. The continued use of scarce, habitat fragments makes these cats highly vulnerable

to vehicle strikes, reduces genetic viability, and minimizes the likelihood of their survival and recovery in the wild.

Sea Turtles

The eastern boundary of the vertical launch area perimeter fence is over 500 feet west of and separated by dunes from sea turtle nesting areas. South Padre Island beach surveys have been conducted on a regular basis since 1978. Under permit from the Service, sea turtle surveys in the action area are conducted by STI April through August of each year. The surveys are conducted using all-terrain vehicles (ATV). Surveys begin at sunrise. Turtle eggs are relocated and incubated within a fenced off corral for protection. Between 1996 and 2012, a total of 189 sea turtles nests were documented as occurring on Boca Chica and South Padre Island. Within this time period a total of approximately 91 sea turtles, predominately Kemp's ridley, nested within the action area (Pers. Comm. Shaver, PAIS 2010) (Figure 13).

Although there have been sightings of post hatchlings and juveniles in Texas, only one hawksbill nest has been recorded on the Texas coast. Located in 1998, it contained 140 eggs and 132 hatchlings from the nest were later released into the Gulf of Mexico (Shaver, 1999b). It is possible that additional nests were undetected, especially when patrols were not conducted or were less comprehensive.

Piping Plover

In 2009, migratory and winter surveys for piping plovers were conducted within the Lower Laguna Madre region in south Texas and 801 piping plovers were observed during migratory surveys, while 881 were documented during wintering surveys. Numbers during the International Censuses at Boca Chica were 60 in 1991, 117 in 1996, 0 in 2001, and few in 2006. Maddock (2010) observed 239 piping plovers on the west and south sides of South Bay. This area within the action area is remote and expansive and piping plovers were seen between South Bay on the north side of the road, on the south side of the road, and Boca Chica beach. During a visit to the SpaceX site on December 11, 2012, Service biologist observed over 200 piping plovers in the flats along Highway 4, which is also designated critical habitat.

Critical Habitat

As shown in Figure 4, the action area is located within the 7,217-acre Critical Habitat Unit TX-1 South Bay and Boca Chica and a portion of TX-2, Queen Isabella Causeway. The boundaries of TX-1 are: starting at the Loma Ochoa, following the Brownsville Ship Channel to the northeast out into the Gulf of Mexico to Mean Lower Low Water (MLLW), then south along a line describing MLLW to the mouth of the Rio Grande, proceeding up the Rio Grande to Loma de Las Vacas, then from that point along a straight line north to Loma Ochoa. The unit does not include densely vegetated habitat within those boundaries. It includes wind tidal flats that are infrequently inundated by seasonal winds, and the tidal flats area known as South Bay. Beaches within the unit reach from the mouth of the Rio Grande northward to Brazos Santiago Pass, south of South Padre Island. The southern and western boundaries follow the change in habitat from wind tidal flat, preferred by the piping plover, to where densely vegetated habitat, not used

by the piping plover, begins and where the primary constituent elements for critical habitat no longer occur. The upland areas extend to where densely vegetated habitat, not used by the piping plover, begins and where the constituent elements no longer occur and include areas used for roosting by the piping plover.

Special management considerations or protections to ameliorate the threats of discharging fresh water across unvegetated tidal flats; activities associated with residential and commercial development; recreational disturbance of foraging and roosting plovers by humans, vehicles, and domestic animals; increased predation due to recreational use; and modification and loss of habitat due to beach cleaning and nourishment for recreational use have been implemented.

TX-2, Queen Isabella Causeway unit, is comprised of 6 acres in Cameron County. The area extends along the Laguna Madre west of the city of South Padre Island. The southern boundary is the Queen Isabella Sate Fishing Pier, and the northern boundary is at the shoreline due west of the end of Sunny Isles Street. The Queen Isabella Causeway bisects the shore but is not included in critical habitat. The eastern boundary is where the developed areas and/or dense vegetation begin, and the western boundary is the mean lower low water line (MLLW). This unit contains land known as wind tidal flats are infrequently inundated by seasonal wind-induced tide events.

Northern Aplomado Falcon

Suitable foraging habitat exists within the action area. Surveys conducted in 1993 to 2003 recorded aplomado falcons foraging and nesting in the action area. Currently 23 artificial nest platforms have been constructed within the survey area and the two closest platforms are 4.5 miles to the northwest and 9.3 miles west of the proposed control center area. The nearest known aplomado falcon territory is approximately 5-6 miles from the proposed SpaceX facility. Five aplomado falcon nestlings, a pair of adult falcons, and a female falcon were observed in 2011 and 2012 at two different nest structures. One structure was located approximately 4-5 miles northwest of the proposed SpaceX site and the other nest structure was along Highway 4, approximately 8 miles away (Pers. Comm., T. Anderson, Biologist, Ecological Services, 2013). However there is suitable habitat on the Mesa del Gavila (just northwest and north of the project site) and Loma de la Pita (south of the project site and other lomas (southwest and west) within 3 miles from the proposed facility. Although there is limited perching and nesting sites available within the control center and vertical launch areas, it is possible aplomado falcons may pass through the sites while moving to other areas of suitable habitat to the north and south.

Documented bird releases and monitoring by The Peregrine Fund confirm individuals and breeding pairs using coastal grasslands, coastal dunes, and tidal flats within the action area for feeding, breeding, and sheltering.

South Texas remains in drought conditions but prey such as small birds and insects still are readily available (Peregrine Fund 2012). However, brush encroachment by mesquite and huisache and development in the Laguna Atascosa NWR vicinity could result in the loss of suitable habitat. The Service has been working closely with The Peregrine Fund to clear

mesquite and huisache from grassland habitat in an established falcon territory on the Bahia Grande Unit, but this type of landscape improvement is difficult and a slow process. It is anticipated that such projects will help improve the falcon's survival.

Red Knot

Except for localized areas, there have been no long-term systematic surveys of red knots. Morrison et al. (2006) estimated only about 300 red knots wintering along the Texas coast, based on surveys in January 2003 (Niles et al. 2008). Higher counts of roughly 700 to 2,500 red knots have recently been made on Padre Island, Texas during October, which could include wintering birds (Newstead et al. in press; Niles et al. 2009). Foster et al. (2009) found a mean daily abundance of 61.8 red knots on Mustang Island, based on surveys every other day from 1979 to 2007. Similar winter counts (26 to 120 red knots) were reported by Dey et al. (2011a) for Mustang Island from 2005 to 2011. From 1979 to 2007, mean abundance of red knots on Mustang Island decreased 54 percent, but this may have been a localized response to increasing human disturbance, coastal development, and changing beach management practices (Newstead et al. in press; Foster et al. 2009) (i.e., it is possible these birds shifted elsewhere in the region).

There are no current estimates for the size of the Northwest Gulf of Mexico wintering group as a whole (Mexico to Louisiana). The best available current estimates for portions of this wintering region are about 2,000 in Texas (Niles 2012a), or about 3,000 in Texas and Louisiana, with about half in each State and movement between them (C. Hunter Pers. Comm. September 20, 2012). During the migration period, although foraging red knots can be found widely distributed in small numbers within suitable habitats, birds tend to concentrate in those areas where abundant food resources are consistently available from year to year (Fraser et al. 2010; Cohen et al. 2010a, Niles et al. 2008, Smith et al. 2008; Karpanty et al. 2006, Botton et al. 1994).

Because wintering and migratory red knots concentrate in areas with abundant primary food sources, during winter and migration red knots will travel along the Northwest Gulf of Mexico. The size of red knot groups near the project site can be as large as several hundred individuals representing 20 to 50 percent of the Northwest Gulf of Mexico population.

Several areas in Texas have been identified as important wintering and migration stop over areas. These areas are important because they meet most of the habitat characteristics needed by red knots and have consistent red knot observations over several years. One of the important areas is the Boca Chica area adjacent to the project area (Figure 14).

Factors affecting species environment and designated critical habitat within the action area

Land Ownership

The majority of the land in the action area is in private, state, or federal ownership or management. Those include private homes in Boca Chica Village, Brownsville Navigation District, TPWD and Service NWR lands, and U.S. Border Patrol bridges and stations. Future land use in the project area is expected to be driven by the goals, objectives and mandates of these landowners and may have a direct relationship on the effectiveness of any structural

conservation measures. The management or activities may negatively or beneficially affect the species environment within the action area.

Brush clearing continues to be major limiting factor for feline populations in the Lower Rio Grande Valley (Collins 1984; Rappole 1986). The ocelot and jaguarundi also depend on densely vegetated travel corridors along resacas, ramaderos, and between brush tracts (Rappole 1988). Such corridors facilitate dispersal through an otherwise cleared landscape. Vegetation removal associated with "clean farming" and water storage, delivery, and drainage has negatively affected felid populations by preventing travel between remnant brush tracts.

Habitat Acquisition and Management

The South Texas Refuges Complex is situated in southernmost Texas, and is made up of three refuges, Santa Ana, Laguna Atascosa, and the Lower Rio Grande Valley. Laguna Atascosa Refuge is located within the action area. A wide array of wildlife species and large numbers of individuals flourish in the extant diverse habitat of the Lower Rio Grande Valley, due in part to warm climate year-round, moderate amounts of precipitation, and the Rio Grande flowing into the Gulf of Mexico. This wildlife and habitat diversity is economically important to the international border region as approximately 200,000 tourists annually spend approximately $150 million. Because approximately 95 percent of the vegetation in the Lower Rio Grande Valley has been cleared or altered, NWRs, state parks and wildlife areas, properties purchased for conservation by nonprofit organizations, and some private holdings, are important links in the efforts to protect the tremendous biodiversity and related economics of the region. The Service established the South Texas Refuge Complex to preserve and manage remnants of these communities and attempt restoration of adjacent disturbed lands.

The Service is continuing to acquire and enhance native Tamaulipan brushland around Laguna Atascosa Refuge to promote movements of endangered cats between known and suspected areas of occupation. The resource protection and management strategy consists of four integrated approaches to address complex resource needs. They include: concentration of biotic community needs; maintenance of a wildlife habitat corridor; safeguarding of anchor units of large size; and protection of strategically placed management units of smaller size.

The Mexican Government and a number of interested Mexican and U.S. conservation organizations are focusing their attention on the ecologically valuable areas to the south of the project, including the Laguna Madre of Tamaulipas, Mexico and the Sierra de los Picachos, Nuevo Leon, Mexico. The Service's Lower Rio Grande/Rio Bravo Binational Ecosystem Team has been working with Mexico to establish a wildlife corridor along the Rio Grande within the action area and in Tamaulipas between Falcon Dam and the Laguna Madre to connect important ecologically valuable areas along both sides of the U.S./Mexico border. They are also working to connect these acres to the large blocks of intact habitat on the Laguna Atascosa NWR and on South Texas ranches to the north.

The use of corridors is becoming prevalent in reserve design (Noss 1987) in an attempt to maintain or restore natural landscape connectivity. Increased connectivity, along with increased

effective habitat area, counteracts habitat fragmentation (Noss 1987). Corridors facilitate gene flow and dispersal of individual animals (Soule and Simberoff 1986). Life histories of wide-ranging animals suggest that maintenance or restoration of landscape connectivity is a good management strategy (Noss 1987). A network of refuges connected by corridors may allow the persistence of far-ranging species that need more resources than are found in one refuge site.

Potential disadvantages of corridors, such as human disturbance, can be avoided by enlarging corridor width (Noss 1987). Necessary width depends on habitat structure and quality within the corridor, the surrounding habitat, human use patterns, and the particular species that are expected to use it (Noss 1987). The ideal corridor width along the Rio Grande would be wide enough for target species to access sufficient food, water, and cover. In this way, genetic exchange could occur along the corridor, and populations could be maintained even though density at any particular place in the corridor might be low.

International Boundary and Water Commission (IBWC) Activities

Through a Biological Opinion (BO) and memorandum of understanding (MOU) between the Service and IBWC, the IBWC agreed to provide a 33-foot wide corridor in the Rio Grande Floodway and the Off-River Floodway System. The vegetated corridor was to be adjacent to the Rio Grande or the 75-foot mowed areas and could contain segments of less-than-mature/climax vegetation not less than 3-feet in height (e.g., native grasses, sunflower, some cactus species), only if these segments were not so long as to prevent the cats from utilizing the mature/climax vegetation corridor or the larger dense brush habitat "islands". The IBWC developed a plan to insure a viable ocelot/jaguarundi travel corridor to benefit both cat species by helping to avoid genetic isolation of populations and promoting their dispersal into suitable habitat.

The significance of this corridor is further enhanced by its connectivity to other narrow vegetation corridors associated with waterways such as irrigation canals and drainage ditches. However, in places along the river, the 33-foot-wide corridor contains only sparse vegetation less than 3 feet tall. Also, in some areas, such as near and beneath the Gateway Bridge at Brownsville, the corridor is largely in private ownership, and, while the USIBWC possesses easements allowing it to mow the vegetation in the corridor, it has not acquired permission from the landowners to plant vegetation. The only area at this time where the 33-foot wide corridor has been established is on the Service's refuge lands.

It is important to note the 33-foot-wide corridor is not the sole avenue for ocelot/jaguarundi movement in the action area. In many places along the river there are much wider, moderately to densely-vegetated patches of habitat on both public and private lands which augment the nominal cat corridor. These patches provide potential home range habitat, as well as travel routes. Even where the floodway narrows there is additional good cover from the river's normal edge to the top of the adjacent river channel banks. Although IBWC mows the area within 75 feet of the river once a year, this riparian zone is covered by a nearly continuous patch of Carrizo cane, a combination of common and giant reed (*Phragmites communis* and *Arundo donax*, respectively) that regrows after mowing and fires from extensive rhizomes at a phenomenal rate, returning within weeks to the density associated with optimal ocelot habitat. Owing to its

density and resilience, as well as its remoteness from the flood levee where most of the roads, human activity, and floodlights are located, this carrizo zone an important travel corridor. An incidental take statement has been issued by the Service for one ocelot and one jaguarundi for the life of the project (20 years) in the 2003 BO prepared for the IBWC.

U.S. Border Patrol (USBP) Activities

Current and past USBP activities have affected the species habitat. Portable and permanent lighting incorrectly positioned illuminates brush vegetation and causes the species to avoid such areas. Clearing of brushland for patrol roads, drag roads, and construction of ports of entry (POEs) has resulted in fragmentation and loss of habitat. Multiple roads between the flood levee and the river further fragment the habitat. There are a number of roads traversing the Lower Rio Grande Valley NWR tracts. Brush habitat along the toe of the levee is fragmented due to USBP vehicles going down the south side of the levee toward the river and cutting through the wildlife corridor. Development around the ports of entries also resulted in loss, avoidance or fragmentation of habitat. The construction of 56 miles of border fence/wall in Cameron and Hidalgo counties has impacted private landowners, TPWD, and NWR land. The Service issued an incidental take statement for one ocelot and one jaguarundi for the life of the project (20 years) in the 2003 BO prepared for the USBP Operation Rio Grande.

U.S. Department of Agriculture Animal and Plant Health Inspection Service (APHIS) Activities

The APHIS Cattle Fever Tick Eradication Program's Tick Control Barrier in Maverick, Starr, Webb, and Zapata counties, Texas plans to enhance the eradication effort against cattle fever ticks in South Texas. The proposed action includes installation of approximately 70 miles of non-contiguous game fencing along Highway 83 from Roma, in Starr County to the beach area in Cameron County, under agreements for cost-sharing with landowners. Recurrent cattle fever tick outbreaks are increasing in locations either within the Permanent Tick Quarantine Zone or outside of the zone in the cattle fever tick-free area of South Texas. The proposed fence would also help prevent re-infestation of areas where the pest has been or is being eliminated. APHIS is currently writing a biological assessment on the project's effects to the endangered ocelot and jaguarundi and is expected to request formal consultation with the Service.

The Service also issued a BO in August 2013, for APHIS's *Biological Assessment for the U.S. Department of Agriculture, Animal and Health Inspection Service, Veterinary Services Cattle Fever Tick Eradication Program Cooperative Agreement for Surveys for Tick Vectors of Equine Piroplasmosis in Wildlife in South Texas.* APHIS will survey for the host range and geographic distribution of the tick *Amblyomma cajennense* in Texas that may serve as vectors of equine piroplasmosis. Surveys are to be conducted in Cameron County, which is in the action area. An incidental take statement was issued for one ocelot and/or jaguarundi because of potential trapping and vehicle mortality and one northern aplomado falcon from harm and harassment due to trapping and mist netting activities.

U.S. Army Corps of Engineers (USACE) Activities

USACE permits some nourishment activities that can widen beaches, change sediments and stratigraphy, alter coastal processes, plug dune gaps, and remove overwash areas. Tractor tilling

or scraping used to clean area beaches has increased and can artificially steepen beaches, destabilize dunes, and change sediment distribution patterns. This can alter the turtle nesting areas, disrupt or impact deposited nests and nesting sea turtles and cause hatchling mortality, as well as change roosting and sheltering areas used by plovers. Both nourishment and scraping activities can bury and suffocate benthic fauna consumed by shorebirds and prolong benthic recruitment or re-establishment. Artificial dune systems are constructed and maintained to protect beachfront structures. Development and excessive recreational use of beaches and flats, such as walking jogging, walking pets unleashed and operating vehicles increases potential impacts to species utilizing these habitats. Such activities could result in a loss of habitat, interference in nesting for sea turtles, disorientation of adult sea turtles and hatchlings from artificial lighting on the beach.

The Service issued a BO for the issuance of a USACE Department of the Army permit and a Service's Refuge Special Use Permit for beach maintenance activities on 6.22 miles of beach on South Padre Island and 7.48 miles of beach at Boca Chica by the Cameron County Parks and Recreation and the Cameron County Public Works Departments. Incidental take was issued for three adult Kemp's ridley sea turtles and three nests per year, including all hatchlings and/or eggs (up to approximately 200 eggs), one adult loggerhead sea turtle and 1 nest per year, including all hatchlings and/or eggs (up to approximately 200 eggs) and one adult green sea turtle and 1 nest per year, including all hatchlings and/or eggs (up to approximately 200 eggs).

Weather

Hurricanes generally produce damaging winds, storm tides and surges, and rain and can result in severe erosion of the beach and dune systems. Hurricanes and other storms can result in the direct loss of sea turtle nests, either by washing away of nests by wave action or inundation or "drowning" of the eggs or hatchlings developing within the nest or indirectly through erosion of nesting habitat. Depending on their frequency and severity, storms can affect sea turtles on either a short-term (nests lost for one season and/or temporary loss of nesting habitat) or long-term basis (habitat unable to recover).

Drought

Drought is of concern in Texas and the wildlife management community. The statewide average annual precipitation in Texas is 27.95 inches. In 2011, Texas received 11.27 inches of precipitation or about 40 percent of the normal annual precipitation. That year, 97 percent of the state was considered to be in extreme to exceptional drought and experienced substantial stream flow declines (Winters 2013). The U. S. Season Drought Outlook report (October 17, 2013 to January 31 2014) forecasts the drought will persist or intensify within the action area. Precipitation deficits and low stream flows could impact listed species within the action area through habitat alterations, loss of wetlands, and changes in water depth, salinity, and temperature.

Climate Change and Sea Level Rise

According to the Intergovernmental Panel on Climate Change Report (IPCC 2007), warming of the earth's climate is unequivocal, as is now evident from observations of increases in average

global air and ocean temperatures, widespread melting of snow and ice, and rising sea level. The IPCC Report (2007) describes changes in natural ecosystems with potential wide-spread effects on many organisms, including marine mammals, reptiles, and migratory birds. Average temperature is predicted to rise from 36°F to 41° F for North America by the end of this century (IPCC 2007). Species live within a narrow temperature range; changes in marine systems are associated with rising water temperatures, as well as related changes in ice cover, salinity, oxygen levels, and circulation (Sea Turtle Conservancy 2010). Ocean acidification resulting from massive amounts of carbon dioxide and pollutants released into the air can have adverse impacts species which use calcium carbonate to build shells and reefs such as sea turtles (Sea Turtle Conservancy 2010). Also, sea turtles exhibit temperature dependent sex determination and rapidly increasing global temperatures yield warmer incubation temperatures and highly female-biased sex ratios (Glenn and Mrosovsky 2004, Hawkes et al. 2009).

One of the most certain consequences of climate change is rising sea levels (Titus and Narayanan 1995). Montagna et al (2009) reports tide-gauge records in South Texas, including the effects of land subsidence, show relative sea level rising at a rate of 0.18 inches/year at Rockport since 1948, 0.08 inches/year at Port Mansfield since 1963, and 0.14 inches/year at South Padre Island since 1958. Rockport is approximately 200 miles north, Port Mansfield approximately 80 miles north, and South Padre Island approximately 40 miles north of the project area. Modeled projections in the IPCC (2007) report indicate that significant portions of the Texas coastline will be inundated and a major redistribution of coastal habitats is likely. After adding estimates for local land subsidence, the amount of projected relative sea-level rise by the year 2100 is 0.66 to 2.00 feet at Port Mansfield and 1.12 to 2.46 feet at South Padre Island (Montagna et al. 2009). In areas with low-lying beaches where sand depth and longshore transport of sand is a limiting factor, the sea would inundate sea turtle nesting sites and decrease available nesting habitat (Fish et al. 2005; Baker et al. 2006). The loss of habitat as a result of climate change could be accelerated due to a combination of other environmental and oceanographic changes such as an increase in the frequency of storms and/or changes in prevailing currents, both of which could lead to increased beach loss via erosion (Baker et al. 2006). On some undeveloped beaches, shoreline migration would have limited effects on the suitability of nesting habitat. Bruun (1962) stated that during a sea level rise; a typical beach profile would maintain its configuration but will be translated landward and upward. However, along developed coastlines, and especially in areas where erosion control structures have been constructed to limit shoreline movement, rising sea levels would cause severe effects. Erosion control structures can result in the permanent loss of dry nesting beach or deter nesting sea turtles from reaching suitable nesting sites (National Research Council 1990). Nesting females may deposit eggs seaward of the erosion control structures potentially subjecting them to repeated tidal inundation. The demand for both nourishment and the placement of hardened structures on the beach as management options for beach erosion are likely to increase in the future in the face of projected sea level rise and more intense storm activity associated with global climate change. Increasing storms and rising sea levels could damage or destroy sea turtle nests and nesting habitat, and temperature changes could skew sex ratios. In regard to piping plovers, increased storms and rising sea levels could damage, destroy, or otherwise alter foraging and roosting habitat.

All of these actions or factors may have adverse effects on ocelots, jaguarundis, northern aplomado falcons, sea turtles and wintering non-breeding red knots, piping plovers and plover critical habitat by destroying, diminishing, or altering the habitats on which they depend.

Effects of the Action
Under section 7(a)(2) "effects of the action" refers to the direct and indirect effects of an action on a species or critical habitat, together with the effects of other activities that are interrelated and interdependent with that action. The effects of the proposed action are added to the environmental baseline to determine the future baseline that serves as the basis for the determination in this BCO. The impacts discussed below are the Service's evaluation of the direct and indirect effects of the proposed action. Indirect effects are those caused by the proposed action that occur later in time, but are still reasonably certain to occur (50 CFR 402.02).

Interrelated and interdependent actions
Interdependent actions are defined as "actions having no independent utility apart for the proposed action," while interrelated actions are defined as "actions that are part of a larger action and depend upon the larger action for their justification" (50 CFR §402.02). The Service has determined that there are no interrelated or interdependent actions apart from the action under consideration.

Beneficial effects
Beneficial effects are those effects of the proposed action that are completely positive, without any adverse effects to the listed species or its critical habitat. The proposed action will not result in beneficial effects to the ocelot, jaguarundi, sea turtles, piping plovers or its critical habitat, northern aplomado falcons, or red knots.

Direct effects
Loss of Habitat
The proposed SpaceX vertical launch and control center areas are composed of approximately 56.5 acres of which 25.43 acres are jurisdictional wetlands and 31.07 acres are uplands. Only 20 acres of the 56.5-acre vertical launch area will be fenced and developed. The vertical launch area consists of wetlands and tidal flats that are inundated in high and spring tides, and fill from and drain to the southern portion of the site. The area also has emergent high marsh and scrub shrub. The construction of the vertical launch and control center areas will result in the direct removal of 15.74 acres of upland habitat and 3.34 acres of wetland habitat by placing fill directly into wetlands and water. In addition, construction will cut off the tidal influence, indirectly impacting 2.85 acres of wetland. The indirect impacts are comprised of 2.54 acres of high marsh vegetated wetlands and 0.31 acre of unvegetated wetland salt flats.

Approximately 4.22 acres of floodplain will be filled in Zone V10 in the vertical launch area and approximately 4.37 acres in Zone A8 in the western portion to elevate various components of the vertical launch area out of the floodplain. Construction of the control center area will impact approximately 12.4 acres in Zone A8. Typical impacts from floodplain development and filling

include increased flood levels because floodwaters have been obstructed or diverted to other areas. Stormwater discharges will also increase from new impervious surfaces.

Invasive species may be introduced by construction and operation activities of the two sites and will degrade habitat by displacing native species. Launch failures could result in the spread of debris and/or fires from explosions removing habitat. Spills of hazardous materials could occur during transportation or flood events and adversely impact soil, surface water and ground water adjacent or downgradient from the vertical launch and control centers. Emergency cleanup of debris or spills could result in removal or degradation of habitat.

Piping Plover, Piping Plover Critical Habitat and Red Knot: Unvegetated flats and depressional wetlands that occur within piping plover Critical Habitat Unit TX-1 are considered important habitat components that support foraging, roosting and sheltering piping plovers. Approximately 0.70 acre of unvegetated flats and depressional wetlands habitat occurs within the vertical launch area footprint and would be removed. Also, 0.31 acre of tidal flat would be cut off from tidal influence. Critical habitat could also be lost by stormwater runoff from impervious surfaces that would cause vegetation to grow within the wind-tidal flats or reduce available piping plover food and roosting habitat. Critical Habitat Unit TX-2 is also within the action area; however, no direct loss of habitat will occur as no construction is planned in this unit.

Ocelot and Jaguarundi: Ocelots and jaguarundi have been documented crossing areas of less than optimal habitat. The loss of 31.07 acres of upland habitat will be removed for the cats to travel through the area and fragment areas that could be acquired for the north-south travel corridor.

Aplomado falcon: The control center area and the vertical launch area are not suitable coastal prairie habitat but, falcons have been seen flying through these areas while foraging in nearby upland coastal prairie habitat. Other areas within the action area that may be suitable for reintroductions and/or establishment of nest boxes for recovery will be eliminated.

The Spill Prevention, Control and Countermeasure Plan (SPCCP), Hazardous Material Management Program (HMMP) and conservation measures to avoid and minimize erosion and sedimentation and to control the spread of invasive species will be implemented to help reduce potential adverse impacts.

Human Disturbance

Boca Chica beach is currently used by the public for recreational activities. The project will increase disturbance from human presence from pre-, during, post-construction and operational activities and the species may be displaced causing them to expend additional energy. The disturbance may occur through interruption of normal behavior via flushing. The disturbance is likely to be temporary and once the disturbance is removed normal behavior should resume.

Ocelot and Jaguarundi: Although not documented for the ocelot and jaguarundi, several responses to human disturbance can be expected in felines. For example, Florida panthers

shifted their habitat use area in response to hunters although no changes related to energy intakes (activity rates, movement rates or predation success) were noted (Janis and Clark 2002). In another study, lynxes were found to have a median tolerance limit to approaching humans of 164 feet and they tolerated a closer approach by humans when in denser habitats than in more open areas (Sunde et al 1998 as cited by Tempel et al 2006). In general, typical wildlife responses to human disturbance may be fleeing, increased vigilance, and changes in habitat selection (Frid and Dill 2002).

Northern Aplomado Falcon: Human presence and disturbance could also displace adult aplomado falcons from preferred nesting habitats. Disturbance during nesting may cause the adult to leave the nest, exposing eggs or small young to inclement weather or predators Disturbance may also reduce foraging efficiency and feeding time. Lighting and water towers could attract raptors or other migratory birds to the vertical launch area for perching. Nest building and perching will be discouraged by the use of visual fright devices and monopole technology. Human disturbance or noise from pre-launch operations would likely cause them to take flight prior to launch.

Piping Plovers and Red Knots: Zonick and Ryan (1996) found that in Texas, human disturbance decreases the amount of undisturbed habitat and appears to limit local piping plover abundance. Piping plovers and red knots will likely be flushed from the area expending energy and interrupting foraging or roosting. This is expected to be a temporary disturbance.

Sea Turtles: Sea turtles reaching nesting beaches may return to the water, "false crawl", and not lay eggs due to human or pet disturbance. Hatchlings could get disoriented, dehydrated or incur possible injury. Species which prey on sea turtle nests or young turtles, such as coyotes (*Canis latrans*), raccoons (*Procyon lotor*), skunks (*Mephitis mephitis)* and fire ants *(Solenopsis invicta),* may be attracted to the area by the garbage and may increase in number as a result of the increased food resources provided by the garbage.

Noise

Presently noise levels in the vertical launch and control center areas are around 43 dBA which represents a quiet suburban and rural setting. Construction activities that would increase noise levels include construction equipment operating at the sites and construction/delivery vehicles traveling to and from the sites and the use of an impact pile driver. Construction activities could create noise levels that range from 73 to 101 dBA (L_{max}) at 50 feet from the activities. Pile driving could result in 101 dBA at a distance of 50 feet from the pile (DOT). The human limit under the Occupational Safety and Health Administration (OSHA) guidelines is 115 dBA. In addition, generators are expected to be used as emergency power and supplemental power during the final stages of the launch schedule. It is anticipated that the generators could be used continuously for the final 48-hours prior to launch.

Ignition of rockets or static tests will create instantaneous noise. A Falcon 9 rocket launched from the launch pad will produce a noise level of 130 dBA at 0.2 mile, attenuating to 105 dBA at approximately 4 miles and 89 dBA at 20 miles. Noise levels from the Falcon Heavy would reach

135 dBA at 0.2 mile attenuating to 105 dBA at 6 miles and 94 dB at 20 miles. Up to a maximum of 12 launch operations are planned per year, including mission rehearsals and static tests. Noise levels are expected to last for 30 to 60 seconds during a launch and static test.

The primary impact associated with vehicle launches and noise is the startle effect. Noise can cause stress in animals and the range of autonomic responses to noise could range from no reaction to alerting, disruption of feeding and/or breeding and flight. The responses are also hard to predict because disturbance may depend on species, frequency, duration and intensity of noise. For the proposed project, the most severe noise likely to be encountered by species that occur within the action area is that from launches and associated activities, construction, pile driving and motor vehicles.

Piping Plovers and Red Knot: Birds demonstrate startle effects exposed to a sound pressure level (SPL) of 108 dBA (Burger 1981). Noise levels exceeding that level will occur a maximum of 12 times a year (launches and static test) within 3-6 miles of the launch pad. High-noise events may cause birds to engage in escape or avoidance behavior and may flush and expend energy that may affect survival or growth, or spend less time engaged in necessary activities like feeding and preening (NoiseQuest 2013). Monitoring of snowy plovers at Vandenberg Air Force Base showed them to crouch and observe objects such as helicopters or launch vehicles that mimic avian predators, or flush at launch but soon return to normal behavior (FAA 2013). Piping plovers are expected to have a startle response that interferes with normal behaviors such as feeding or roosting. Laboratory findings show that if a bird is exposed to continuous noise level above 110 dBA SPL, hearing will likely be damaged (Dooling and Popper 2007). However, highway noise above 93 dBA SPL might mask important communication signals used by birds, and possibly lead to behavioral or physiological effects (Dooling and Popper 2007). Piping plovers in Critical Habitat Unit TX-2 will not be directly affected by construction, but may be impacted by noise generated by a launch of the Falcon Heavy. However, a maximum of two Falcon Heavy launches are proposed in a 12-month period and may result in minimal temporary impacts from startle effects.

Northern Aplomado Falcon: The falcon does nest within the action area. The closest known active nest is within 5 miles of the site and would experience approximately 105 dB noise level. Although, the sound level at 105 dBA is half that at 108 dBA that demonstrates a startle effect, it is possible that both chicks and adults would have a similar reaction. Ellis et al (1991) looked at effects of low-level military jet aircraft and mid-to high-altitude sonic booms on nesting peregrine falcons. The peregrine falcons demonstrated crouching, or rare flushing from the perch or nest. Incubating or brooding adults never burst from the nest. Jet passes and sonic booms often caused noticeable alarm. Adult aplomado falcons could flush from the nest leaving chicks exposed to predators. They could also experience reduced communication ranges, interference with predator/prey detection, or habitat avoidance in the action area. More intense impacts may include behavioral change, disorientation, or hearing loss if within closer range of the launch pad at the time of ignition of rockets. Ellis et al (1991) also noticed negative responses became rarer and potentially became habituated to the noises or types of noises that will occur and stop exhibiting the startle response.

Ocelots and Jaguarundi: There are no known studies that specifically address the effects of noise on ocelots or jaguarundis, in fact, information about the effect of noise on felines is lacking. Studies of terrestrial mammals have shown that noise levels of 120 dBA can damage mammal's ears. Levels at 95 dBA can cause temporary loss of hearing sensitivity. Noise from aircraft has affected other large carnivores by causing changes in home ranges, foraging patterns, and breeding behavior (NoiseQuest 2013). Wolves were frightened by low-altitude flight that were 25 to 1,000 feet of the ground but were found to adapt later (Dufour 1980). A negative effect of running and avoidance behavior is increased energy use. The cats use the lomas scattered throughout the action area to cross expansive tidal flats. It is reasonable to assume that the cats could display a range of responses to noise; they could have no reaction, become alert, stop foraging, alter travel routes, or become startled and flee the area, potentially exposing them to vehicular mortality.

Sea Turtles: Noise may cause sea turtles reaching nesting beaches to startle and return to the water, "false crawl", and not lay eggs. The National Aviation Service conducted a study in 1990, on the impacts of the Zakynthos, Greece airport on nesting sea turtles. It revealed the disturbance of the low flying jets over loggerhead sea turtle nesting beaches caused females to return to the sea without successful laying (Euroturtle 2013). Given the distance between the launch pads and potential sea turtle nesting habitat is approximately 0.18 mile; noise levels at the nesting beach could reach 130 to 135 dB and could have an effect on sea turtles.

Vibration

Some energy from rocket launches and static test will manifest as vibration in the ground near the launch pad. Vibration may be significant from rocket launches and engine tests. Effects from vibrations are likely to be confined to additive disturbance to species in that they may cease normal behaviors. Noise that induces structural vibration damage to 1 in 100 buildings or structures within areas exposed to unweighted nose levels of 119 dB or greater, which occurs 3.4 miles from the vertical launch area for the Falcon 9 and 6 miles for the Falcon Heavy (FAA 2013). The closest house is 1.8 miles; therefore, one could assume that vibration could be felt at Boca Chica beach, approximately 800 to 900 feet, from the launch pad.

Ocelot, Jaguarundi, Northern Aplomado Falcon, Piping Plover and Red Knot: Ground vibrations could result from a launch or static test, pile driving, or vehicular motion during construction and operations. Species reactions could vary depending on their proximity to the launch site or construction/operation activities. These species may experience some startle effect and/or habitat avoidance. Impacts should be short term and normal behavior would resume minutes afterwards.

Sea Turtles: Vibrations caused by moving maintenance vehicles and/or equipment, launches, and pile driving near the beach could frighten nesting turtles, causing them to false crawl (NMFS and Service 1991a, 1991b, 1992; Ernest et al. 1998). Vibrations could also harm incubating eggs, but this is difficult to assess because scientific data are lacking to fully understand the level of impact on sea turtles from traffic vibrations or noise. The closest nesting sea turtle habitat to the

proposed launch pad is approximately 800-900 feet, and as shown above vibration appears it could be felt up to 3.4 miles from the launch area therefore, vibration caused from rocket launches could cause nesting turtles to abandon their nesting attempt and potentially harm incubating eggs.

Vehicle Collisions

Vehicles associated with construction will be ongoing daily for 24 months, including several weeks of night construction. Security patrols and transportation of rockets, equipment and fuels will be ongoing for the life of the project. Construction will increase traffic by approximately 107 vehicles per day from 190 vehicles currently traveling within the Lower Rio Grande Valley NWR corridor and 95 currently traveling within the corridor providing access to Boca Chica Beach and the vertical launch area.

Ocelot and Jaguarundi: Data indicates that vehicular collisions are a significant source of ocelot mortality, with 44 percent (12 of 27) of known ocelot mortalities from 1982 to 1996 likely being vehicle related (Hewitt et al. 1998) and 45 percent of the total ocelot mortality documented in South Texas between 1983 and 2002 likely being vehicle related (Haines et al. 2005). Peak ocelot activity is around sunset and sunrise with continued activity during the night hours. Ocelots have been seen to cross paved linear structures such as roads and have been documented on SH4 and will be subject to increased road mortality due to the increase in traffic. The posting of wildlife crossing signs by TxDOT is likely to reduce speeds of oncoming motorists, thereby reducing the potential for a cat to be struck.

Sea Turtles: Operation of security vehicles on the beach can crush nesting turtles, stranded turtles, hatchlings, and eggs (Mann 1977; NMFS and Service 1991a, 1991b, 1992, 1993; Ernest et al. 1998). Adult loggerhead and green sea turtles nest at night and most female Kemp's ridley nest during daylight hours and may be caught in the morning hours on the beach at some stage of nesting: oviposition, covering the nest, or exiting and returning to the ocean. Hatchlings may also emerge at night or early in the morning from any nests missed by the daily sea turtle patrols. Post hatchlings are commonly stranded in sargassum washed in by late summer and fall storm events (these post-hatchlings are often referred to as washbacks) (Carr and Meylan 1980). Post-hatchling washbacks are often found dead or in a weakened state; however, efforts are made to revive or maintain live post hatchlings for subsequent release when ocean conditions are calmer. Because of the size and increase in vehicular traffic from recreational use and security sweep activities in some areas, live post hatchlings on the beach during the day are vulnerable to being run over.

Vehicle collisions with sea turtle hatchlings during the daytime have been recorded. Beach visitors found *in situ* nest hatching on Boca Chica Beach and attempted to provide safe passage but some hatchlings were killed by passing vehicles (Pers. Comm., D. Shaver, PAIS 2006). There was also a report of a stranded turtle being hit by a vehicle on South Padre Island (Pers. Comm., D. Shaver, NPS 2007).

Piping Plovers and Red Knot: Driving is allowed in many areas of the wintering grounds from the mean low tide line to the line of vegetation on the shore. Increased vehicular access due to recreation or security patrols may increase ruts or berms. Vehicles driving on the beach could potentially cause injury to plovers that may be resting in ruts, or next to a berm, especially during inclement weather, and/or expose critical habitat to further erosion and removal of organic matter and food sources. Direct mortality from construction equipment may occur if plovers and red knots do not disperse prior to equipment or vehicular use.

Northern Aplomado Falcon: Air and vehicular travel kills approximately 2 million birds each year (IMBD 2000). Although possible, there has not been any documented vehicular mortality of the northern aplomado falcon within the action area. Increased traffic from construction activities may displace foraging aplomado falcons.

Educating construction and SpaceX employees on the potential of vehicle collisions and reduced speeds along SH4 will help minimize impacts.

Lighting

Lighting emissions are light sources that illuminate an area in the surrounding environment. Sources of light emissions include launch site lighting, employee/customer parking lighting, airborne and ground-based aircraft operations and roadway lighting. Glare is light emission being redirected off of a reflective surface such as windows glass in facility. There are no state or local regulations that govern visual resources and light emissions in Texas.

Sea Turtles: Anthropogenic light sources have had documented negative effects on sea turtles. Adult females looking for nesting beaches seek dark stretches of suitable shoreline. Unshielded lights can deter females from crawling onto a beach to nest. At hatching, juveniles emerge and seek the nearest available light source, which on an undeveloped beach is the horizon over the ocean. Lights shining in the vicinity of the nest can disorient emerging hatchlings, leading them away from the ocean and leaving them more vulnerable to predation, desiccation, or crushing by vehicles. Hatchlings that have reached the surf can also become disoriented by lighting, and have been documented to leave the surf (NMFS and Service 2007a). Some of these behavioral effects on adult turtle and disorientation of young turtles are expected to occur.

Some structures within the launch complex, use amber LEDs or low pressure sodium bulbs for exterior night lighting. Most of these facilities are not located immediately adjacent to the beach, which limits the potential effects on listed species However they do contribute to elevated levels of ambient light and are some of the only lights on barrier islands within the action area. Such night lighting can negatively impact nesting sea turtles.

Implementing the Lighting Management Plan and doing regular inspections will help reduce the effects these lights have on turtles, but some adverse effects to sea turtles, either in the form of hatchling disorientations or reducing the likelihood of nesting may occur when launches occur within sea turtle nesting season.

Ocelot and Jaguarund: Thee species may avoid lit areas and seek other north-south travel corridors through the lomas expending energy and increasing the potential for vehicular mortality.

Northern Aplomado Falcon, Piping Plover and Red Knot: Some birds may be attracted to light, especially during overcast nights, causing them to be disoriented and collide with buildings or other structures (FAA 2013). To minimize collisions with the four lightning towers and the water tower these structures will be lit in accordance with the Federal Communications Commission's (FCC) communication tower siting, construction, operation and decommission guidelines.

Lighting effects are reduced by complying with lighting policy for minimizing disorienting effects on migratory birds and the Light Management Plan, along with surveys, and raptor protection measures for utility upgrades and designated FCR.

Reduced Dispersal, Fragmentation and Isolation

Most biologists agree that habitat fragmentation is a major cause of reduced biodiversity (Noss et al 2001). Habitat fragmentation is the separation of a landscape into various land uses (development, agriculture, etc...) resulting in numerous small disjointed habitat patches left for use by wildlife.

Ocelot, Jaguarundi: The vertical launch and control center areas are located within the Rio Grande Valley Wildlife Corridor which comprises a north-south coastal corridor on the eastern boundary of the Rio Grande delta that supports rangeland, wetland, and uplands that may be suitable ocelot and jaguarundi movement. Fragmentation eliminates areas needed for breeding, feeding, and sheltering for species like the ocelot and jaguarundi that require large, unbroken blocks of habitat. Fragmentation can also isolate cats from travel corridors and reduce dispersal for breeding. In a small population, such as the ocelot and jaguarundi in South Texas, inbreeding can reduce fitness of individuals and loss of genetic variability can reduce the ability of an animal to adapt to a changing environment (Lande 1988). Dispersal of cats may be temporarily impacted by proposed actions if the disturbance is such that the cats would return to Mexico and attempt to return at a later time to seek a new corridor. It is also possible cats may not return to the U.S. and potentially reduce the opportunities to increase or improve the genetic viability in Texas populations. The project may preclude north-south movement.

Educating construction employees and contractors will help reduce speeds, avoid unauthorized disturbance of habitat and illegal dumping in the lomas and other important habitat during construction.

Northern Aplomado Falcon, Piping Plover, Red Knot: Additionally, the small habitat patches resulting from fragmentation often do not provide the food and cover resources for many species. This can result in an increased risk of death by predation if the animal has to venture beyond the cover of the patch to find new food resources, or starvation.

Sea Turtles: Lighting, vehicular collisions and or beach impacts will potentially cause adult females to false crawl or hatchlings may become disoriented, trapped in ruts, or be run over and reduce nesting success and dispersal.

Indirect effects
Indirect effects are those effects that are caused by or will result from the proposed action and are later in time, but are still reasonably certain to occur.

Habitat Conversion
Emissions from the SpaceX Merlin 1D engine has been characterized as comprising CO_2, CO, water vapor, nitrogen oxide (NO_x), and carbon particulates. Most CO emitted by the liquid fuel engines is oxidized to CO_2 during afterburning in the exhaust plume. The exhaust cloud (Figure 17) that would form near the launch pad at lift-off as result of the exhaust plume and evaporation and subsequent condensation of deluge water may impact surface waters, tidal flats and vegetation (FAA 2013). Water vapor could reach unvegetated areas. SpaceX states that at the launch site, the deluge water system would generate a vapor cloud that would travel approximately 600 feet from the launch pad toward the east in the direction of the flame duct exit. Low wind conditions, required for a launch, may disperse the vapor cloud approximately 200 feet to the northwest under prevailing southeast winds (Pers. Comm. S. Davis, SpaceX 2013). Portions of the deluge water would also be entrained in the exhaust and would follow that exhaust cloud over the Gulf of Mexico. Schmalzewr et al (1998) monitored the effects of Delta, Atlas, and Titan launches from Cape Canaveral Air Station. The principal effluences from solid rocket motors were hydrogen chloride, aluminum oxide, water, hydrogen, carbon monoxide and carbon dioxide. The exhaust plume mixed with the deluge water created a launch ground cloud. The fall out or rain out from this cloud produced localized effects from acid or particular deposition causing damage to plants and animals exposed to it. Because the Falcon 9 and Falcon Heavy launch vehicles use only LOX and RP-1 propellants, SpaceX states the exhaust cloud would consist of steam only and would not contain any hazardous materials. However, the water in the ground cloud could lead to vegetation changes as seen in various shuttle launches. Changes included loss of sensitive species, loss of plant community structure, reduction in total cover and replacement of some native species with weed species. The heat and moisture from the exhaust cloud, which will extend beyond the fence line, may cause these same alterations to the plant community, cause wind-tidal flats to vegetate, as well as impact surface-dwelling invertebrates.

Piping Plover, Piping Plover Critical Habitat and Red Knot: Using estimates SpaceX provided it is possible, depending on wind conditions that approximately an additional 8.66 acres of piping plover critical habitat in TX-1 may potentially be lost through conversion into vegetated wetlands (Figure 15).

Ocelot and Jaguarundi: Lomas used by the cats to transient through the area may experience loss of vegetation or conversion to non-native species.

Northern Aplomado Falcon: Coastal prairie grasslands could experience changes in species composition or abundance; including increased woody species thereby, reducing the foraging habitat for the falcon.

A monitoring plan to document any vegetation changes and implementation of appropriate corrective actions will help reduce impacts to habitat.

Monitoring

While the intent of conducting frequent surveys, implementing area closures and posting signage, and similar actions is to reduce or avoid impacts to listed species by detecting them early, these activities in themselves, because they result in increased human activity within the beach habitats, result in some adverse effects to listed species. Plovers being monitored are generally disturbed to some degree during monitoring and during efforts to locate sea turtle nests and this disturbance, while limited may increase the likelihood of nest predation. Observers may also inadvertently crush sea turtle nests or plovers while accessing areas to conduct monitoring or management.

Cumulative Impacts

Cumulative impacts include the effects of future State, local, or private actions that are reasonably certain to occur in the action area considered in this BCO. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. Past and present federal actions in the vicinity of the proposed action are discussed under the Environmental Baseline section. Currently, no active oil and gas leases occur on or adjacent to proposed launch control sites but there are two oil and gas leases two miles offshore. There are no existing wind farms in the vicinity of the vertical launch site; however Baryonyx has two leases off the gulf coast in the vicinity of the Rio Grande Valley. The South Padre Island Second Access, the Rio Grande Wind farm Project-Baryonxy Corporation the Palmito Ranch Battlefield Viewing Platform, and the Port of Brownsville Liquefied Natural Gas (LNG) Facility are not discussed because they are federal actions and will require separate consultation.

The proposed rail line from Port of Brownsville to Brownsville/South Padre Island International Airport is being assessed for viability. No environmental documentation has been prepared but land use will convert to transportation ROW and potentially result in future increase in development within the action area. STARGATE is a project the University of Texas-Brownsville (UTB) Center for Advance Radio Astronomy has proposed. It involves construction of a radio frequency technology facility that would provide students access to satellite and spacecraft tracking equipment. The facility is expected to be located in the vicinity of the SpaceX control center area, although UTB has not yet acquired land for the facility. Funding is being proposed and explored and in discussions with SpaceX over potential Memorandum of Understanding. The project could result in cumulative impacts to visual resources and light emission.

Oil and gas development in the Rio Grande Valley and the rapid economic expansion of the large

metropolitan areas, Harlingen, Brownsville, and Matamoros, with the continuing influx of immigrants, retirees, and increased tourism will likely continue to result in the loss of brushlands, and coastal grasslands. As remaining small islands of suitable habitat and the corridor to connect them are developed and brush encroachment reduces plant diversity for prey species, ocelots, jaguarundis, and aplomados recovery alternatives are limited. Road expansions to accommodate the Rio Grande Valley development and road network, and border crossings will likely increase loss and fragmentation of habitat corridors and increased road mortality for the cats. Encroachment from urban development and colonias that bring increased noise, light, fencing, and human disturbance will also likely result in the loss of habitat and avoidance of areas or corridors by the endangered ocelot, jaguarundi, northern aplomado falcon in the wild, piping plover, red knot and sea turtles across their listed range.

The Service is continually working with private and state entities to review proposed projects, offer technical assistance and provide recommendations on avoidance/minimization measures and reintroduction and restoration measures to protect the listed species in this BO, and their habitats. By continued cooperative efforts to replace, secure, and improve such habitats and connect optimal habitat that exists on NWR and private lands, the Service does not believe that the cumulative effects are likely to jeopardize the continued existence of the ocelot, jaguarundi, northern aplomado falcon, piping plover, red knot, and nesting sea turtles.

IV. Conclusion

After reviewing the current status of the ocelot, jaguarundi, northern aplomado falcon, piping plover, and five species of sea turtles, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the project, as proposed is not likely to jeopardize the continued existence of the listed species. It is also the Service's biological opinion that the project as proposed is not likely to significantly destroy or adversely modify piping plover critical habitat.

After reviewing the current status of the red knot, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the Service's opinion that the action as proposed, is not likely to jeopardize the continued existence of the proposed red knot.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered or threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity.

Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to, and not intended as part of the agency action is not considered to be prohibited taking under the Act, provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and must be undertaken by the FAA so that they become binding conditions of the project in order for the exemption in section 7(o)(2) to apply. The FAA has a continuing duty to regulate the activity covered by this incidental take statement. If the FAA (1) fails to assume and implement the terms and conditions or (2) fails to require any agent acting on behalf of FAA to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to any contracting document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the FAA must report the progress of the action and its impacts on the species to the Service as specified in the incidental take statement (50 CFR 402.14(i)(3)).

Amount or Extent of Take Anticipated

The Service anticipates incidental take of an ocelot and jaguarundi in the form of harm and harassment will be difficult to detect because 1) the species is wide-ranging, 2) elusive, 3) nocturnal, and 4) finding a dead or impaired specimen that has resulted from impaired essential behavioral patterns like breeding, feeding or sheltering is unlikely. The take of an ocelot or jaguarundi, however, can be reasonably anticipated by increased risk of injury by road mortality, and/or by prevented dispersal of cats into otherwise suitable habitat. Therefore, the Service anticipates:

1) 2 endangered cats (ocelots and/or jaguarundi) would be taken in the form of harm and harassment, due to the construction and operations and/or injury or mortality due to a vehicular collision, noise and human disturbance within the project area for the life of the project.

2) Sea turtle nesting habitat along 7.53 miles of beachfront will be disturbed by vehicular traffic associated with security activities; however, incidental take of sea turtles will be difficult to detect for the following reasons:
   - the loggerhead, green, leatherback and hawksbill turtles nest primarily at night and although the Kemp's ridley primarily nest during the day, some have been known to nest at night
   - all nests are not located because a) natural factors, such as rainfall, wind, and tides may obscure crawls; and b) human-caused factors, such as pedestrian and vehicular traffic, may obscure crawls, and result in nests being destroyed because they were missed during a nesting survey and egg relocation program;
   - the total number of hatchlings per undiscovered nest is unknown;
   - the reduction in percent hatching and emerging success per relocated nest over the natural nest site is unknown; and
   - an unknown number of females may avoid the project beach and be forced to nest in a less than optimal area.

However, take of these species can be anticipated because:

- sea turtles nest within the beach portion of the action area;
- project security patrols and monitoring will likely occur along the beach area during a portion of the nesting season.

Take is expected to be in the form of harassment, injury, and/or death from:

- destruction of all nests that may be constructed and eggs that may be deposited from March 15 through October 1 and missed by a nest survey and egg relocation program within the boundaries of the beach portion of the action area;
- injury or death from vehicles and/or equipment driving over an adult sea turtle, hatchling, stranded or post-hatchling washback, sea turtles from an undetected, unmarked/unprotected sea turtle nest, and
- harassment in the form of disturbing or interfering with female turtles attempting to nest during security patrols or monitoring; behavior modification of nesting females resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs.

As stated previously, approximately 91 sea turtle nests have been recorded along South Padre Island and Boca Chica beaches to the Rio Grande. The Service anticipates the proposed project could potentially "take" a maximum of 91 nesting sea turtles prior to any avoidance and minimization measures being implemented. Implementation of avoidance and minimization measures further reduces the estimated number of sea turtles that could be taken. The Kemp's ridley is the most frequently documented sea turtle occurring in the action area and the loggerhead is a very infrequent second. Thus, the potential for FAA/SpaceX related activities interacting with Kemp's ridley adults, hatchlings or eggs would be greater, thus the number of Kemp's ridley adults, hatchlings and eggs at risk of "take" would also be greater.

Therefore, the Service anticipates that despite avoidance and minimization measures implemented through the term of this BCO (2025) a risk still exists, although minimal, that adult sea turtles could be struck by vehicles and nests could go undetected by the egg relocation program surveys within the proposed action area and:

- 3 adult Kemp's ridley sea turtles and 3 nests per year, including all hatchlings and/or eggs (up to approximately 200 eggs) could be taken.

- 1 adult loggerhead sea turtle and 1 nest per year, including all hatchlings and/or eggs (up to approximately 200 eggs) could be taken.

- 1 adult green sea turtle and 1 nest per year, including all hatchlings and/or eggs (up to approximately 200 eggs) could be taken.

- 1 adult leatherback sea turtle and 1 nest per year, including all hatchlings and/or eggs (up to approximately 200 eggs) could be taken.

- 1 adult hawksbill sea turtle and 1 nest per year, including all hatchlings and/or eggs (up to approximately 200 eggs) could be taken.

If the agreed upon avoidance and minimization measures are to be deviated from or if the level of take is reached for any one of the species, FAA and SpaceX must contact the Service's Coastal Ecological Services Field Office immediately to review the circumstances and revisit the take analysis. Although incidental take is anticipated for three Kemp's ridley nests per year, if one nest is taken the Service also would appreciate the opportunity to review the circumstances and the avoidance and minimization measures.

3) 1 northern aplomado falcon to be taken by harm or harassment due to noise and human disturbance through the term of this BCO (2025).

4) Incidental take of piping plovers will be difficult to detect for the following reasons: a) harassment to the level of harm may only be apparent on the breeding grounds the following year; and b) dead plovers may be carried away by waves or predators. The level of take of this species can be anticipated by the proposed activities because: a) piping plovers migrate to and winter in the action area; b) increased levels of construction and operational disturbance is expected. Take is expected in the form of harm and harassment due to decreased fitness and survivorship of wintering plovers due to loss and degradation of foraging and roosting habitat and decreased fitness and survivorship of plovers attempting to migrate to breeding grounds due to loss and degradation of foraging and roosting habitat. Therefore, the Service anticipates direct and indirect take of an unspecified number of piping plovers.

5) The direct and indirect loss of 6.18 acres from construction and the conversion of 8.66 acres of occupied piping plover critical habitat in Critical Habitat Unit TX-1, for a total take of 14.84 acres of piping plover critical habitat.

Effect of Take

Ocelot, Jaguarundi, Northern Apolmado Falcon, Piping Plover, Sea Turtles

In the accompanying biological and conference opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to these species. The action area encompasses a relatively small portion of the rangewide habitat of each of the species addressed in this opinion and small portion of each species' population and altered a minimal amount of critical habitat. The proposed action includes a variety of protective measures that are intended to minimize incidental take and alteration of critical habitat. For these reasons, the effect of the take anticipated in this BCO is not expected to significantly affect the species considered.

Red Knot

After reviewing the current status of the red knot, the environmental baseline for the action area the effects of the proposed issuance of a launch permit and the cumulative effects, it is the Service's Conference Opinion that the project, as proposed, is not likely to jeopardize the

continued existence of the proposed red knot. Critical habitat has not been proposed for this species.

Migratory Birds
The Service will not refer the incidental take of any migratory bird or bald eagle for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 USC 703-712), or the Bald and Golden Eagle Protection Act of 1940, as amended (16 USC 668-668d), if such take is in compliance with the terms and conditions specified herein.

REASONABLE AND PRUDENT MEASURES
As part of the project description, the FAA/SpaceX has agreed on voluntarily measures to avoid and minimize impacts to the ocelot, jaguarundi, falcon, piping plover, red knot and sea turtles. The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize the impact of incidental take on these species and assist the Service in improving methods to minimize impacts of incidental take.

1. Coordinate efforts with the Service's ocelot/jaguarundi lead biologist to protect and preserve ocelot and jaguarundi habitat.
2. Establish a protocol to notify the Service of direct take of an ocelot, jaguarundi, or falcon.
3. Coordinate efforts to increase northern aplomado nest sites.
4. Coordinate efforts with refuge staff to reduce impacts to refuge lands.
5. Submit a detailed Security Plan.
6. Submit a detailed Sea Turtle Monitoring Plan.
7. Submit a detailed Bird Monitoring Plan.
8. Submit a detailed Vegetation Monitoring Plan.
9. Submit a detailed Stormwater Monitoring Plan.
10. Submit a detailed Light Monitoring Plan.
11. Reduce noise related to generator use during construction or operation.
12. Reduce impacts to piping plover habitat during security patrols.
13. Submit annual reports to the Service.
14. Coordinate decommissioning of the site with the Service.

The prohibitions against taking the red knot found in section 9 of the Act do not apply until the species is listed. However, the Service advises the FAA/SpaceX to consider implementing the following reasonable and prudent measures. If this conference opinion is adopted as a biological opinion following a listing or designation, these measures, with their implementing terms and conditions, will be nondiscretionary.

Terms and Conditions
In order to be exempt from the prohibitions of section 9 of the Act, the FAA/SpaceX must comply with the following terms and conditions, which implement the reasonable and prudent measures, described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. In coordination with the ocelot/jaguarundi biologist, FAA/SpaceX will identify reasonable measures to protect and/or preserve suitable habitat within the Rio Grande Wildlife Corridor.

2. In the event that activities result in the direct take (killing, harming, or maiming) of an ocelot, jaguarundi, aplomado falcon, piping plover, red knot, and/or nesting sea turtles, the person(s) responsible for monitoring shall notify the Service at (361) 994-9005 immediately. A standard methodology for handling dead or injured species found during the project is to be established in coordination with the Service. This methodology shall be directed at determining the cause of death and ensuring that all data is recorded. The finder should ensure that the specimen and related evidence is not disturbed.

3. In coordination with private organizations (e.g., The Peregrine Fund) or state and federal agencies, assist efforts to increase releases (i.e., hack sites) or nest boxes in suitable northern aplomado falcon habitat.

4. In coordination with refuge staff, identify further options that would assist in protecting refuge lands and species habitats from impacts that may result from the public intrusions prior to closures. For example, vehicle barriers, in the form of short, spaced posts, sufficiently close together to prevent a truck or ATV from entering, but wide enough apart to allow for terrestrial animals to pass. This could be done alongside SH4 or other identified roads where the footprint is already disturbed.

5. A detailed Security Plan is to be developed to fully describe agreements and plans with local authorities whose support is needed to ensure public safety during launch procedures, locations of checkpoints and roadblocks, who will secure those areas, exact type of unmanned and manned aerial and ground vehicles to be used to perform sweeps and if necessary in the future, a location on private land for public viewing.

6. Because FAA/SpaceX will perform security sweeps on a 7.53-mile stretch of beach prior to launches during the sea turtle season (March 15 to October 1) a detailed Sea Turtle Monitoring plan is to be developed. The Service approved plan will describe how the surveys will be done, when it will be done and by whom.

7. Develop a bird monitoring plan for pre, during and post construction. Plan should include the piping plover, red knot, and northern aplomado falcon, and describe how where, how, when and who will be performing the surveys. It should also provide similar information for surveys to be performed during launch operations.

8. Develop a vegetation plan to monitor changes in piping plover critical habitat adjacent to the vertical launch area. Figure 15 depicts the 8.66 acres of piping plover critical habitat that will be impacted by the water vapor ground cloud extending a maximum distance of 600 feet beyond the fenceline. Take has been issued for the loss of this habitat. An additional 1000 foot radius encompasses an additional 23.51 acres that may be subject to

additional changes but the Service has not issued take for (Figure 16). The detailed vegetation plan should outline how the 23.51 acres will be monitored and action to be taken if changes begin to occur.

9. To protect surrounding sensitive habitat and waterways, FAA/SpaceX should develop a detailed Stormwater monitoring plan that is coordinated with the Service, EPA and TCEQ to ensure compliance with protective surface water and sediment criteria (i.e. TRRP 24 Residential Surface Water and Sediment PCL and EPA Water Quality Criteria for surface water and sediment). The plan should include sampling contingencies for normal site operations, spills or emergency releases due to impending tropical storms or other events. The plan should be scalable, allowing for annual review by FAA/SpaceX, the Service, EPA and TCEQ. The initial plan should conduct sampling monthly for the first year to establish a baseline. At the end to the first year, sampling would be conducted in conjunction with major site activities (i.e. vehicle launch) where a discharge may occur or at a frequency determined by the concerned agencies and FAA/SpaceX. Sampling for emergency release or spill events would be conducted as needed and independent of established or routine monitoring. FAA/SpaceX should consult with the TCEQ and EPA on specific ecological sediment, storm and surface water criteria. Since the surrounding area is adjacent to NWR lands and has endangered species habitat, residential/ecological standards should be used to determine protective thresholds and sampling protocols for both water and sediment samples. At no time should industrial standards be applied to offsite discharges in ecologically sensitive areas. Sampling of both sediment and surface water is to beginning immediately upon discovery of a release of 0.1 gallons or more of any substance classified as a Resource Conservation and Recovery Act (RCRA) hazardous waste or when 25 gallons or more of a substance not meeting the classification of a RCRA hazardous waste. For development of this plan and discussion RCRA hazardous waste includes those substance defined as characteristically hazardous as specified in 40 CFR Part 261 Subpart C. All emergency or spill response samples are to be collected immediately upon discovery and that analysis would be conducted after the event. All samples should be conveyed to an appropriate laboratory for analysis within the samples specified holding time and with all appropriate preservation and chains of custody.

10. To minimize impacts to nesting sea turtle from lighting impacts submit a detailed Light Monitoring Plan that describes how FAA/SpaceX will ensure lighting is not occurring on the beach. The plan should describe how a census of number, type, and locations of lights visible from the beach. Lighting inspections should occur on the beach in front of the vertical launch area. A set of daytime and nighttime lighting inspections should be done before nesting before the nesting season and three to seven additional nighttime inspections during the nesting-hatching season are recommended.

11. The Draft Closure Plan and all monitoring plans are to be submitted to the Service for review 60 days after issuance of the Final BO. The final plans will be submitted to the Service within 30 days after receipt of Service review comments on the draft plans, and

any further coordination between the Service and FAA/SpaceX regarding the plans and their implementation. If additional time is needed please coordinate with the Service.

12. To reduce noise impacts from generators that may be used during construction or operations all generators are to be in baffle boxes (a sound-resistant box that is placed over or around a generator), have an attached muffler, or use other noise-abatement methods in accordance with industry standards.

13. To reduce impacts to piping plovers and red knots security patrol vehicles or other necessary equipment on the beach will be driven above the "wet line" to minimize disturbance of birds and protect feeding and roosting areas.

14. FAA/SpaceX is to submit an annual summary report to the Service's Coastal Ecological Services Field Office by December 31st of each year. The FAA/SpaceX summary report should include monitoring reports, measures implemented during project activities, success of such measures, incidences, and any recommendations on improvements to those measures. Reports should be sent to: U.S. Fish and Wildlife Service, Coastal Ecological Services Field Office, ATTN: Field Supervisor, c/o TAMU-CC, 6300 Ocean Drive, Campus Box 338, Corpus Christi, Texas 78412.

15. Take is not authorized beyond 2025. In the event activities continue beyond 2025, the FAA should consult with the Service 6 months prior to the expiration of this BCO.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal action agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or develop information.

For the benefit of ocelot, jaguarundi, and falcon the Service recommends the following:

1. Locate areas where there are opportunities to present or establish Service-approved workshops, signage, or other opportunities for each species in counties where study will be conducted.

2. Work with the Service to design and fund a research program to determine the population of ocelots and jaguarundis and prey species available to the cats in the south Texas counties.

3. Promote progressive range management techniques for the falcon on large expanses of grassland and coastal prairie habitat with long term cooperative arrangements such as leases, exchanges, purchases, and conservation education.

In order for the Service to remain informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, we requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation and conference on the action(s) outlined in the request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

You may ask the Service to confirm the conference opinion as a biological opinion issued through formal consultation if the red knot is listed or critical habitat is designated. The request must be in writing. If the Service reviews the proposed action and finds that there have been no significant changes in the action as planned or in the information used during the conference, the Service will confirm the conference opinion as the biological opinion on the project and no further section 7 consultation will be necessary.

After listing of the red knot as endangered/threatened and/or designation of critical habitat for and any subsequent adoption of this conference opinion, the FAA shall request reinitiation of consultation if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect the species or critical habitat in a manner or to an extent not considered in this conference opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the species or critical habitat that was not considered in this conference opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

The incidental take statement provided in this Conference Opinion does not become effective until the red knot is listed and the Conference Opinion is adopted as the BO issued through formal consultation. At that time, the project will be reviewed to determine whether any take of the red knot and/or their habitat has occurred. Modifications of the opinion and incidental take statement may be appropriate to reflect that take. No take of the red knot may occur between the listing of the red knot and the adoption of the Conference Opinion through formal consultation, or the completion of a subsequent formal consultation.

As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in

a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take should cease pending reinitiation.

If you or your staff has any questions concerning this opinion, please contact Mary Orms at (361) 994-9005 or via email at mary_orms@fws.gov .

Sincerely yours,

for Edith Erfling
Field Supervisor

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Appendix A. Consultation History

October 10, 2012 – The Service participated in a meeting with FAA, SpaceX and consultants and refuge staff to discuss project and information needs.

October 31, 2012 – The Service provided consultants for SpaceX information on aplomado falcon sightings, nest structures, cat trappings and sightings along SH4.

November 27, 2012 – Consultant for SpaceX requested information on red knots and the Service provided information.

December 4, 2012 – The Service discussed surveys for aplomado falcons. Consultant emailed and stated that he would put forth pre- and post-construction surveys and potentially pre-launch as part of the mitigation plan like the piping plovers.

April 20, 2012 - The FAA sent a letter requesting concurrence or revision of a species list and an invitation to participate in a pre-scoping meeting to be held May 15, 2012 in Brownsville, TX.

May 4, 2012 – The Service responded with revisions to the species list.

May 15, 2012 - Representatives from the Service's Ecological Services Field Office and Lower Rio Grande Valley National Wildlife Refuge attended an agency-only pre-scoping meeting and site visit to the proposed Control Center and Vertical Launch sites.

September 2012 - The Service received a Draft Final BA from FAA for review and comment.

October 10, 2012 - A meeting was held with the Service, FAA and Cardno TEC to discuss the Draft Final BA.

November 13, 2012 - The Service provided formal comments on the Draft Final BA to FAA.

January 4, 2013 – FAA sent a letter with a January 2013 BA for initiation of consultation.

February 26, 2013 – The Service participated in a meeting with FAA, BEDC, USBP, NPS, NWR, TPWD, Cameron County Law Enforcement, and a private security company. Items discussed were launch viewing areas, preparation of various plans, perch deterrents, wildlife crossings, monitoring and sea turtle impacts.

March 1, 2013 – Letter from the Service to FAA providing comments on the Final BA submitted with an initiation request, requested revision of BA.

March 11, 2013 – The FAA requested additional information, 2012 Candidate Notice of Review, 2012 Species Assessment for Sprague's pipit and Survey guidelines for winter piping plovers.

March 21, 2013 – The Service received a letter from FAA regarding Section 4(f) determination. The FAA determined that because of the short-term and intermittent nature of the noise generated from launches, the proposed action would not substantially diminish the attributes (i.e., quite setting that contribute to the enjoyment of the NWR or the significance of the NHL. Therefore, the FAA/AST determined that the operational activities would not constitute a constructive use of the NHL or the NWR.

April 15, 2013 – FAA distributed an email stating that the DEIS had been released and available for review. There would be an agency hearing on May 7, 2013 in the morning and a public meeting that night.

April 20, 2012 - The FAA sent a letter requesting concurrence or revision of a species list and an invitation to participate in a pre-scoping meeting to be held May 15, 2012 in Brownsville, TX.

May 20, 2013 – FAA provided the Service a summary from the May 7, 2013 meeting with various agencies, Service included, to discuss and/or clarify the proposed project.

May 23, 2013 – FAA distributed the May 2013 draft Hurricane Preparation Plan to the Service.

May 30, 2013 - The Service provided scoping comments to FAA.

April 12, 2013 – FAA letter to the Service announcing the availability of the DEIS for review and enclosed a revised Final BA. FAA requested initiation of formal consultation on the piping plover, northern aplomado falcon, jaguarundi, ocelot, and 5 sea turtle species.

April 29, 2013 - The Service initiated formal consultation, provided concurrence regarding FAA's effect determination for the West Indian manatee.

May 30, 2013 – FAA provide the Service the draft Hurricane Plan for review.

June 4, 2013 – The Service received a copy of the Department of Interior's, June 3, 2013, letter providing comments on FAA's DEIS. The Service also was provided a copy of TPWD's and EPA's comments on the DEIS.

June 5, 2013 – FAA distributed the Spill Prevention, Control & Countermeasures Plan and the Storm Water Pollution Prevention Plan (Operations) to the Service.

June 11, 2013 – EPA provided the Service information related to NOx and Sox on terrestrial and aquatic ecosystems.

June 13, 2013 – FAA provided the Construction SWPPP for review.

July 1, 2013 – The Service received an email from FAA stating that SpaceX was willing to increase the launch day land closure area and move the soft checkpoint to the area west of the

U.S. Customs and Border Protection checkpoint along SH4 to help alleviate potential impacts to NWR and NHL lands from launch spectators. If something happens in the future where SpaceX want to open up discussion to change the closure area for some reason then they would reinitiate consultation to seek an amendment to the BO.

July 16, 2013 – The Service received a copy of Sierra Club's providing comments on FAA's DEIS.

July 17, 213 – FAA distributed the Hazardous Materials Emergency Response Plan to the Service.

July 19, 2013 – The Service received a copy an email from Magic Valley Electric Coop to SpaceX that the utilities lines would remain the same after the upgrade. However, to help alleviate concerns TxDOT, TPWD and the Service had the, the 2.18 miles of line that would provide electricity to SpaceX will be underground.

July 22, 2013 - Conference call with the National Park Service and the Refuge to discuss lighting, FAA was informed of the meeting.

July 24 2013 – After conference call FAA was informed verbally that the Service would be needing an extension of time to review all the plans, and provide them comments to respond to and in additional some plans were still not received.

July 29, 2013 – FAA emailed a letter to the Service acknowledging the extension and providing us with additional information. FAA provided a copy of the SpaceX Draft Security Plan for our review

August 16, 2013 – The NPS provided the Service with their comments on the SpaceX lighting plan.

August 27, 2013 – FAA letter to the Service agreeing to an extension of formal consultation. The Service was to provide a letter providing the additional information requested.

September 5, 2013 – Senator Cruz's office called for an update. The Service also received an email from the Refuge that they had met with Magic Valley Electric Coop and SpaceX to discuss the electric upgrade and cable.

September 6, 2013 - FAA and the Service discussed the August 27, 2013, letter regarding the date of expected BO, outstanding plans we had still not received. The documents included the Long-term wildlife monitoring plan, the Programmatic Agreement with the National Parks Service addressing the effects of the project on Nationa Park Service properties (Palmito Ranch Battlefield NHL and viewshed), the facility closure and site restoration plan, and catastrophic launch failure response plan.

September 11, 2013 – Refuge staff and the Service's ES office met to discuss their 4(f) concerns.

September 17, 2013 – The Service provided FAA comments on all SpaceX plans (Hurricane, Storwater, Security, Hazardous Waste Management, SPCC,…). The Service also coordinated with the NPS regarding the cypress pilings. Cardnotec also sent an email stating they were unsuccessful at obtaining information on aplomado falcon hack sites.

September 18, 2013 – The NPS provided the Service with a copy of the MOA between NPS, FAA, State Historic Aviation Administration, NPS, TPWD, Council on Historic Preservation and SpaceX in Cameron County.

September 19, 2013 – The Service provided FAA comments on all plans, Hurricane Plan, Stormwater (Construction), Stormwater (Operation), SWCPP, Security, Hazardous Waste Management, Emergency Response Plan.

September 23, 2013 – SpaceX provided an email with 7 revised plans and response to the Service's comments on the plans. The plans were South Texas Security Plan, Commercial Launch Site Lighting Plan, Commercial Site Spill Prevention Plan, Hazmat Emergency Response Plan, Hurricane Plan and South Texas Emergency Action Plan.

September 25, 2013 – Teleconference to discuss issues or needs for the BO.

September 26, 2013 – The Service sent an email to FAA and SpaceX as a follow-up to the September 25, 2013 discussion regarding storm water and habitat monitoring. The Service provided clarification and supplemental information. The Service recommended a stormwater discharge monitoring plan. The plan was to be developed in coordination with the Service, EPA and TECEQ to ensure compliance. The plan was to include sampling contingencies for normal site operations, spills or emergency releases. The Service recommended residential/ecological standards be used to determine protective thresholds and sampling protocols of both water and sediment. At no time were industrial standards to be applied to offsite discharges. The Service concurred with SpaceX recommendation for frequency and necessity of spill response sampling and that sampling was to begin immediately upon discovery of a release of 0.1 gallons or more of any substance classified as RCRA hazardous waste or when 25 gallons or more of a substance no meeting the classification of RCRA hazardous waste.

October 10, 2012 - A meeting was held with the Service, FAA and Cardno TEC to discuss the Draft Final BA.

November 6, 2013 – Conference call with FAA and SpaceX. Service requested clarification on timing of construction. SpaceX stated construction would take 24 months; there would be night construction during pile driving and pouring of concrete which would last for about 1-2 weeks each. We also discussed the possibility of SpaceX working with The Peregrine Fund to install more nest boxes for the falcon and they were amenable to the idea as a conservation measure.

We also discussed the vapor cloud as a rocket lifts offs. It does contain water and does vaporize in the air and our concerns for potential vegetation changes.

November 7, 2013 – In an email SpaceX clarified there would be no water piped from Brownsville to the Launch Control Center. There will be no physical water connection between the city along SH4 to the Launch Control Center. All project water would either be privately brought in from trucks or extracted from a privately held on-site ground well and intra-site piping ("water distribution system").

November 12, 2013 – The Service received an email from Chris Perez, Refuge staff that the Peregrine Fund did not install any nest structures or release sites within three mile radius of the proposed site. However, as part of the recovery program, next year they were planning to set up release sites exactly 3 miles from the proposed SpaceX site in suitable habitat. He also stated that based on the ongoing monitoring and numbers of territories, they were leaning more towards the status of the falcon as table, but that habitat loss is an emergent threat.

November 20, 2013 – FAA provided the Service information on the deluge water as requested. "The deluge water from the pad and flame duct would be captured and not released into the nearby tidal flat. Based on SpaceX's past experience with Falcon 9 launches, the deluge water system would generate a vapor cloud that would travel approximately 600 feet from the launch pad toward the east in the direction of the flame duct. Low wind conditions, required for the launch, may disperse the vapor cloud approximately 200 feet to the cloud and would follow the exhaust cloud over the Gulf of Mexico."

November 27, 2013 – SpaceX provided information on a sample drone that might be used to do security sweeps.

December 3, 2013 – Draft BCO issued to FAA.

December 9, 2013 – Comments on the Draft BCO

December 11, 2013 – The Service participated in a conference call was with FAA and SpaceX to discuss and clarify comments. The description of Term and Condition number 6 regarding sea turtle patrols was to be revised by FAA/SpaceX and sent back for the Service to review and approve.

December 12, 2013 – FAA revised Term and Condition number 6 for the Service' and also requested the opportunity to read through the final document a final time, prior to the Service signing on December 13th. FAA in their email indicated they had spoken to SpaceX and SpaceX was agreeable to pushing the BO signing date to December 17th to allow a final review of the language.

December 17, 2013 – Further discussions over sea turtle monitoring (Term and Condition 6) resulted in a decision to defer the details to a Service approved Sea Turtle Monitoring Plan.

December 18, 2013 – Final BCO signed and forwarded to FAA.

Figure 1. Launch Site Location, Cameron County, Texas.

Figure 2. Project site location and surrounding areas

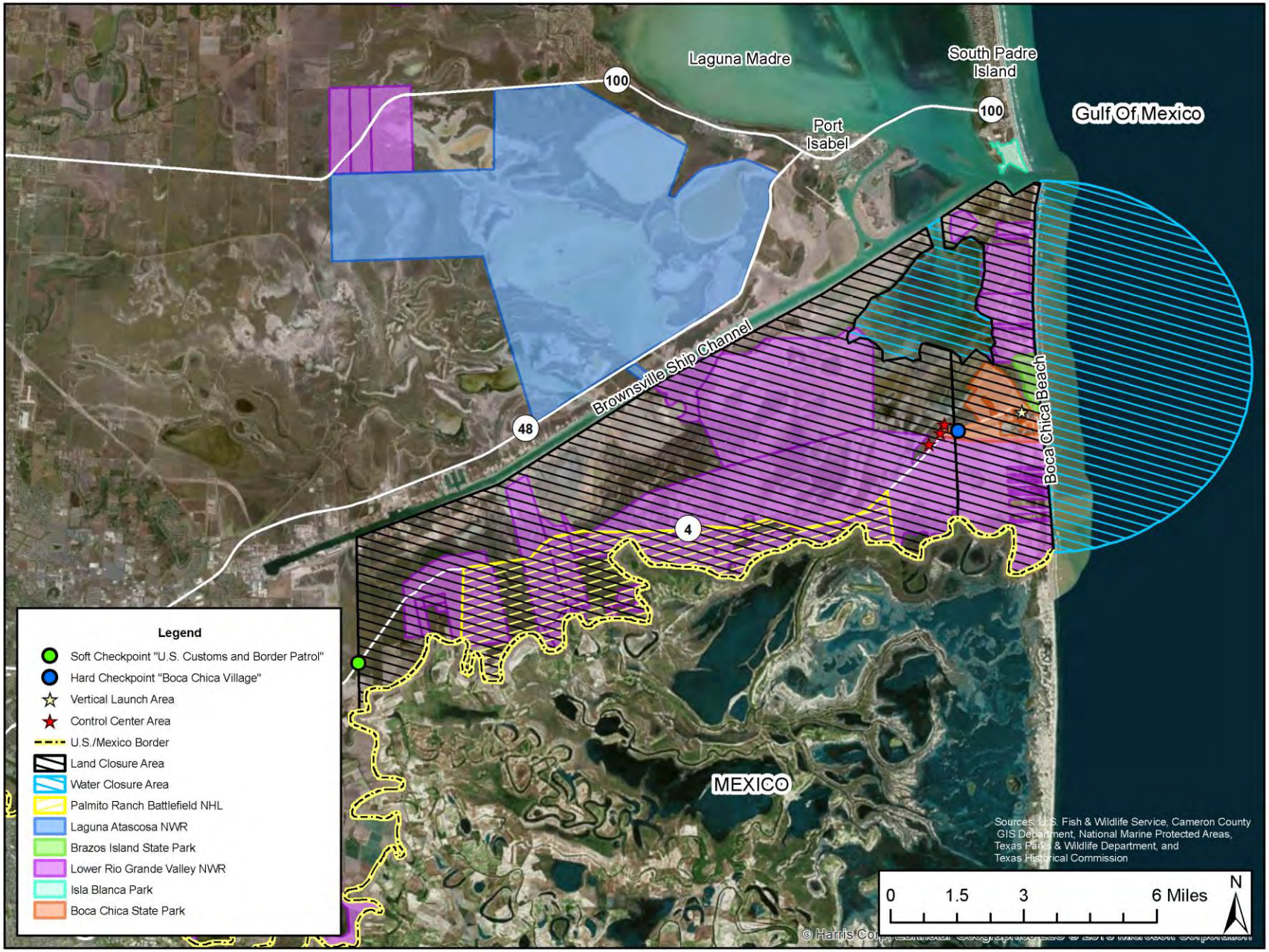

Figure 3.Action Area

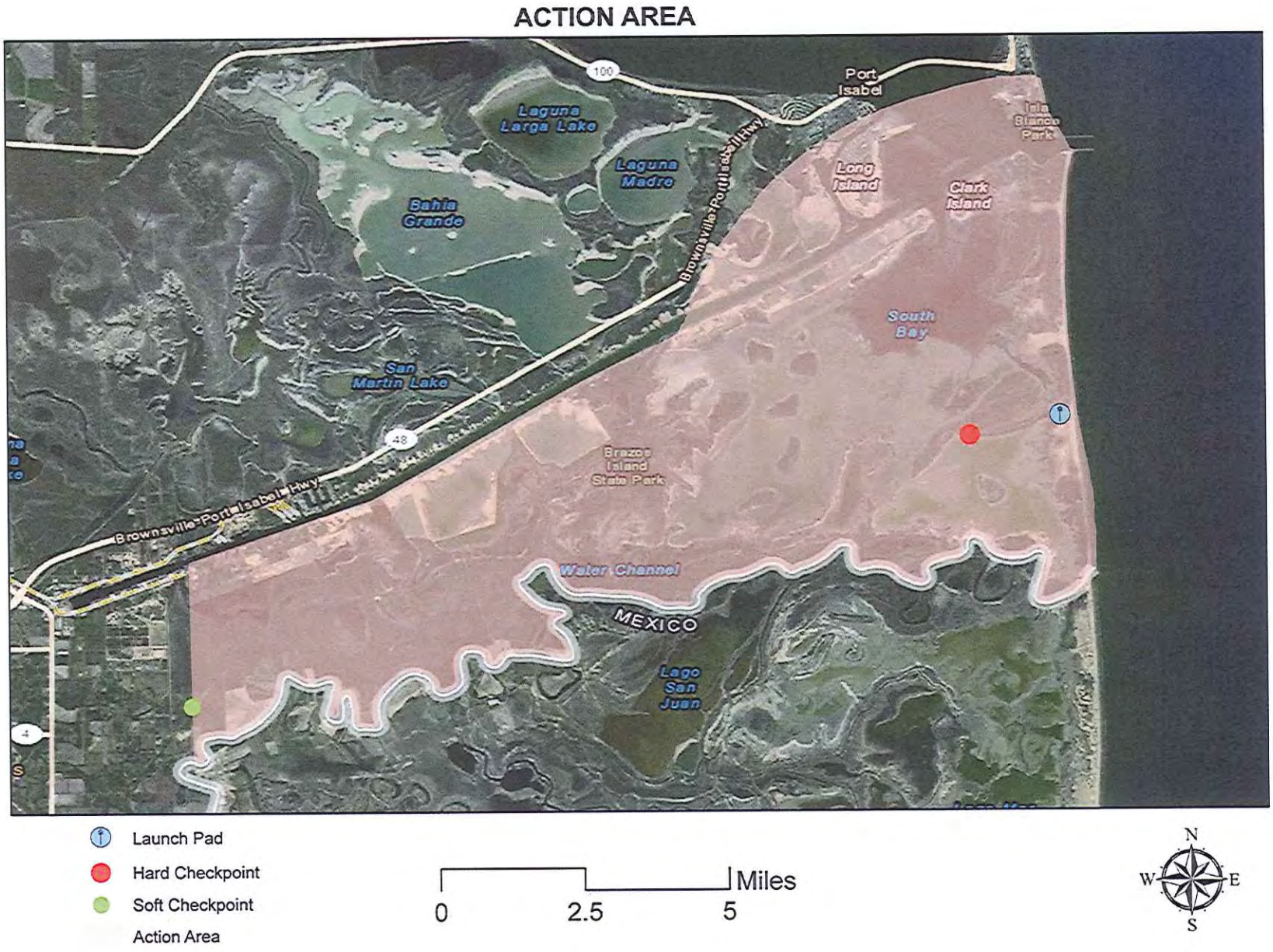

Figure 4. Piping Plover Critical Habitat inside of Action Area.

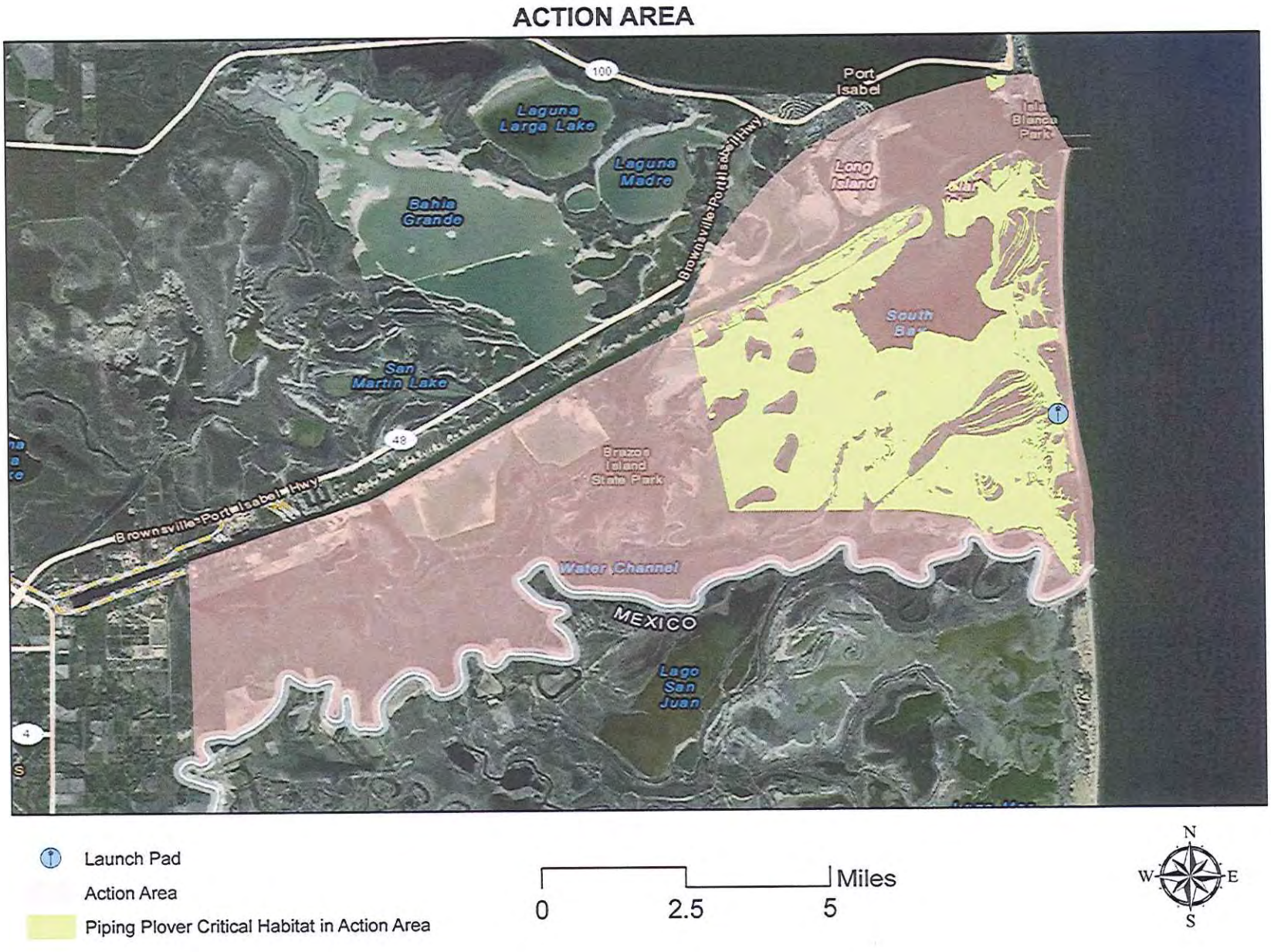

Figure 5. Space X facilities.

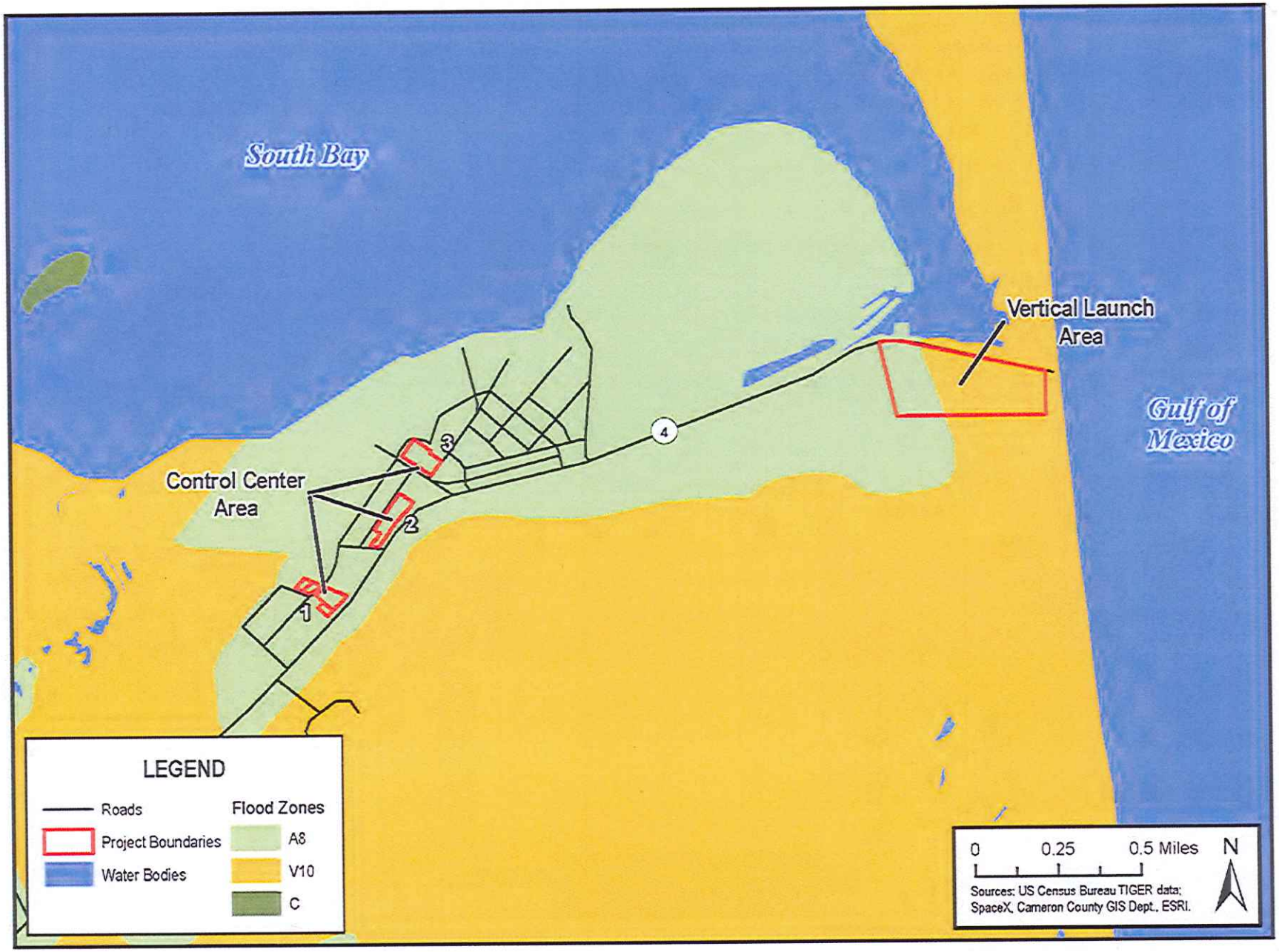

Figure 6. Facilities within the vertical launch area.

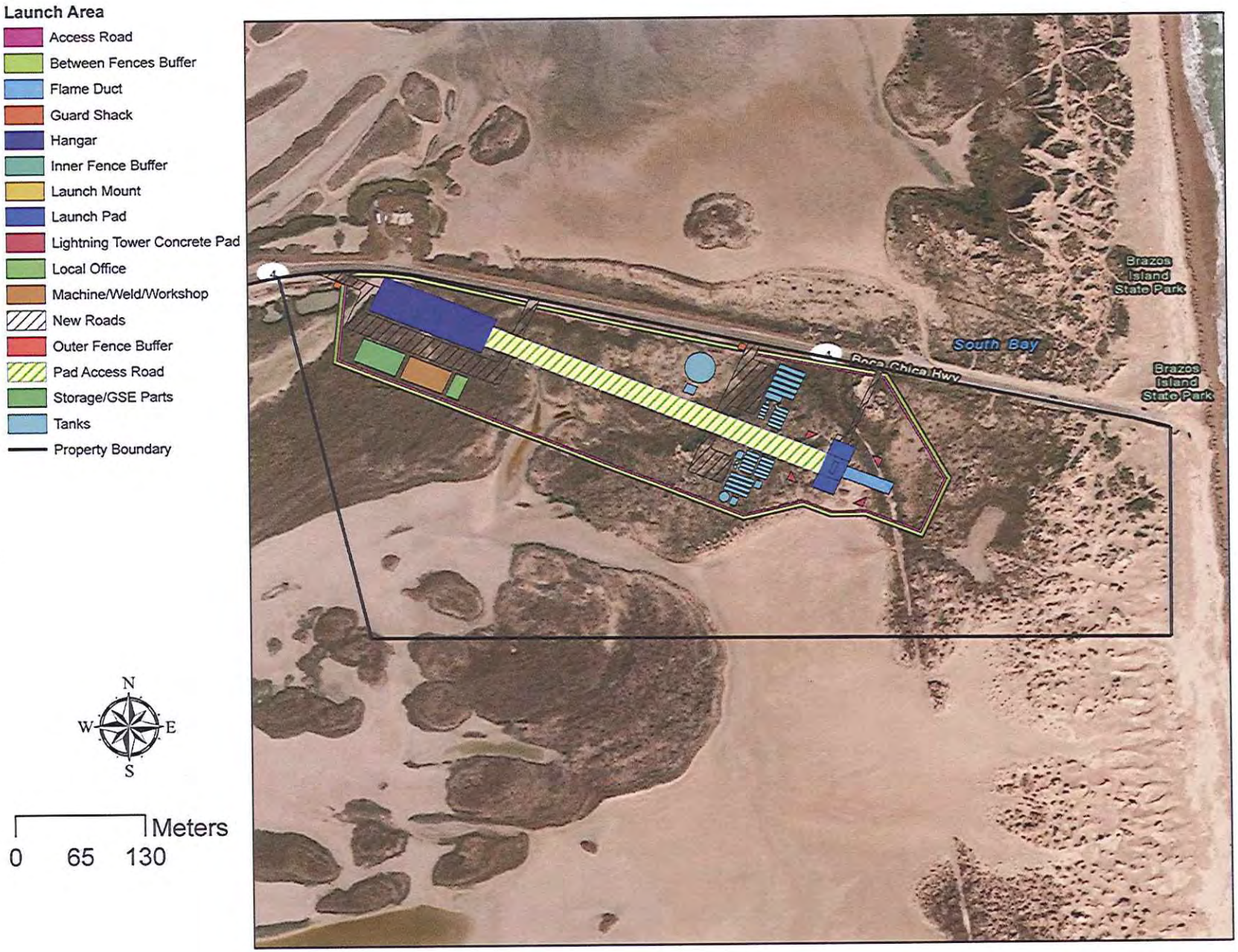

Figure 7. Control center area.

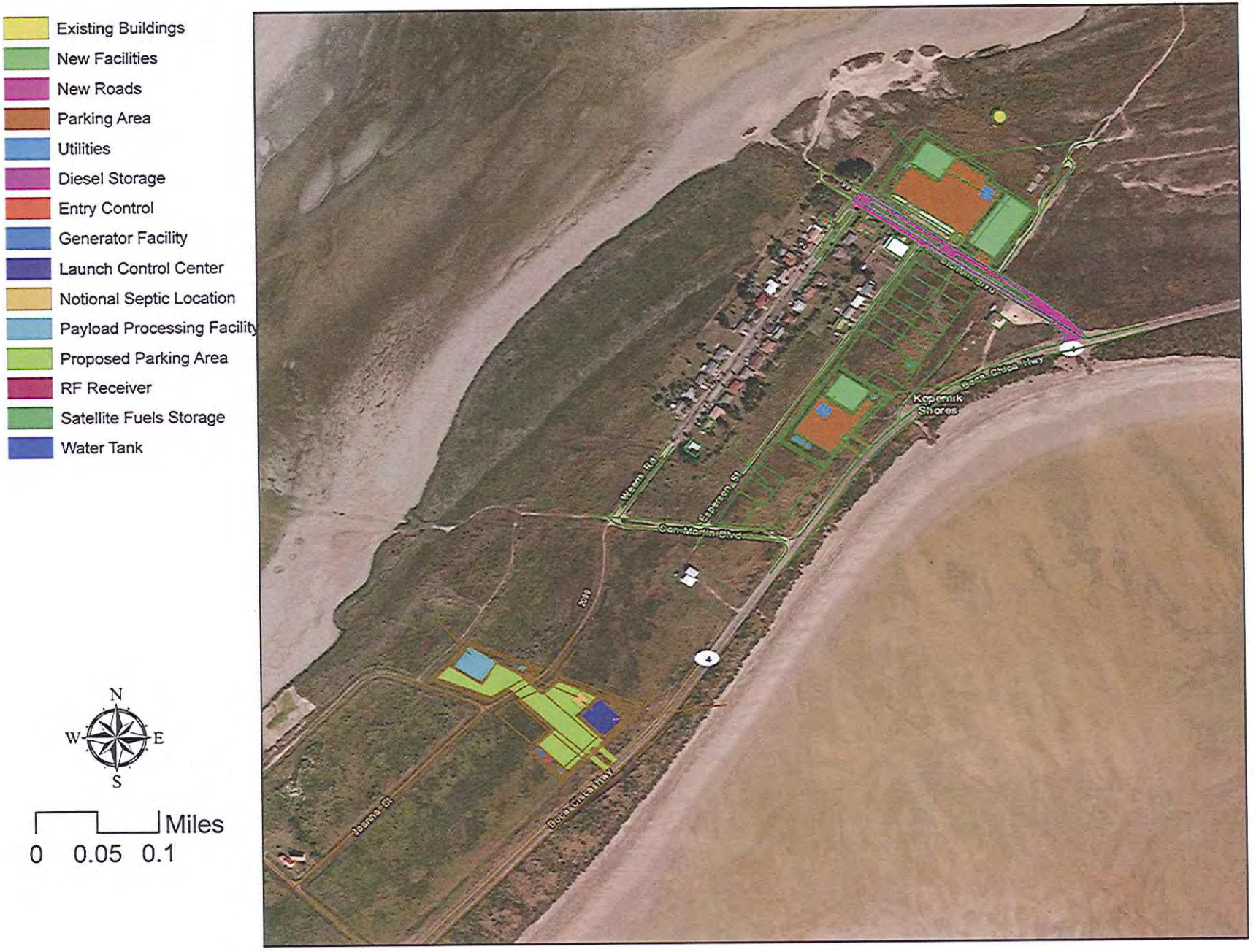

Figure 8. Launch Vehicles (A. Falcon Heavy), (B. Falcon 9).

A.

B.

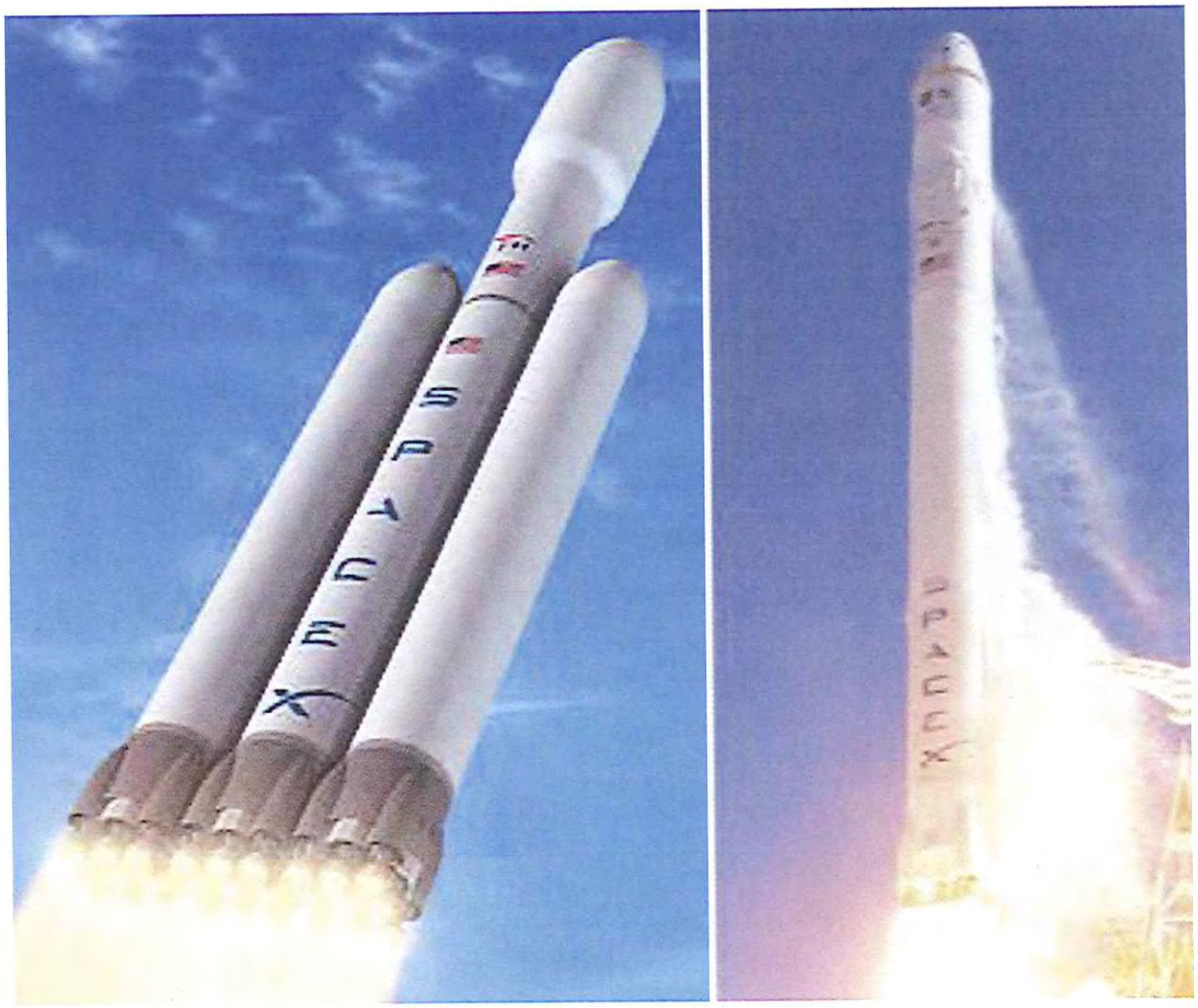

Figure 9. Day closure area.

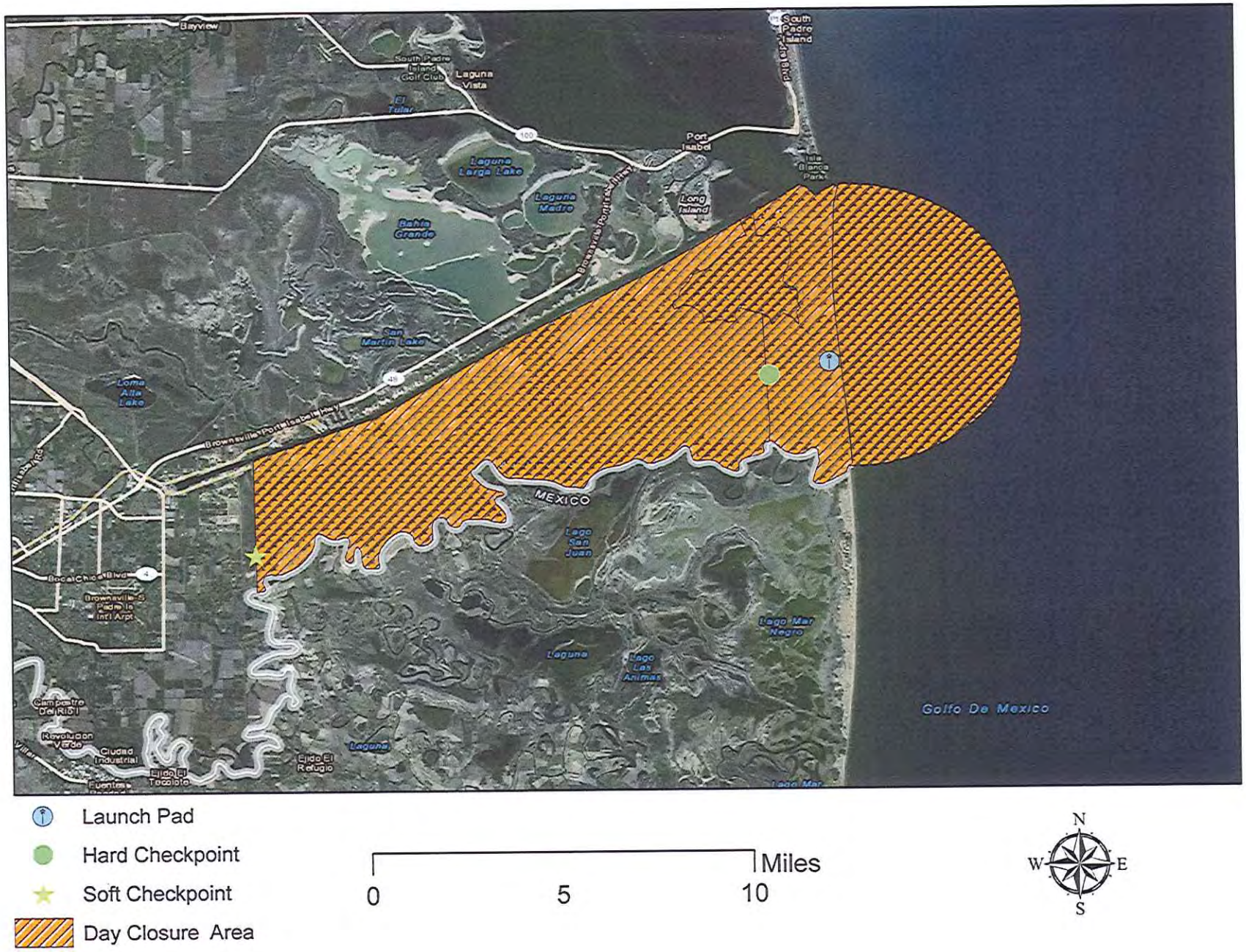

Figure 10. **Known red knot migration stopover areas.** Well-known stopover areas are shown on this map for reference. However, large and small groups of red knots, sometimes numbering in the thousands, occur in suitable habitats all along the Atlantic, Caribbean, and Gulf coasts.

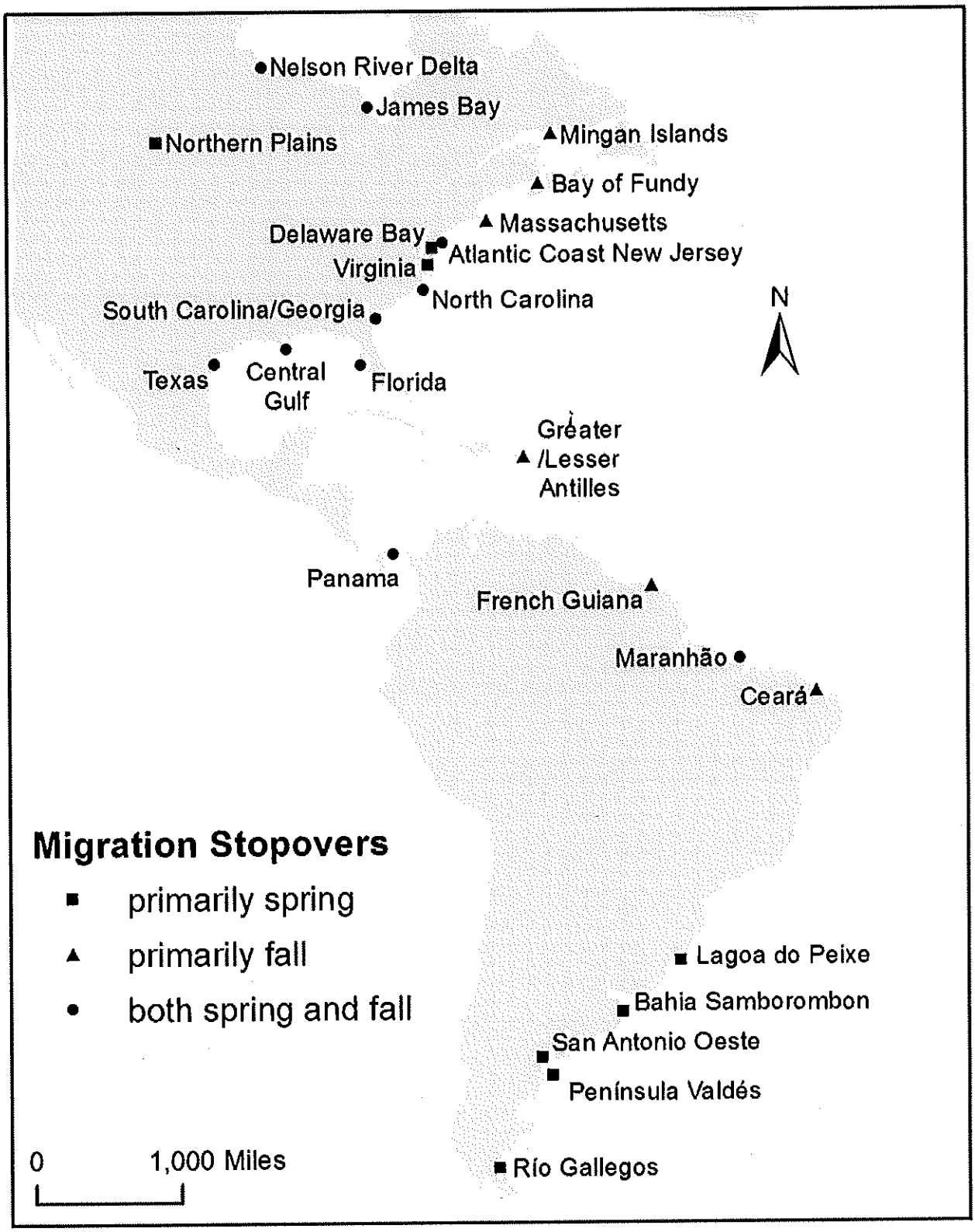

Figure 11. Lomas in the Bahia Grande area

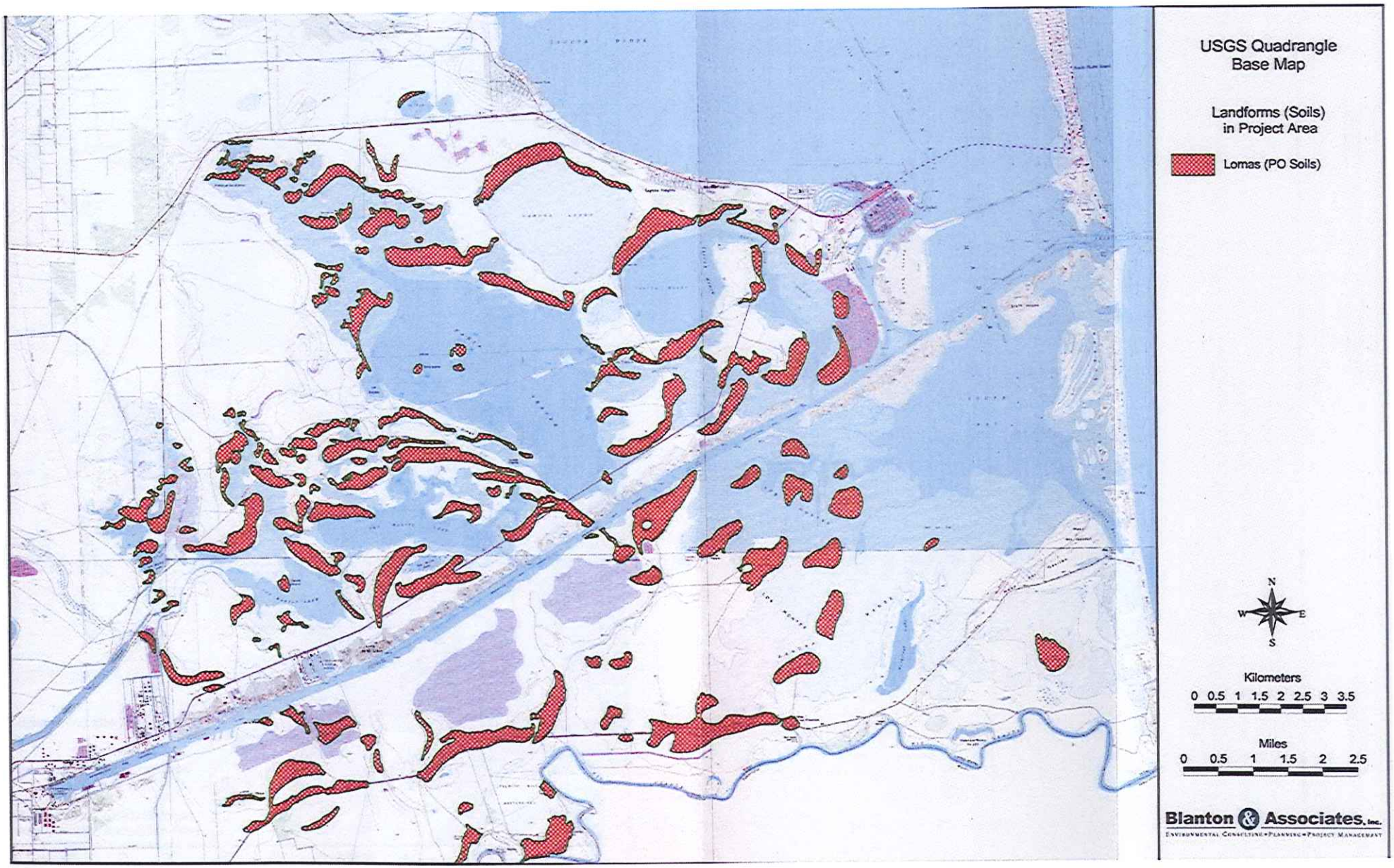

Figure 12. Rio Grande wildlife cooridor.

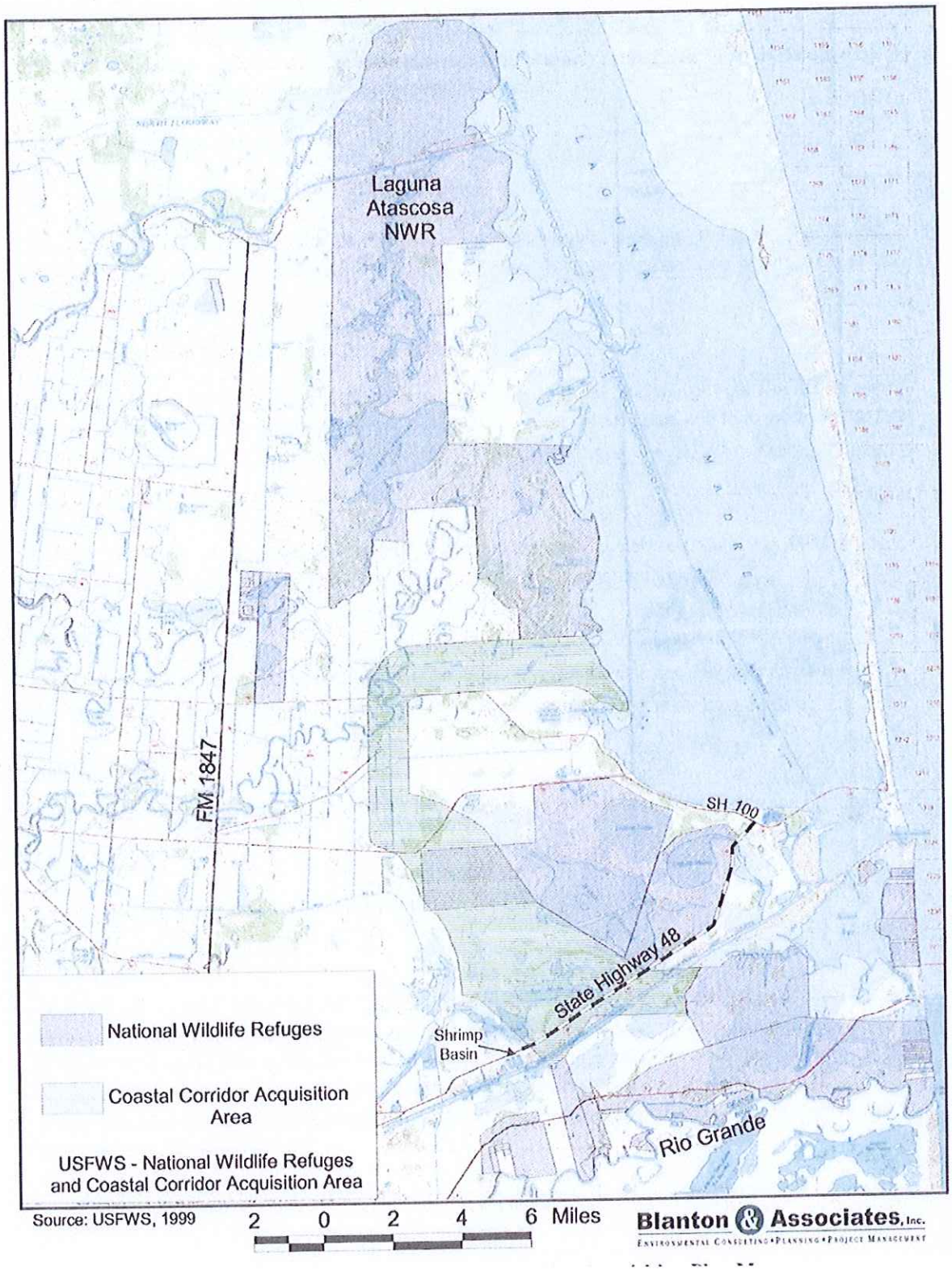

Figure 13. Nesting sea turtles in the action area.

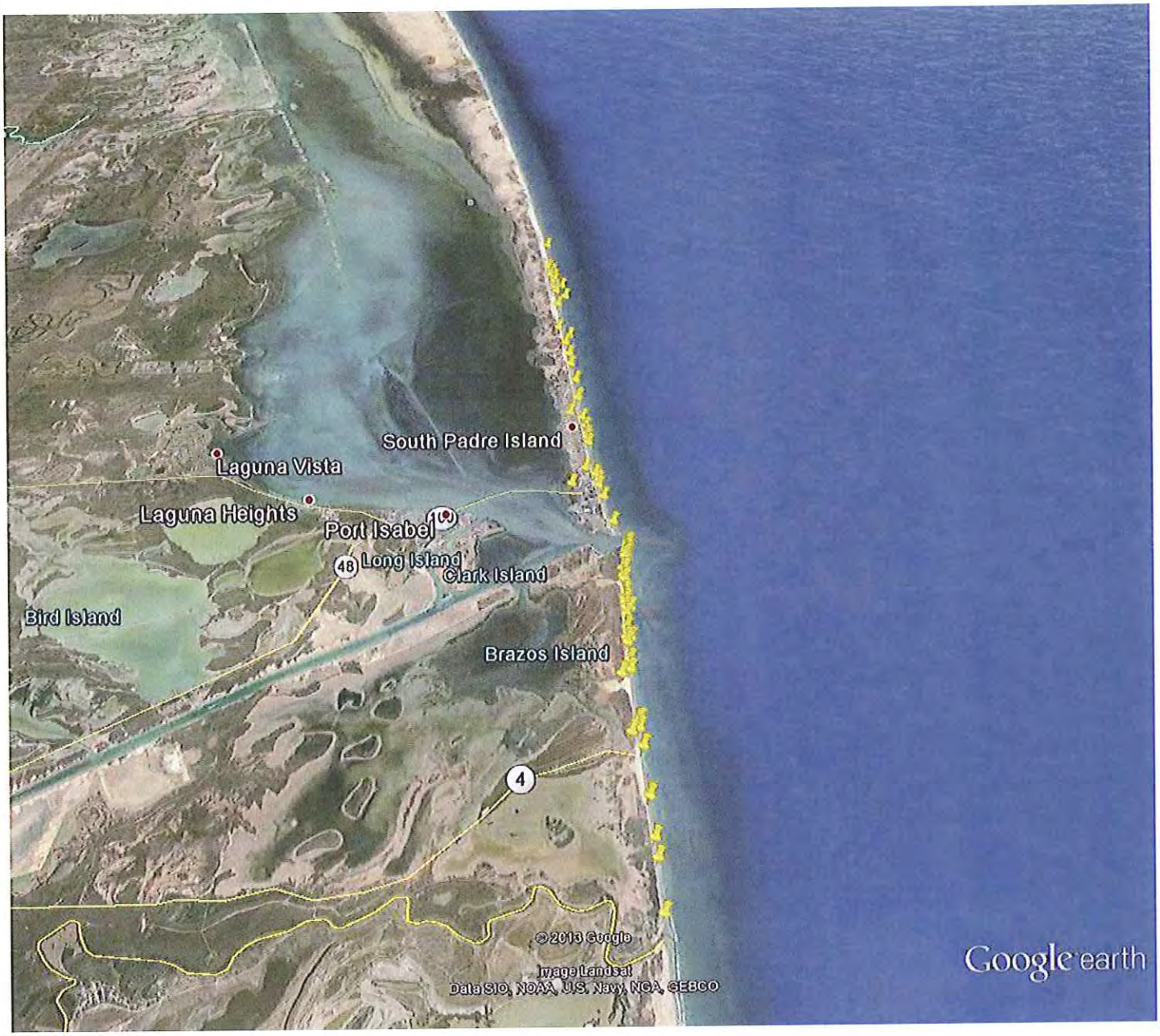

Figure 14. Red knot observations near the project location.

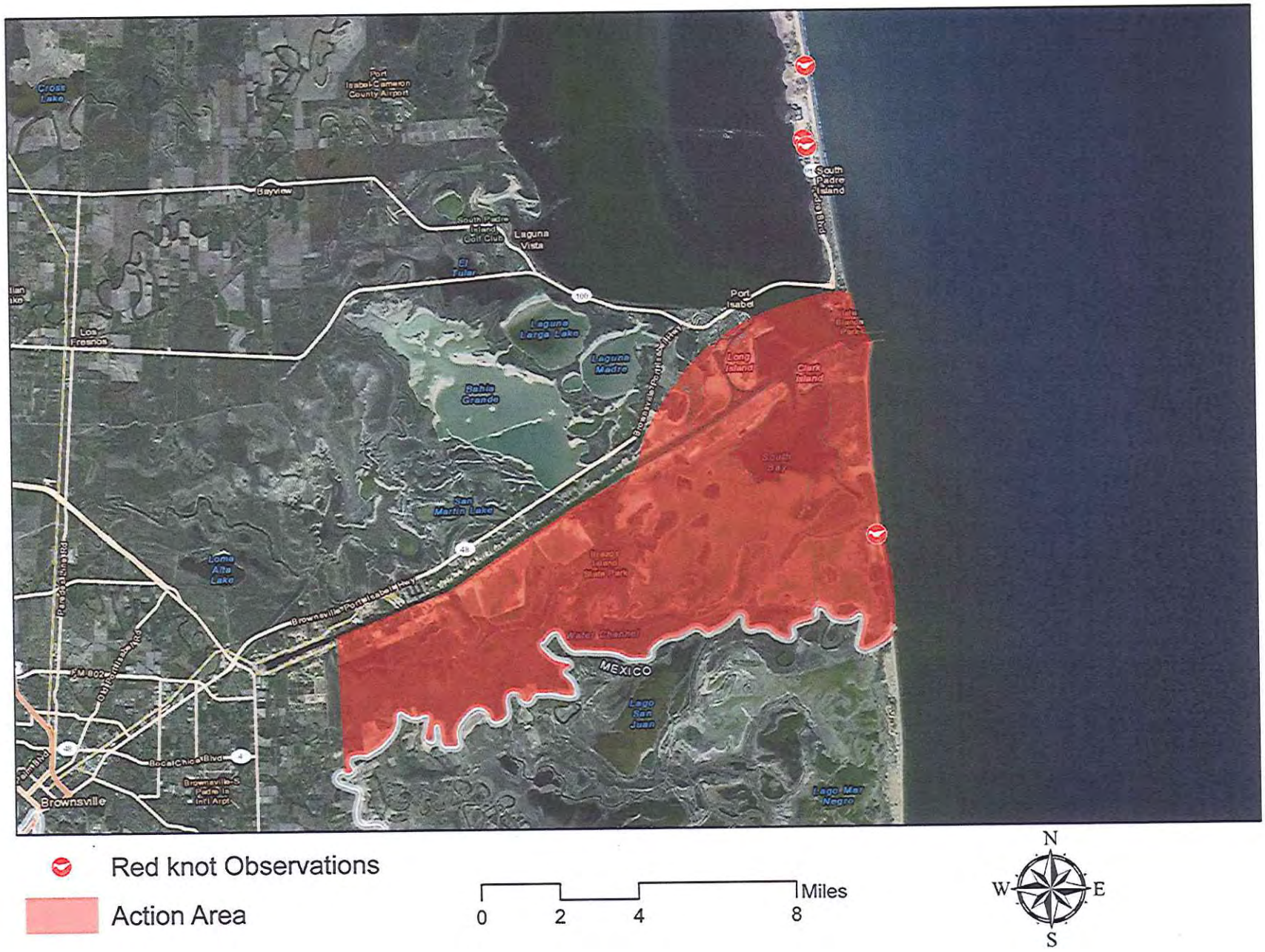

Figure 15. Potential piping plover critical habitat vegetation conversion.

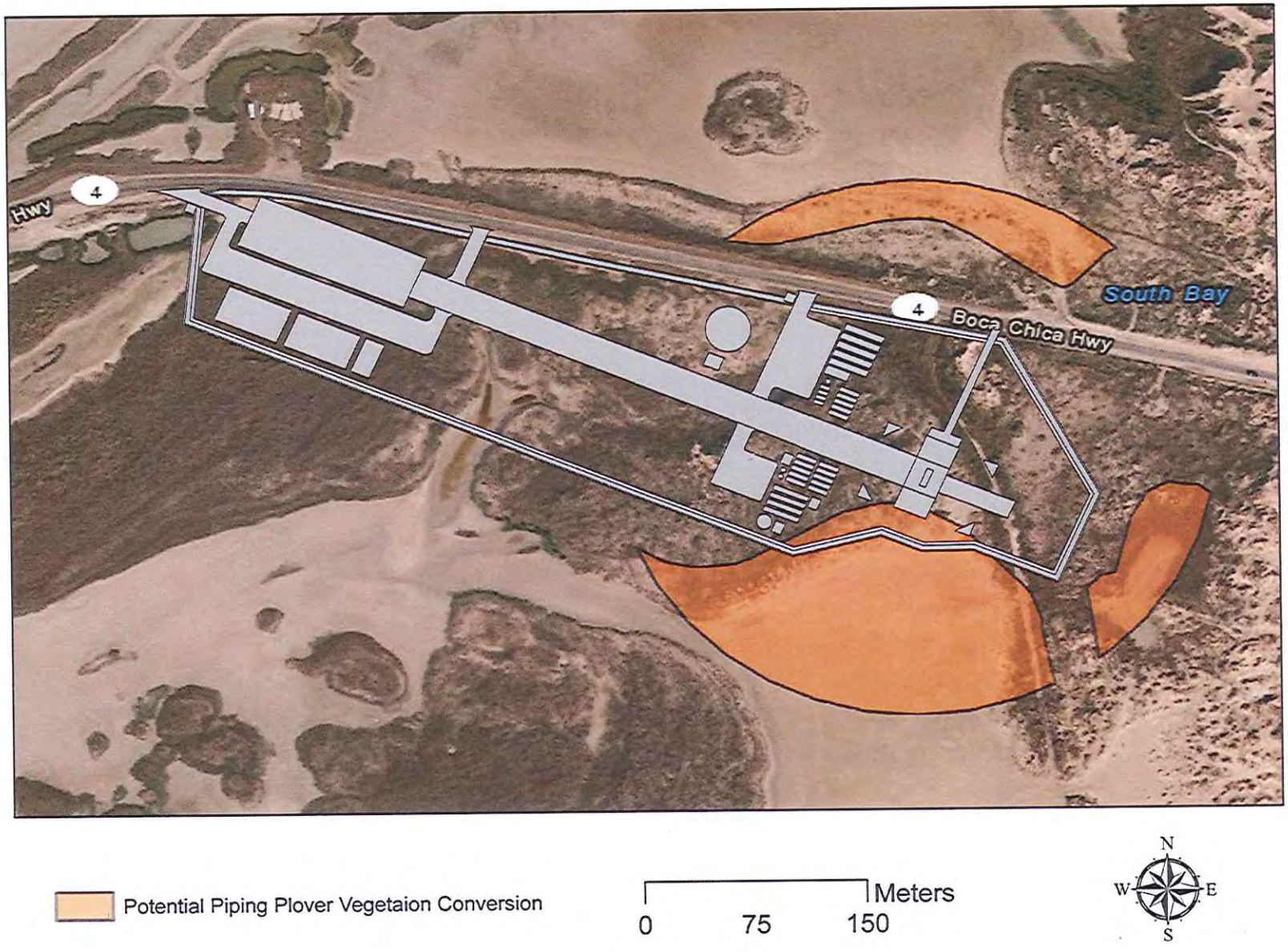

Figure 16. Authorized take for piping plover critical habitat, and 1,000 foot vegetation monitoring area.

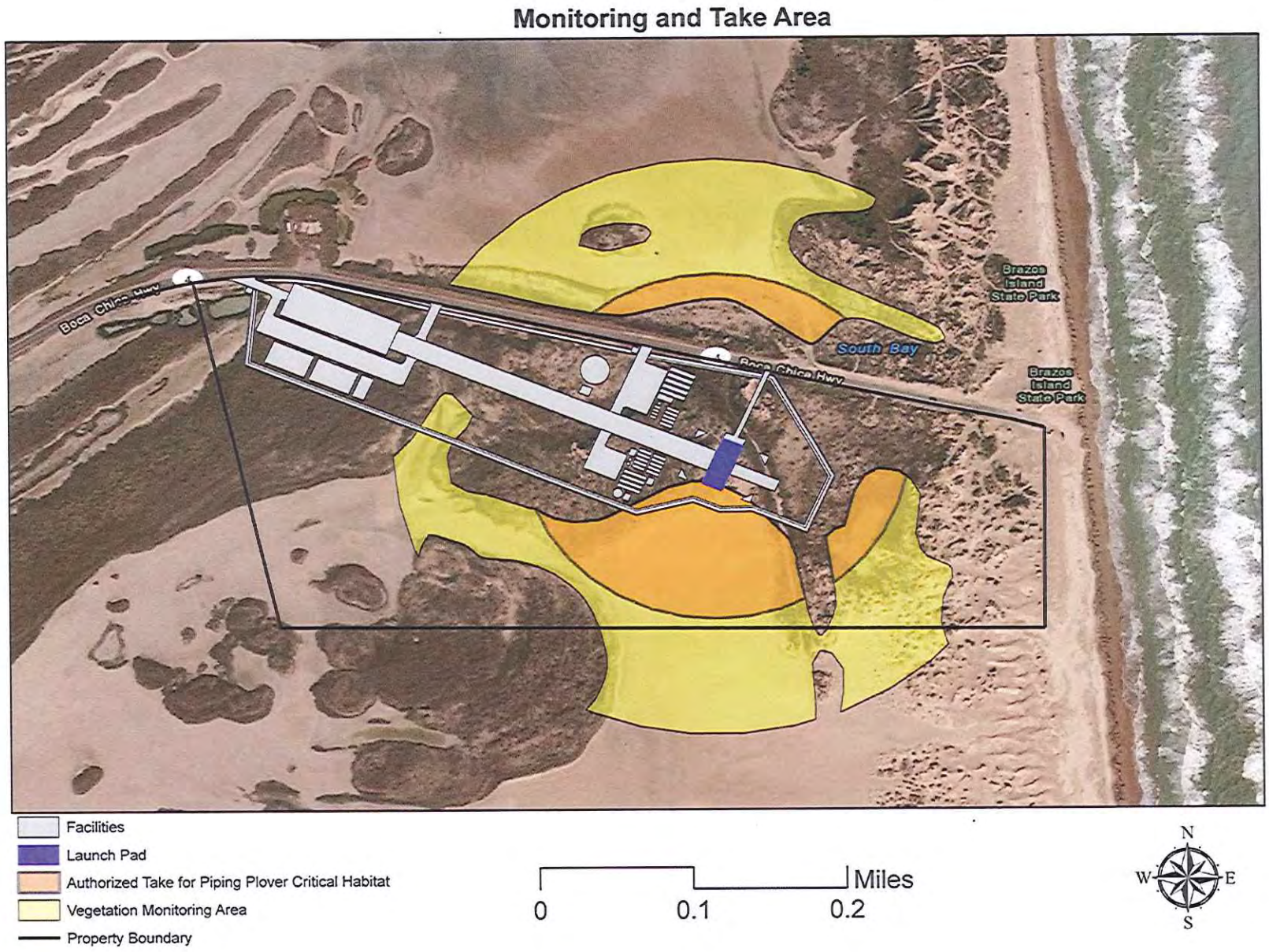

Figure 17. Vapor cloud resulting from launch.