



**Federal Aviation
Administration**

Draft Environmental Assessment for Reditus Space ENOS Capsule Reentries in the Gulf of America

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Environmental Assessment (EA) for Reditus Space ENOS Capsule Reentries in the Gulf of America

AGENCIES: Federal Aviation Administration (FAA), lead federal agency; National Aeronautics and Space Administration and U.S. Coast Guard, cooperating agencies.

This EA was prepared pursuant to section 102(2)(C) of the National Environmental Policy Act (NEPA) of 1969, as amended (42 United States Code [USC] 4321 *et seq.*) and FAA Order 1050.1G, *FAA National Environmental Policy Act Implementing Procedures*. In addition, this EA supports consultation between the National Marine Fisheries Service and FAA in accordance with the Magnuson-Stevens Fishery Conservation and Management Act, as amended (16 USC 1801 *et seq.*).

DEPARTMENT OF TRANSPORTATION, FAA: The FAA is evaluating Reditus Space's (Reditus's) Proposed Action to conduct up to 12 daytime reentries per year of its ENOS-Mk1 (ENOS) capsule in the northeastern portion of the Gulf of America, south of Tallahassee and west of Cedar Key, Florida. Reditus's Proposed Action would include reentry, splashdown, and recovery activities. Reditus must obtain a vehicle operator license from the FAA to conduct commercial reentries of its ENOS capsule. Issuing a license is considered a major federal action subject to environmental review under NEPA. The FAA's proposed federal action is to issue a license to Reditus that would allow Reditus to conduct reentries of the ENOS capsule in the Gulf of America. The FAA has determined that an EA is the appropriate level of NEPA review.

The EA considers the potential environmental impacts from the Proposed Action and No-Action Alternative on aviation emissions and air quality, biological resources (including fish, wildlife, and plants), noise and noise compatible land use, and water resources (surface waters).

PUBLIC REVIEW PROCESS: In accordance with the applicable requirements, the FAA is initiating a public review and comment period for the Draft EA. The public comment period for the NEPA process begins with the publication of the Draft EA. Comments are due on August 28, 2026. The FAA provided public notice of the availability of the Draft EA for public review and comment on the Office of Commercial Space Transportation's (AST's) NEPA website: https://www.faa.gov/space/environmental/nepa_docs.

CONTACT INFORMATION: For questions, please contact: Leslie Grey, Environmental Protection Specialist, FAA, 1200 New Jersey Ave., SE, Washington, DC 20590; email 9-AST-Environmental@faa.gov.

This EA becomes a federal document when evaluated, signed, and dated by the Responsible FAA Official.

Responsible FAA Official:

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Acronyms & Abbreviations

AHA	Aircraft Hazard Area	MBTA	Migratory Bird Treaty Act
AST	Office of Commercial Space Transportation	MMPA	Marine Mammal Protection Act
CFR	Code of Federal Regulations	MSA	Magnuson-Stevens Fishery Conservation and Management Act
cm	centimeter(s)	MSL	above mean sea level
DAF	Department of the Air Force	NAS	National Airspace System
DEP	Department of Environmental Protection	NASA	National Aeronautics and Space Administration
EA	Environmental Assessment	NEPA	National Environmental Policy Act
EFH	essential fish habitat	nm	nautical mile(s)
ESA	Endangered Species Act	NMFS	National Marine Fisheries Service
FAA	Federal Aviation Administration	NOTAM	Notice to Airmen
ft	foot/feet	NOTMAR	Notice to Mariners
GMFMC	Gulf of Mexico Fishery Management Council	PLoC	Programmatic Letter of Concurrence
GPS	Global Positioning System	RSR	reentry, splashdown, and recovery
HAPC	Habitat Area of Particular Concern	SHA	Ship Hazard Area
kg	kilogram(s)	U.S.	United States
km	kilometer(s)	USC	U.S. Code
lb	pound(s)	USCG	U.S. Coast Guard
m	meter(s)	USFWS	U.S. Fish and Wildlife Service

Chapter 1 Introduction

The Federal Aviation Administration (FAA) is evaluating Reditus Space's (Reditus's) proposal to conduct the reentry, splashdown, and recovery (RSR) operations of its ENOS-Mk1 (ENOS) capsule in the Gulf of America (previously Gulf of Mexico). Reditus must obtain a license from the FAA, Office of Commercial Space Transportation (AST) to conduct ENOS RSR operations in the Gulf of America. Issuing a license is considered a major federal action under the National Environmental Policy Act (NEPA) of 1969, as amended (42 United States [U.S.] Code [USC] 4321 et seq.) and requires an environmental review. This Environmental Assessment (EA) evaluates the potential environmental impacts of activities associated with the Federal Action of issuing a license to Reditus (see Section 2.2 for a more detailed description). This EA also evaluates the potential environmental impacts associated with the FAA's approval of related airspace closures.

This EA was prepared in accordance with NEPA; FAA Order 1050.1G, *FAA National Environmental Policy Act Implementing Procedures*; the National Aeronautics and Space Administration (NASA) procedures for implementing NEPA (14 Code of Federal Regulations [CFR] 1216.3); NASA Procedural Requirement (NPR) 8580.1A, *Implementing the National Environmental Policy Act and Executive Order 12114 (Revalidated with Change 2 on April 1, 2025)*; and the U.S. Coast Guard (USCG) Environmental Planning Policy, Commandant Instruction (COMDTINST) 5090.1 (series) and the Environmental Planning Implementing Procedures. The USCG COMDTINST mandates use of the Environmental Planning Implementing Procedures. The two documents align with the U.S. Department of Homeland Security's NEPA policy, Department of Homeland Security Instruction Manual 023-01-001-01 (*Implementation of the National Environmental Policy Act*), and replace USCG COMDTINST 16475.1D, *National Environmental Policy Act Implementing Procedures and Policy for Considering Environmental Impacts*, which has been cancelled. The FAA is the lead federal agency for the preparation and coordination of this EA; NASA and USCG are cooperating agencies.

The completion of the environmental review process does not guarantee that the FAA will issue a license to Reditus for ENOS RSR operations in the Gulf of America. Reditus's license application must also meet FAA safety, risk, and financial responsibility requirements per 14 CFR Chapter III.

1.1 FEDERAL AGENCY ROLES

1.1.1 Federal Aviation Administration

As the lead federal agency, the FAA is responsible for analyzing the potential environmental impacts of the Proposed Action. The Commercial Space Launch Act of 1984, as amended and codified at 51 USC 50901–50923, authorizes the Secretary of Transportation to oversee, license, and regulate commercial launch and reentry activities, and the operation of launch and reentry sites within the United States or as carried out by U.S. citizens. Section 50905 directs the Secretary to exercise this responsibility consistent with public health and safety, safety of property, and the national security and foreign policy interests of the United States. In addition, Section 50903 requires the Secretary to encourage, facilitate, and promote commercial space launches and reentries by the private sector. As codified at 49 CFR § 1.83(b), the Secretary has delegated authority to carry out these functions to the FAA Administrator. The FAA is also responsible for creating airspace closure areas consistent with the statutory mandate in 49 USC § 40103 to ensure the safe and efficient use of the National Airspace System (NAS). The FAA carries out this mandate in accordance with FAA Order 7400.2R, *Procedures for Handling Airspace Matters*, to ensure public safety.

1.1.2 Cooperating Agencies

The FAA requested the USCG and NASA to participate in the NEPA process as cooperating agencies⁽¹⁾ due to their jurisdiction by law and special expertise. NASA has special expertise with respect to potential environmental effects from space launches. The USCG has regulatory authority over waters subject to jurisdiction of the United States pursuant to the Ports and Waterways Safety Act (46 USC 700); regulatory authority of vessels as outlined in CFR Title 33 and Title 46; and responsibility to review and advise the FAA on all launch and reentry site evaluation risk assessments regarding navigation safety. The USCG also supports the FAA with early warning communication to the maritime community with Notice to Mariners (NOTMAR) as outlined in 33 CFR Part 72 and 14 CFR Part 450.147(a)(2). The USCG evaluates every launch and reentry activity with potential risk to the marine transportation system. If necessary, the USCG and NASA could adopt this EA to support their own federal actions and environmental findings associated with activities covered in this EA.

1.2 PURPOSE AND NEED

NEPA states that the purpose and need statement shall briefly specify the underlying purpose and need for the proposed agency action to which the agency is responding in proposing the alternatives including the Proposed Action (42 USC § 4336a(d)). FAA's authority with respect to Reditus's license application is stated above in Section 1.1.1.

The purpose of Reditus's proposal is to demonstrate autonomous, reusable reentry capabilities for microgravity research and manufacturing in low Earth orbit. Its primary objective is to operate a small spacecraft that can host customer payloads in orbit, conduct experiments in microgravity, and return those payloads safely to Earth. The mission concept of operations includes launch on a rideshare vehicle, on-orbit operations lasting several weeks, and finally controlled reentry, followed by recovery of the capsule. Reditus's proposal is needed to validate a scalable system for routine access to and from orbit without reliance on the International Space Station.

1.3 PUBLIC INVOLVEMENT

The FAA provided public notice of the availability of the draft EA for public review and comment on the AST NEPA website⁽²⁾. Following the close of the public comment period, the FAA will revise the Draft EA, as appropriate, in response to comments received, and a Final EA will be prepared. The Final EA will reflect the FAA's consideration of comments and will provide responses to substantive comments. Following review of the Final EA, the FAA will either issue a Finding of No Significant Impact or issue a Notice of Intent to prepare an Environmental Impact Statement.

1.4 OTHER AUTHORIZATIONS

To proceed with the proposed operations identified in Chapter 2 below, Reditus would require environmental and regulatory approvals in addition to the FAA's license. The FAA has identified the following additional environmental approval for Reditus's proposal, but others may be required.

- The Proposed Action has the potential to adversely affect essential fish habitat (EFH) and federally managed fish species. Therefore, in accordance with the Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended (16 USC 1801 *et seq.*), this EA incorporates an EFH Assessment to support an EFH effects determination.

⁽¹⁾A cooperating agency means any Federal, State, Tribal, or local agency that has jurisdiction by law or special expertise with respect to any environmental impact involved in a proposal (42 USC §4336a(a)(3)).

⁽²⁾https://www.faa.gov/space/environmental/nepa_docs.

Chapter 2

Description of Proposed Action and Alternatives

NEPA requires the FAA to consider the purpose and need for the Proposed Action⁽¹⁾ and from that, “study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources.”⁽²⁾ As discussed in Chapter 3, the FAA has not identified any unresolved conflicts concerning alternative uses of available resources associated with Reditus’s proposal. Therefore, in accordance with NEPA as amended and FAA Order 1050.1G, Section 1.5(b)(ii), this EA considers the No-Action Alternative and Reditus’s Proposed Action.

2.1 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, the FAA would not issue a license to Reditus for the reentry and recovery of the ENOS capsule in the northeastern portion of the Gulf of America. Reditus would not be able to perform any space-based research or develop reentry capsule capabilities. Data collected in orbit or during reentry could not be compared with scientific models or ground-based testing intended to simulate those environments. Therefore, although the No-Action Alternative would not meet the purpose of and need for the Proposed Action, it is carried forward as the basis for comparing the environmental consequences of the Proposed Action.

2.2 PROPOSED ACTION

The FAA’s Federal Action is to issue a license, along with potential future renewals and modifications to the license within the scope of operations analyzed in this EA, to Reditus that would allow Reditus to reenter the ENOS capsule within the northeastern portion of the Gulf of America. In addition, the FAA must also approve related airspace closures for reentry operations.

The ENOS spacecraft would be launched as a payload on a Space Exploration Technologies Corporation (SpaceX) Falcon 9 from the Vandenberg Space Force Base (VSFB), California. The environmental impacts of Falcon 9 launches at VSFB were most recently analyzed by the Department of the Air Force (DAF) in the 2025 *Final Environmental Impact Statement for Authorizing Changes to the Falcon Launch Program at Vandenberg Space Force Base, California* (DAF 2025) and the associated Record of Decision (FAA 2025a). Therefore, the scope of operations analyzed in this EA is limited to the proposed RSR operations of the ENOS capsule in the Gulf of America.

Under the Proposed Action, Reditus would conduct up to 12 daytime reentries per year starting in 2026. **Figure 2.2-1** depicts a generalized overview of the proposed concept of operations for the ENOS mission. The following subsections provide a description of the project’s location, the reentry vehicle, and proposed RSR operations.

⁽¹⁾42 USC § 4336a(d)

⁽²⁾42 USC § 4332(H)

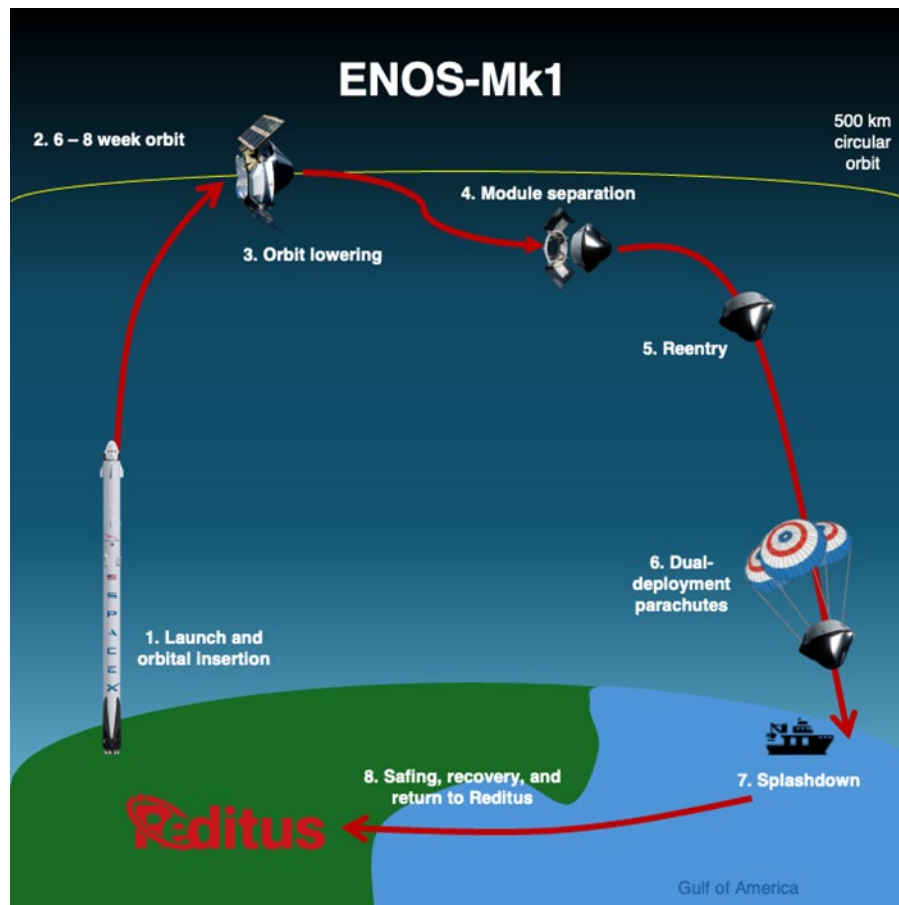


Figure 2.2-1. Concept of Operations for the Proposed Reditus Space ENOS Mission

2.2.1 Location

The proposed Reditus ENOS capsule splashdown location, expended items debris area, Aircraft Hazard Area (AHA), and Ship Hazard Area (SHA) would be located within the northeastern portion of the Gulf of America, south of Tallahassee, Florida and west of Cedar Key, Florida (**Figure 2.2-2**).

- **Splashdown Location:** The proposed ENOS capsule splashdown location is approximately 42 nm (78 km) southwest of the closest point of land (Cedar Key).
- **Expendable Items Debris Area:** The 25 nm² (86 km²) area where expended debris from the ENOS capsule would impact the ocean is approximately 40 nm (74 km) southwest of the closest point of land (Cedar Key). See Section 2.2.4 for details on the expended items.
- **AHA and SHA:** The overlapping AHA and SHA are approximately 250 nautical miles (nm) (463 kilometers [km]) from south to north, 22 nm (41 km) east to west at their widest southern point, and 8 nm (15 km) wide at their narrowest northern point, totaling an area of approximately 4,400 square nm (15,165 square km). They are located approximately 36 nm (67 km) west of Cedar Key and 46 nm (85 km) southeast of Apalachicola. The closest point of land is near Fish Creek, approximately 16 nm (30 km) to the northeast.

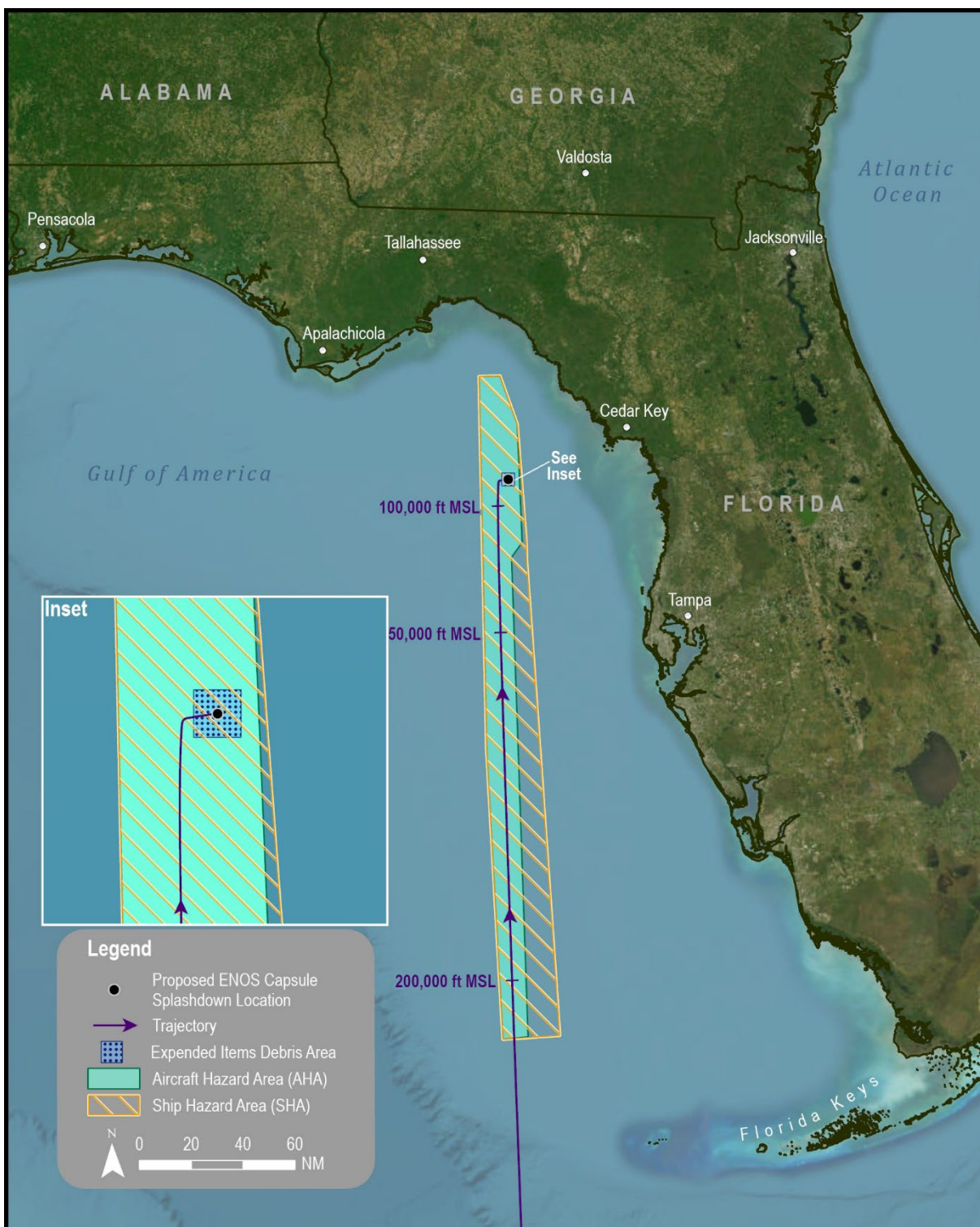


Figure 2.2-2. Proposed Reditus ENOS Capsule Reentry Trajectory, Splashdown Location, AHA, SHA, and Expended Items Debris Area

2.2.2 Reentry Vehicle

The ENOS spacecraft that would be completing the reentry maneuver is a passively stable reentry capsule with the following vehicle specifications (**Figure 2.2-3**).

- Diameter: 45.4 inches (115.3 centimeters [cm])
- Height: 36.3 inches (92.2 cm)
- Nose Cone Radius: 10.75 inches (27.3 cm)
- Conical Angle/Aft Angle: 45°/60°
- Launch Mass: ~441 pounds (lb) (200 kilograms [kg])
- Reentry Mass: ~300 lb (136 kg)
- Propulsion: Green, bi-propellant (propene and nitrous oxide)
- Power: 200W
- Communications: S-band, X-band

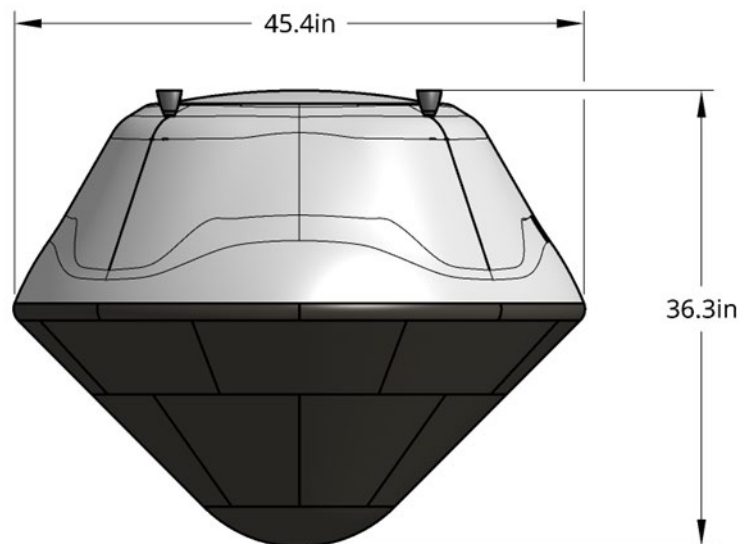


Figure 2.2-3. Reditus Space ENOS Capsule

The capsule would contain most of the capsule's avionics (flight computers, batteries, and telemetry systems), its parachute recovery systems, and a small ballast. The capsule would contain one explosive device, initiated by space standard initiators (filled with guanidium nitrate) and powered by smokeless powder, to deploy the drogue parachute and the main parachute. Upon splashdown, the explosive device would be fully consumed and pose no risk to personnel or the environment. In addition, the capsule would contain 18650 lithium-ion batteries to power its avionics system. Upon splashdown, the capsule would not contain any remaining propellants, gases, or toxic materials.

The propulsion system in ENOS-Mk1 capsule is developed by Dawn Aerospace and contains four oxidizer tanks and one fuel tank, each 0.95 gallon (3.6 liters). The spacecraft utilizes a bi-propellant propulsion system using propene and nitrous oxide. After the final deorbit burn, all tanks are vented. There are no expected residuals as the tanks are intentionally emptied before reentry.

2.2.3 Pre-Reentry Operations

All proposed reentry operations would comply with the necessary notification requirements, including issuance of a Notice to Airmen (NOTAM) and a NOTMAR, as defined in agreements required for a reentry license issued by the FAA.

2.2.3.1 Issuance of a NOTAM

All launch and reentry operations would comply with necessary notification requirements, including issuance of NOTAMs, as defined in agreements required for a vehicle operator license issued by the FAA. A NOTAM provides notice of unanticipated or temporary future closures to components of, or hazards in, the NAS (FAA Order 7930.2U, *Notice to Airmen [NOTAM]*). The FAA issues a NOTAM at least 48 hours prior to a launch or reentry activity in the airspace to notify pilots and other interested parties of temporary conditions. NOTAMs are similarly used by foreign Air Navigation Service Providers to provide notice of temporary airspace closures in their airspace. Advance notice via NOTAMs and the identification of Aircraft Hazard Areas (AHAs)⁽¹⁾ assist pilots in scheduling around any temporary disruption of flight activities in the area of operation.

The location and size of airspace closures for commercial space operations also vary with each mission type and are influenced by multiple factors, including prior flight history. The FAA used a notional AHA, shown in **Figure 2.2-2**, to complete an NAS assessment of the airspace closures for this EA. The AHA defines the temporarily closed airspace that would be established and published through a NOTAM prior to the launch/reentry.

To comply with the FAA's licensing requirements, Reditus has entered into a Letter of Agreement (LOA) with the Jacksonville Air Route Traffic Control Center, Jacksonville Tower Terminal Radar Approach Control Facility, Air Traffic Organization Space Operations, and U.S. Air Force to accommodate the flight parameters of the Reditus ENOS capsule. The LOA outlines procedures and responsibilities applicable to operations including notification of reentry activity; communication procedures prior to, during, and after a reentry; planning for contingencies/emergencies; NOTAM issuance; and any other measures necessary to protect public health and safety. The Proposed Action would not require the FAA to alter the dimensions (shape and altitude) of the airspace. However, temporary closures of existing airspace may be necessary to ensure public safety during the proposed operations.

The FAA conducted an NAS assessment of the proposed Reditus ENOS capsule reentry AHA utilizing aircraft data from 2025. Based on the analysis, the notional AHA could affect a minimum of 2 commercial aircraft per hour, during the lowest period of traffic, or up to a maximum of 104 commercial aircraft per hour, during peak daily travel periods.

Based on the notional AHA, the Reditus capsule program operation is expected to have minimal impact on three published commercial and general aviation routes. The AHA is contained almost entirely within offshore warning areas that are routinely designated for military operations and does not physically overlay any Florida airports. While aircraft transiting offshore routes may require tactical reroutes around the AHA during activation, significant impacts to NAS operations are not anticipated. Accordingly, traffic management initiatives such as Ground Stops, Miles-in-Trail (MIT), or other strategic

⁽¹⁾Hazard areas are any region of land, sea, or air that must be surveyed, publicized, controlled, or evacuated to control the risk to the public. It includes regions of land, sea, and air potentially exposed to hazardous debris generated during normal flight events and all reasonably foreseeable failure modes.

flow management measures are not expected to be required to safely integrate this space transportation operation into the NAS.

General aviation operations would be similarly impacted by having to remain clear of the AHA. However, the absence of rigid connecting schedules may allow general aviation pilots to more easily reroute or reschedule around active reentry times.

Reditus would submit a Flight Safety Data Package to the FAA in advance of the reentry. The package would include the reentry trajectory and associated AHAs. These AHAs define the temporarily closed airspace that would be defined and published through a NOTAM prior to the reentry. FAA Air Traffic Organization Space Operations Office uses the AHA information to produce an Airspace Management Plan, which describes the reentry information and any associated potential impacts to the NAS. Airspace controlled by the FAA may be restricted through the activation of airspace closures. The most common type of airspace closures are Temporary Flight Restrictions and altitude reservations. The FAA generally uses Temporary Flight Restrictions to protect airspace over land up to 12 nm (22 km) offshore and altitude reservations to protect oceanic airspace beyond 12 nm (22 km) offshore. The NOTAM would establish a closure window that is intended to warn aircraft to keep out of a specific area throughout the time that a hazard may exist. The length of the window is primarily intended to account for the time needed for the operator to meet its mission objectives. The location and size of the closure area is defined to protect the public. For a reentry, typically the keep-out must begin at the time of reentry and ends when the mission has been completed, terminated, or cancelled.

Under 14 CFR § 450.3(c), reentry begins with the pre-reentry burn health checks. The end of reentry, also defined under 14 CFR § 450.3(c), includes activities necessary to return the reentry vehicle, or vehicle component, to a safe condition on the ground after impact or landing. The FAA has determined that reentry ends after telemetry confirms splashdown via Global Positioning System (GPS) signal for nominal operation, as hazards are absent at the time of splashdown and the vehicle is confirmed to be in a safe condition.

Airspace closures are immediately released once the mission has successfully cleared the area and no longer imposes a risk to the public. The actual duration of airspace closure is normally much less than the original planned closure, especially if the reentry window is relatively long and the reentry occurs at the beginning of the window. The FAA typically begins to clear airspace and reroute aircraft in advance of a reentry and directs aircraft back into the released airspace after the mission to recover to normal flow and volume.

2.2.3.2 Issuance of a NOTMAR

All reentry operations would comply with necessary notification requirements, including issuance of a NOTMAR, as defined in agreements required for a reentry license issued by the FAA. The USCG issues NOTMARs to alert the maritime community of potential hazards or SHAs in navigable waterways. These notifications ensure that pilots and mariners can plan around temporary disruptions. A NOTMAR itself does not alter or close shipping lanes but serves as a notification of temporary hazards within a defined area to ensure public safety during the proposed operations.

To comply with FAA's licensing requirements, Reditus may enter into a Letter of Intent (LOI) with the USCG (Atlantic Area Command, Heartland District, and Southeast District) in order to safely reenter the ENOS capsule over open ocean. The LOI would describe the required responsibilities and procedures for both Reditus and the USCG during a reentry operation, resulting in the issuance of a NOTMAR. The USCG would be responsible for issuing the NOTMAR for the SHA encompassing the proposed

splashdown area (**Figure 2.2-2**). Reditus would provide the exact SHA location prior to reentry of the capsule.

In accordance with 33 CFR 72, the USCG issues two types of NOTMARs to inform the maritime community of temporary changes in conditions or hazards in navigable waterways. Local Notice to Mariners (LNMs) are published at least weekly but can be available to the public within 1 day of notifying the USCG. Marine Broadcast Notices to Mariners (BNMs) are issued as needed. The Proposed Action would not require shipping lanes to be altered or closed but may require the temporary rerouting of vessel traffic in the area. Reentries would be infrequent, of short duration, and scheduled in advance to minimize interruption to ship traffic.

2.2.4 Reentry Operations

The ENOS capsule would enter the proposed splashdown area within the Gulf of America from the south along a due north (bearing 0 degrees) trajectory (see **Figure 2.2-2**). The capsule would implement a two-stage descent system. A stainless-steel container with a lid inside the top of the capsule body would contain an approximately 6-foot (ft) (1.8-meter [m]) diameter Kevlar drogue parachute. The container lid would be attached to a “slug gun” type deployment system powered by smokeless powder.

At 30,000 ft (9,100 m) above mean sea level (MSL), the capsule would deploy the drogue parachute lid and extract the drogue parachute. The drogue parachute is intended to help the capsule maintain stability from the transition from supersonic (i.e., Mach 5 to 1.2) to subsonic (i.e., less than the speed of sound) speeds. At approximately 10,000 ft (3,000 m) MSL, a 16-ft (4.9-m) diameter nylon and Kevlar main parachute would be deployed (**Figure 2.2-4**). Upon main parachute deployment, the drogue parachute and its container would be jettisoned and not recovered. They are expected to sink relatively quickly. The main parachute would be contained within a Kevlar deployment bag. Recovery of the deployment bag would be attempted, but it is small and is expected to sink relatively quickly.

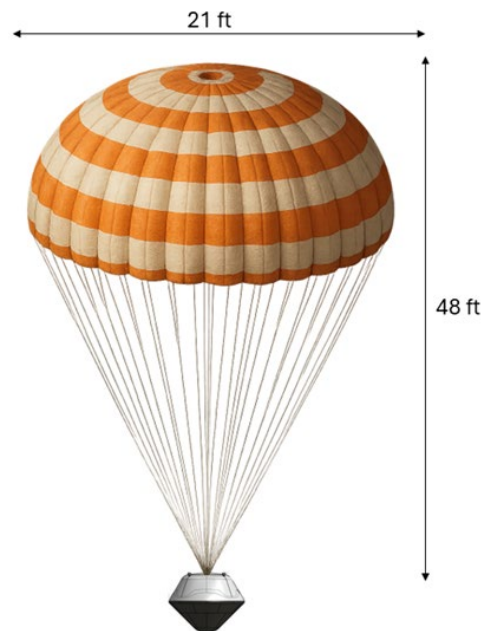


Figure 2.2-4. ENOS Capsule Recovery Main Parachute

The capsule would descend at approximately 15.5 miles per hour (25 km per hour) under the main parachute. Upon splashdown, the satellite would broadcast the capsule's location over Iridium satellite communications system's L-band frequency to Reditus's mission control center and the recovery team. It also has a backup communication over Long Range (LoRa), which communicates over ultra-high frequencies. The capsule would be naturally buoyant. If the parachute doesn't deploy, or the recovery team is unable to locate the capsule, recovery operations would take place after the time that the capsule would have fully landed and would continue for up to 72 hours (with pauses during night or poor weather). If the capsule is not found within that time it would be presumed to have sunk and would not be recovered. The total time for reentry operations from when the capsule enters the atmosphere to splashdown in the SHA would be approximately 15 minutes.

Table 2.2-1 provides a summary of the expended and recovered items associated with the proposed ENOS capsule RSR operations. All items that are not recovered are expected to sink relatively quickly and settle on the ocean bottom.

Table 2.2-1. Summary of Items Associated with the Reentry and Splashdown of the ENOS Capsule

Item	Size	Weight	Recovered/Fate
Lid for drogue parachute	6 x 6 inches (15.2 x 15.2 cm)	4.4 lb (2.0 kg)	No/Sink to the sea floor
Container for drogue parachute	6.1 x 1.1 inches (15.5 x 2.8 cm)	0.8 lb (0.3 kg)	No/Sink to the sea floor
Drogue parachute	6-ft (1.8-m) diameter	2.4 lb (1.1 kg)	No/Sink to the sea floor
Kevlar deployment bag	4.8 x 3.6 inches (12.2 x 9.1 cm)	0.4 lb (0.2 kg)	No/Sink to the sea floor
Main parachute	21-ft (6.4-m) diameter	1.1 lb (0.5 kg)	Yes
Capsule	45 x 36 inches (114 x 91 cm)	364 lb (165 kg)	Yes

2.2.4.1 Contingency Abort Operations

In the event the capsule does not meet Reditus reentry criteria, the vehicle would remain in orbit. Reditus has budgeted a minimum of six contingency opportunities to reconcile issues for a final reentry attempt within the same proposed splashdown area. If the issue cannot be reconciled, the capsule would be abandoned in orbit. Abandonment in orbit would likely result in a random reentry at some unknown future date and time, estimated at 5 to 20 years. During the random reentry, the capsule would have an off-nominal trajectory which would cause significant instability resulting in an incorrect orientation or flight path angle. This would result in higher total heat loads than the heatshield could withstand, resulting in likely destruction of the capsule within the atmosphere.

2.2.5 Post-Reentry Operations

2.2.5.1 Capsule Recovery

The recovery team would consist of a captain, a pilot, and four Reditus personnel on a 30-ft (9-m) marine research vessel. The recovery vessel would depart from Pensacola, Florida and be stationed just outside the northern portion of the SHA communicated in the NOTMAR. After receiving communications from the recovery buoy following the capsule's parachute deployment, the recovery vessel would begin its search pattern to recover the capsule.

The recovery of the capsule would be conducted via a crane/winch on the recovery vessel. As the capsule would not contain any hazardous materials or fuels, it would not need to be safed prior to recovery. Following recovery of the capsule and the main parachute (if possible), the recovery vessel would return to Pensacola where the capsule would then be transported by truck back to Reditus headquarters in Atlanta, Georgia.

Post-splashdown stabilization and final safing operations, including last exercise of control over the vehicle, would include the following safety procedures:

- Telemetry confirmation: Ground systems confirm splashdown via GPS signal,
- Recovery vessel transits to splashdown location,
- Capsule flotation check,
- Deploy divers to connect recovery vessel hook to capsule,
- Mechanically bring capsule onto recovery vehicle,
- Open access vehicle and deactivate spacecraft and disconnect all pyro-channels, and
- Verify shutdown and safe recovery.

The proposed recovery operations would occur only during daytime hours and during suitable weather and sea state conditions. However, the transit of the recovery vessel to and from the splashdown location could occur at night (i.e., early morning or early evening). Actual recovery of the capsule would occur during daylight hours. If unsafe conditions arise during the recovery attempt (e.g., bad weather), the recovery effort would be halted and resumed once conditions were favorable.

If during reentry operations there are structural integrity issues with the capsule, it would likely mean that the capsule would not survive reentry. Recovery operations would be attempted without location information from the recovery buoy. Given the small size of the capsule, if it breaks up upon reentry or on impact with the ocean surface, it is likely that expended capsule debris would quickly sink and would not be recoverable.

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER CONSIDERATION

2.3.1 Reentry and Recovery Site Selection Criteria

Selecting a recovery or landing area for a capsule return depends largely on matching the safety and mission-critical criteria to the facilities and capabilities of the prospective landing area. Issues of concern include minimal risk to public safety and to the returned capsule payload. Due to the capsule's size and reentry flight characteristics, the impact to the capsule from a terrestrial landing would result in the destruction of the capsule and loss of all data. A site within U.S. waters is also required given, (a) the time, uncertainty, and complexity associated with obtaining the necessary agreements between the U.S. and a foreign government; (b) the time to return a capsule to Reditus headquarters from a foreign country would be unacceptable; and (c) maintaining integrity, safety, and security of the capsule during recovery and transport back to the U.S. would be very challenging or prohibitive. Therefore, only a landing area within the marine environment within proximity of the U.S. was carried forward. The following criteria were used to assess potential sites to be considered as a potential landing area for the Reditus capsule:

1. *Safety*: The site must accommodate a landing area of approximately 20 nm (37 km) from south to north and approximately 20 nm (37 km) from east to west.
2. *Capsule Return*: The locale must enable prompt delivery of the capsule back to Reditus headquarters in Atlanta, Georgia for further investigation, analysis, and processing.

3. *Range Recovery Assets*: Existing ocean recovery operations are required to expedite the recovery and return of the capsule.
4. *Marine Protected Areas*: The splashdown area must avoid existing marine protected areas (e.g., National Marine Sanctuaries) and designated critical habitat for Endangered Species Act (ESA)-listed species.

2.3.2 Alternative Landing Sites Considered but Not Carried Forward

In addition to the proposed landing area in the Gulf of America, two other landing locations were considered.

- Off the Pacific Coast of Washington, Oregon, or California: Does not meet Criterion 2. Due to the inclination of capsule's orbit, recovery operations would be required to travel further from the coast requiring more complex logistics and costs, including the need to utilize multiple and larger ships. The location was not convenient, cost effective, or efficient with respect to the location of Reditus's headquarters in Georgia where the capsule would be returned.
- Off the Atlantic Coast of Florida: Does not meet Criterion 4. Areas off the Atlantic Coast of Florida contain designated critical habitat for the ESA-listed threatened loggerhead turtle (*Caretta caretta*) and the endangered North Atlantic right whale (*Eubalaena glacialis*).

Of the potential areas assessed, only the northeastern Gulf of America off the coast of the Florida Panhandle was determined to be the best-suited splashdown area based on the site selection criteria.

Chapter 3

Affected Environment and Environmental Consequences

3.1 INTRODUCTION

This chapter provides a description of the affected environment and potential environmental consequences for the environmental impact categories that have the potential to be affected by the Proposed Action and No-Action Alternative. The study area varies based on the environmental impact category being analyzed and is defined for each environmental impact category in this chapter. The level of detail provided in this chapter is commensurate with the importance of the potential impact on the environmental impact category. The environmental impact categories assessed in this EA include Aviation Emissions and Air Quality, Biological Resources, Noise and Noise-Compatible Land Use, and Water Resources (surface waters). The following environmental impact categories are not analyzed in detail for the reasons stated.

- **Coastal Resources.** The coastal zone refers to land and water areas of the State of Florida within the Gulf of America to the border of the State of Alabama extending seaward to the state's outer limit of jurisdiction (9 nm [16.7 km] offshore) including all offshore islands (Florida DEP 2024a). The nearest proposed RSR activities to land would occur approximately 16 nm (30 km) offshore. Given the offshore location and the limited nature of RSR activities, RSR activities would not result in any effects to coastal resources. Although recovery vessels would transit through the coastal zone when traveling to and from the offshore recovery area, these transits would occur along established maritime routes using existing ports. Recovery activities would represent a negligible increase relative to existing maritime traffic and would not alter coastal landforms, habitats, shoreline processes, or coastal infrastructure. Therefore, recovery vessel transits would not affect coastal resources.
- **Department of Transportation Act Section 303 (referred to as "Section 4(f)") and Land and Water Conservation Fund Act (referred to as "Section 6(f)").** Section 4(f) of the Department of Transportation Act of 1966 (49 USC §303) protects significant publicly owned parks, recreational areas, wildlife and waterfowl refuges, and public and private historic sites. Section 4(f) provides that the Secretary of Transportation may approve a transportation program or project requiring the use of publicly owned land of a public park, recreation area, or wildlife or waterfowl refuge of national, state, or local significance, or land of an historic site of national, state, or local significance, only if there is no feasible and prudent alternative to using that land and the program or project includes all possible planning to minimize harm resulting from the use. Section 6(f) of the Land and Water Conservation Fund Act (LWCFA) of 1965 (16 USC 4601-4 – 4601-11) provides matching funds to states or municipalities for planning, improvements, or acquisition of outdoor recreational lands. Any property that was planned, purchased, or improved with LWCFA money is considered a 6(f) property. Typically, Section 6(f) properties are recreational lands that are also regulated under Section 4(f) of the Department of Transportation Act. The Proposed Action would not result in any effects to public parks, refuges, historic sites, or marine protected areas. The proposed Reditus capsule will not splash down in protected ocean areas. There are no Section 4(f) or Section 6(f) properties within the vicinity of

the proposed Reditus capsule splashdown area. No facilities would be constructed at the splashdown area; there would be no constructive nor physical use of Section 4(f) or Section 6(f) properties. In addition, there would be no audible sonic boom that would affect Section 4(f) or Section 6(f) properties (see Section 3.5 and Appendix A).

- **Farmlands and Land Use.** The Proposed Action would occur completely in the marine environment and therefore would not impact farmlands or land use.
- **Hazardous Materials, Solid Waste, and Pollution Prevention.** Upon reentry and splashdown, the Reditus capsule would not contain any hazardous materials or fuels. All fuel and oxidizer (propene and nitrous oxide) tanks are intentionally vented prior to reentry; there are no expected residuals. However, the capsule would contain Panasonic 18650 lithium-ion batteries. As the batteries are expected to remain intact inside the capsule upon splashdown and be fully recovered, the potential for the lithium-ion batteries to be exposed to the marine environment is considered very low. In the unlikely event that the capsule is not recovered or breaks apart upon splashdown, thereby exposing the lithium-ion battery to the environment, there would only be approximately 43 grams of lithium released into the marine environment per RSR event, or 516 grams per year during the proposed 12 RSR operations per year. Therefore, given the very small amount of lithium within the batteries and the lithium would be quickly diluted within the water column, adverse effects to the marine environment are not expected. In addition, recovery vessel operations have the potential to release small amounts of oil and gas into the water. However, vessel operations would be conducted in accordance with the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78), which prohibits certain discharges of oil, garbage, and other substances from vessels. The Proposed Action is therefore not expected to have a significant impact on ocean water resources due to hazardous materials.

Each proposed Reditus RSR operation would only result in the deposition on the ocean bottom of a maximum of four items totaling approximately 57 square ft (ft²) (5 square m [m²]) in area (see **Table 2.2-1**), or 684 ft² (60 m²) per year. These items would be dispersed across a wide area and not settle within the same spot on the ocean bottom during each RSR operation.

After capsule recovery operations, the ENOS capsule will be brought back to Reditus's headquarters in Atlanta, Georgia, where the engineering team would evaluate the health of the vehicle's subsystems and components. If vehicle components, such as the batteries, are deemed to be faulty, they will be disposed of in accordance with federal and state laws.

In addition, those items that would not be recovered and would sink to the sea floor (see **Table 2.2-1**) are comprised of inert materials which are neither chemically or biologically reactive and contain no hazardous materials, and are anticipated to sink relatively quickly. Accordingly, they would not affect the marine environment in the short term (while the debris is floating or descending through the water column) or in the long term (when the debris has settled into benthic habitats). Therefore, there would be no significant impacts to the marine environment from hazardous materials or solid waste from proposed Reditus RSR operations.

- **Historical, Architectural, Archeological, and Cultural Resources.** Given the location of the proposed Reditus RSR operations more than 16 nm (30 km) from the coast of Florida, the potential for the occurrence of submerged cultural resources (historical and archaeological) is considered very low. Current databases and studies regarding cultural resources along the coast of Florida address areas much closer to shore (e.g., within 3 miles [4.8 km]) and do not provide

an inventory or assessment of cultural resources further from shore (Bureau of Ocean Energy Management 2021; National Ocean Service 2022; Florida Department of Environmental Protection [DEP] 2024b). Although the potential for a submerged cultural resource to occur within the Reditus splashdown area exists, even if a submerged cultural resource was present, the proposed Reditus RSR operations would only result in the deposition on the ocean bottom of four items totaling approximately 57 ft² (5 m²) in area (see **Table 2.2-1**). Additionally, these items would be dispersed across a wide area and not settle within the same spot on the ocean bottom after the proposed annual RSR operations. Therefore, there would be no significant impacts to any known or undiscovered submerged cultural resources from proposed Reditus RSR operations.

- **Natural Resources and Energy Supply.** The Proposed Action would not have any measurable effect on local supplies of energy or natural resources. Recovery vessel fuel use for reentry and recovery would be minimal and consistent with existing operations in the area. The Proposed Action would not result in the development of new facilities, changes in local energy demands, consumption of other natural resources, and would not require additional sources of power or other public utilities. Therefore, there would be no significant impacts to natural resources and energy supply from the proposed Reditus RSR operations.
- **Socioeconomics and Children's Environmental Health and Safety Risks.** The Proposed Action would not require construction or development. Only existing Reditus personnel would be used to conduct reentry operations and therefore would not induce population growth or affect the number of jobs in Atlanta, Georgia (the location of the Reditus headquarters) or in the nearby communities. The use of a marine research vessel out of Pensacola, Florida up to 12 times per year would also not induce population growth or affect the number of jobs in the region. The increase in vessel traffic around the Port of Pensacola associated with up to 12 ENOS capsule recoveries per year would be negligible compared to existing traffic and therefore would not contribute to socioeconomic impacts. Impacts to mariners in the area and associated activities would be short-term and infrequent, and therefore minimal. Potential socioeconomic impacts from re-routing aircraft or marine vessels due to commercial space operations are expected to be negligible relative to other causes leading to the re-routing of aircraft and marine vessels. Other issues or activities such as weather and military exercises also require airspace or seaspaces closures and may have longer and larger closure areas than the proposed Reditus RSR operations. Each RSR operation would comply with the necessary notification requirements, including issuance of NOTAMs and NOTMARs, consistent with current procedures. The continued deconfliction of maritime activities would ensure that there would be no adverse impacts on anticipated economic growth of Port of Pensacola from additional RSR activities.

Potential impacts to commercial and recreational fishing activities would be minimal. Maritime access restrictions during RSR activities could pose an inconvenience to recreational and commercial fishing operations. The fishing activity that could be affected within the study area from vessel restrictions would be a small fraction of the amount of fishing within the Gulf of America and would have a minimal effect on these fishing operations as all maritime restrictions would be temporary and spatially limited. Local commercial fishing operations would temporarily adjust their routes or find other suitable locations to fish to avoid revenue loss during these limited restricted activities. In addition, advance notice of temporary maritime closures for safety and/or security would be provided via NOTMARs and would assist all

mariners, including recreational and commercial fisherman, to plan their operations accordingly. Therefore, there would be no significant impacts to commercial and recreational fishing activities from the proposed Reditus RSR operations.

Potential socioeconomic impacts include additional airline operating costs for increased flight distances and times resulting from re-routing aircraft and increased passenger costs as a result of impacted passenger travel, including time lost from delayed flights, flight cancellations, and missed connections. Proposed RSR operations would neither result in the closure of any public airport during the operation nor so severely restrict the use of the surrounding airspace as to prevent access to an airport for an extended period of time. The FAA does not expect the temporary airspace closures associated with Reditus's proposed RSR operations to result in significant socioeconomic impacts. Further, local air traffic control facilities would coordinate with airports and aircraft operators to minimize the effect on airport traffic flows as well as traffic flows in en-route airspace.

As RSR operations would occur completely within the marine environment, no component of the Proposed Action would result in a disproportionate health and safety risk to children. Therefore, there would be no significant impacts related to socioeconomics or children's environmental health and safety risks from the proposed 12 Reditus RSR operations per year.

- **Visual Effects (including light emissions).** Visual effects are related to the extent to which the Proposed Action would produce light emissions that create annoyance or interfere with activities; or the extent to which the Proposed Action would detract from, or contrast with, visual resources or the visual character of the existing environment. As the Proposed Action would occur more than 16 nm (30 km) from shore in the Gulf of America, Reditus RSR operations would not affect visual resources. The Proposed Action would not degrade the existing visual character or quality of the area of the Gulf of America where proposed RSR operations would occur and would have no adverse effect on a scenic vista or scenic resources. Under the Proposed Action, no new source of substantial light or glare would be created that would adversely affect day or nighttime views in the area. In addition, the use of a recovery vessel conducting a roundtrip between Pensacola, Florida and the capsule splashdown area would not result in additional visual impacts compared to the existing marine vessel traffic in the region. Therefore, there would be no significant visual effects from proposed Reditus reentry operations.
- **Water Resources (Groundwaters, Floodplains, Wetlands, and Wild and Scenic Rivers):** The Proposed Action does not include any construction on or alteration of a floodplain, wetland, or Wild and Scenic River. The proposed Reditus ENOS capsule RSR operations would occur entirely over the ocean and would have no impact on groundwater. Therefore, the Proposed Action would not impact groundwaters, floodplains, wetlands, or Wild and Scenic Rivers.

3.2 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, the FAA would not issue a license to Reditus for the ENOS Mk 1 capsule reentries within the northeastern Gulf of America. Reditus would not be able to perform space-based research or develop reentry capsule capabilities. Under the No-Action Alternative, there would be no new impacts on the environmental impact categories analyzed in this EA.

3.3 AVIATION EMISSIONS AND AIR QUALITY

3.3.1 Definition of Resource and Regulatory Setting

Air quality is the measure of the condition of the air expressed in terms of ambient pollutant concentrations and their temporal and spatial distribution. Air quality regulations in the United States are based on concerns that high concentrations of air pollutants can harm human health, especially for children, the elderly, and people with compromised health conditions, as well as adversely affect public welfare by damaging crops, vegetation, buildings, and other property.

Under the Clean Air Act (CAA), the U.S. Environmental Protection Agency (EPA) developed the National Ambient Air Quality Standards (NAAQS) for six common air pollutants known as “criteria” pollutants (EPA 2026a). These criteria air pollutants are carbon monoxide (CO), nitrogen dioxide (NO₂), ozone (O₃), particulate matter (PM), sulfur dioxide, and lead (Pb). The EPA determined that these criteria air pollutants may harm human health and the environment, and cause property damage. The EPA regulates these pollutants to permissible levels through human health-based (primary standards) and environmental-based (secondary standards) criteria.

Based on measured ambient criteria pollutant data, the EPA designates all areas of the United States as having air quality better than the NAAQS (attainment), worse than the NAAQS (nonattainment), or unclassifiable (40 CFR Part 81, Subpart C, Section 107). The designation of attainment for any NAAQS is based on the evaluation of ambient air quality monitoring data collected through federal, state, and/or local monitoring networks.

The EPA General Conformity Rule (40 CFR part 93, subpart B) ensures the actions taken by federal agencies in nonattainment and maintenance areas conform to a state’s plan to meet the NAAQS. The General Conformity Rule applies only to federal actions occurring in nonattainment or maintenance areas. It provides that a federal agency cannot issue a permit for or support an activity unless the agency determines the action will conform to the most recent EPA-approved State Implementation Plan. This means that projects using federal funds or requiring federal approval must not:

1. Cause or contribute to any new violation of a NAAQS.
2. Interfere with provisions in the applicable State Implementation Plan for maintenance of any standard.
3. Increase the frequency or severity of any existing violation.
4. Delay the timely attainment of any standard, interim emission reduction, or other milestone.

The General Conformity Rule established emissions thresholds (40 CFR § 93.153[b]), known as *de minimis* levels, for use in evaluating the conformity of an action. To evaluate conformity, all changes in emissions due to the action are compared to the *de minimis* threshold specified in the General Conformity Rule for each pollutant. If the net emissions increases due to the action are less than the *de minimis* thresholds, the action is presumed to conform to the State Implementation Plan, and no further conformity evaluation is required. If the emission increases exceed any of the thresholds, then further assessment is required. In attainment areas, conformity does not apply, but the *de minimis* levels can be used as screening thresholds.

Toxic air pollutants, also called hazardous air pollutants (HAPs), are a class of pollutants that do not have ambient air quality standards but are examined on an individual basis when there is a source of these pollutants. Mobile sources of air emissions include launch vehicles, commercial ships, recreational boats, cruise ships, and aircraft. HAPs emitted from mobile sources are called Mobile Source Air Toxics (MSATs). MSATs are compounds emitted from highway vehicles and non-road equipment that are

known or suspected to cause cancer or other serious health and environmental effects. In 2001, the EPA issued its first Mobile Source Air Toxics Rule, which identified 21 compounds as being HAPs that required regulation (EPA 2001). A subset of six of these MSATs compounds were identified as having the greatest influence on health and included benzene, 1,3-butadiene, formaldehyde, acrolein, acetaldehyde, and diesel PM. The EPA issued a second Mobile Source Air Toxics Rule in February 2007, which generally supported the findings in the first rule and provided additional recommendations of compounds having the greatest impact on health. The rule also identified several engine emission certification standards that must be implemented (EPA 2007).

More information about air quality can be found in Chapter 1 of the 1050.1 Desk Reference (FAA 2023).

3.3.2 Study Area

The air quality study area includes Escambia County, Florida, where recovery vessels would transit during reentry operations, along with the route used to truck the capsule from Pensacola, Florida, to Reditus headquarters in Atlanta, Georgia. The study area extends up to 3,000 ft (914 m) above ground level (the mixing height). The mixing height is defined as the vertical region of the atmosphere where pollutant mixing occurs. Above this height, pollutants that are released generally do not mix with ground-level emissions and do not have an effect on ground level concentrations in the local area. The majority of recovery vessel emissions would be released in broad ocean areas, where attainment status is unclassified and the NAAQS do not apply.

Emissions associated with Reditus ENOS capsule reentries would be generated by the combustion of propellant during the reentry burn but these emissions would occur at elevations well above 3,000 ft (914 m) and over the broad ocean and, therefore, are not expected to affect air quality over land.

3.3.3 Existing Conditions

Existing air quality conditions in Escambia County, where recovery vessels would transit to and from, is in attainment for all criteria pollutants (EPA 2026b). In the offshore (Gulf of America) portion of the study area, existing air quality conditions are representative of background marine atmospheric environments, characterized by low ambient concentrations of criteria pollutants and minimal anthropogenic emission sources. The proposed Reditus ENOS capsule splashdown area would occur at a minimum of 80 nm (148 km) from shore and would be outside state coastal water jurisdictions.

3.3.4 Environmental Consequences

As stated previously in Section 2.2.2, after the final deorbit burn, all oxidizer and fuel tanks are vented and there would be no emissions associated with the propulsion system during reentry. Therefore, under the Proposed Action, the only activities that would result in emissions that would impact regional air quality are those associated with the marine research vessel used during the recovery of the Reditus ENOS capsule and a pickup truck used to transport the capsule from Pensacola, Florida to Atlanta, Georgia. The emissions from (1) a single marine research vessel travelling from Pensacola, conducting the recovery operation, and returning to Pensacola up to 12 times per year and (2) a single pickup truck making one round trip between Pensacola and Atlanta 12 times per year are expected to be below the *de minimis* levels. Therefore, the Proposed Action is exempt from further General Conformity evaluation. Emissions associated with the Proposed Action would not lead to concentrations that could exceed National, Florida, or Georgia Ambient Air Quality Standards. In addition, the majority of proposed RSR operations would occur more than 70 nm (130 km) from the 9-nm (16.7-km) territorial boundary from the coast of Florida where the National or Florida Ambient Air Quality Standards apply.

Therefore, there would be no significant impacts to air quality from conducting up to 12 proposed Reditus RSR operations per year.

Airspace closures associated with commercial space operations would result in additional aircraft emissions mainly from aircraft being re-routed and expending more fuel. Any delays in aircraft departures from affected airports would be short-term. Affected airports potentially include Panama City Airport, Apalachicola Municipal Airport, Tallahassee Regional Airport, Perry-Foley Airport, and Cross City Airport. However, given there are up to 12 reentries per year, how far offshore the AHA is from these airports (105 nm [194 km], 51 nm [94 km], 53 nm [98 km], 32 nm [59 km], and 36 nm [67 km], respectively), and the relatively short time period from the capsule entering the atmosphere to splashdown (approximately 15 minutes), aircraft grounding is not anticipated. Thus, increases in air emissions from grounded aircraft are not expected. Therefore, these emissions increases are not expected to result in an exceedance of a National or Florida Ambient Air Quality Standard for any criteria pollutant. Emissions from aircraft being rerouted would occur above 3,000 ft (914 m) (the mixing layer) and thus would not affect ambient air quality. Therefore, airspace closures associated with commercial space operations are not expected to result in significant air quality impacts.

3.4 BIOLOGICAL RESOURCES (INCLUDING FISH, WILDLIFE, AND PLANTS)

3.4.1 Definition of Resource and Regulatory Setting

Biological resources are valued for their intrinsic, aesthetic, economic, and recreational qualities, and they include fish, wildlife, plants, and their respective habitats. Typical categories of biological resources include terrestrial and aquatic plant and animal species, game and non-game species, special-status species (state or federally listed threatened or endangered species, marine mammals, or species of concern, such as species proposed for listing or migratory birds), and environmentally sensitive or critical habitats.

As the Proposed Action occurs wholly within the marine environment, this section focuses on marine biological resources. Marine biological resources include living, native, or naturalized plant and animal species and the habitats within which they occur. Habitat can be defined as the resources and conditions present in an area that support a plant or animal. For the purposes of this EA, marine biological resources are divided into two categories: EFH and special-status species.

3.4.1.1 Essential Fish Habitat (EFH)

The MSA, enacted in 1976 and amended by the Sustainable Fisheries Act in 1996 and the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006, mandates identification and conservation of EFH. EFH is defined as those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity (i.e., full life cycle). These waters include aquatic areas and their associated physical, chemical, and biological properties used by fish, and may include areas historically used by fish. Substrate types include sediment, hard bottom, structures underlying the waters, and associated biological communities. In addition to EFH designations, areas called Habitat Areas of Particular Concern (HAPCs) are also designated by the regional Fishery Management Councils. Designated HAPCs are discrete subsets of EFH that provide extremely important ecological functions or are especially vulnerable to degradation. In accordance with Section 305(b)(2) of the MSA, Federal agencies are required to consult with the National Marine Fisheries Service (NMFS) and to prepare an EFH assessment if potential adverse effects on EFH are anticipated from their activities.

3.4.1.2 Special-status Species

Special-status species includes marine species within the study area that are listed under the ESA, including associated critical habitat; marine mammals listed under the Marine Mammal Protection Act (MMPA); and bird species listed pursuant to the Migratory Bird Treaty Act (MBTA).

Endangered Species Act (ESA)

The ESA of 1973 (16 USC 1531–1544) provides for the conservation of endangered and threatened species and the ecosystems on which they depend. The ESA defines an endangered species as a species in danger of extinction throughout all or a significant portion of its range. A threatened species is one that is likely to become endangered within the near future throughout all or in a significant portion of its range. The U.S. Fish and Wildlife Service (USFWS) and NMFS jointly administer the ESA and are responsible for listing species as threatened or endangered and for designating critical habitat for listed species. The ESA allows the designation of geographic areas as critical habitat for threatened or endangered species. Section 7(a)(2) requires each federal agency to ensure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species. When a federal agency's action "may affect" a listed species, that agency is required to consult with the service (NMFS or USFWS) that has jurisdiction over the species (50 CFR section 402.14(a)).

Marine Mammal Protection Act (MMPA)

The MMPA of 1972 established, with limited exceptions, a moratorium on the "taking" of marine mammals in waters or on lands under U.S. jurisdiction. The Act further regulates "takes" of marine mammals on the high seas by vessels or persons subject to U.S. jurisdiction. The term "take," as defined by the MMPA, means "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal." "Harassment" was further defined in the 1994 amendments to the MMPA, which provided two levels of harassment: Level A (potential injury) and Level B (potential behavioral disturbance).

The MMPA directs the Secretary of Commerce (through National Oceanic and Atmospheric Administration [NOAA] Fisheries, also known as NMFS) and the Secretary of the Interior (through the USFWS) to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by U.S. citizens or agencies who engage in a specified activity (other than commercial fishing) within a specified geographical region if NMFS or USFWS finds that the taking will have a negligible impact on the species or stock(s), and will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses (where relevant).

Migratory Bird Treaty Act (MBTA)

The MBTA of 1918 (16 USC 703–712) and the Migratory Bird Conservation Act of 1929 (16 USC 715-715d, 715e, 715f–715r), are the primary laws in the United States established to conserve migratory birds. The MBTA prohibits the taking, killing, or possessing of migratory birds or the parts, nests, or eggs of such birds, unless permitted by regulation. The migratory bird species protected by the MBTA are listed in 50 CFR 10.13.

More information about biological resources can be found in Chapter 2 of the 1050.1 Desk Reference (FAA 2023).

3.4.2 Study Area

The study area for marine biological resources includes the 25 nm² (86 km²) area where expended debris from the ENOS capsule would impact the ocean's surface, water column, and bottom habitat; the ENOS capsule splashdown location (within the expended debris area); and the transit corridor for the marine research vessel from Pensacola to the recovery area and back. The continental shelf within the northeastern Gulf of America extends to approximately 60 nm (111 km) southwest of Apalachicola, Florida and 150 nm (278 km) west of Cedar Key, Florida (U.S. Department of State 2023). Therefore, the study area occurs completely over the continental shelf of the northeastern Gulf of America. The average depth within the proposed capsule recovery area is 72 ft (22 m).

3.4.3 Existing Conditions

3.4.3.1 Essential Fish Habitat (EFH)

The Gulf Council is responsible for designating EFH for all federally managed species occurring in the coastal and marine waters off Florida, Alabama, Mississippi, Louisiana, and Texas. In addition to designating EFH, the Gulf Council is also responsible for identifying HAPCs for federally managed species. EFH that is important to the long-term productivity of populations of one or more managed species, or particularly vulnerable to degradation, may also be identified by NMFS as a HAPC.

The entire marine study area is located within an area designated by the Gulf Council as EFH for four Fishery Management Plans (NMFS 2025):

- **Shrimp Species:** all estuaries and from Pensacola Bay, Florida, to the Florida Keys out to depths of 35 fathoms (210 ft [64 m]) (Gulf of Mexico Fishery Management Council [GMFMC] 2016; Gulf Council 2025c).
- **Highly Migratory Species:** northeast Gulf of America (NMFS 2006, 2017).
- **Coastal Migratory Pelagic Species:** all estuaries and from the US/Mexico border to the Florida Keys from estuarine waters out to depths of 100 fathoms (600 ft [182 m]) (GMFMC 2016; Gulf Council 2025a).
- **Reef Fish Species:** all coastal estuaries and from the US/Mexico border to the Florida Keys from estuarine waters out to depths of 100 fathoms (600 ft [182 m]) (GMFMC 2016; Gulf Council 2025b).

The proposed Reditus capsule splashdown area does not overlie any HAPC. Therefore, there would be no impacts to HAPCs from proposed Reditus RSR operations and HAPCs are not discussed further.

3.4.3.2 Special-Status Species

ESA-listed Species

Based on the USFWS Information for Planning and Consultation (IPaC) website, there is the potential for one ESA-listed species to occur within the Reditus study area under the jurisdiction of the USFWS: black-capped petrel (*Pterodroma hasitata*) (**Table 3.4-1**) (USFWS 2026; see Appendix B). The black-capped petrel is a pelagic seabird that breeds on Caribbean islands and travels long distances to foraging areas in the western Atlantic and southern Caribbean basins, and the northern Gulf of Mexico. They are relatively scarce in shallower continental shelf areas and most common near seamounts, submarine ridges, and other benthic landscapes (e.g., continental shelf break) where vigorous current mixing and deep upwelling bring food items (e.g., squid and fish) to the surface (USFWS 2023).

In addition to the marine bird species under the jurisdiction of the USFWS, 12 marine species under the jurisdiction of NMFS potentially occur within the Reditus study area: 5 whale species, 5 sea turtle species, and 2 fish species (**Table 3.4-1**).

Table 3.4-1. ESA-listed Marine Species Potentially Occurring within the Reditus Study Area

Common Name (Scientific Name)	ESA Status
BIRDS	
Black-capped petrel (<i>Pterodroma hasitata</i>)	Endangered
WHALES	
Blue whale (<i>Balaenoptera musculus</i>)	Endangered
Fin whale (<i>Balaenoptera physalus</i>)	Endangered
Rice's whale (<i>Balaenoptera ricei</i>)	Endangered, PCH
Sei whale (<i>Balaenoptera borealis</i>)	Endangered
Sperm whale (<i>Physeter macrocephalus</i>)	Endangered
SEA TURTLES	
Green turtle (<i>Chelonia mydas</i>) – North Atlantic DPS	Threatened, PCH
Hawksbill (<i>Eretmochelys imbricata</i>)	Endangered
Kemp's ridley (<i>Lepidochelys kempii</i>)	Endangered
Leatherback turtle (<i>Dermochelys coriacea</i>)	Endangered
Loggerhead turtle (<i>Caretta caretta</i>) – Northwest Atlantic DPS	Threatened
FISH	
Gulf sturgeon (<i>Acipenser oxyrinchus desotoi</i>)	Threatened
Smalltooth sawfish (<i>Pristis pectinata</i>)	Endangered

Notes: DPS = Distinct Population Segment; PCH = proposed critical habitat.

Sources: NOAA Fisheries (2025); USFWS (2026).

- **Whales**

The five whale species are all found in deeper pelagic waters beyond the continental shelf edge that lies approximately 80 nm (148 km) to the west of the proposed RSR operations and are not expected to occur within the shallow waters of the Reditus study area (NOAA Fisheries, 2025).

None of the whale species has designated critical habitat within the Gulf of America.

However, in July 2023, NMFS proposed critical habitat for Rice's whale within the northern Gulf of Mexico (now Gulf of America) (**Figure 3.4-1**) (NMFS 2023a). Within the proposed rule for critical habitat, NMFS identified the physical and biological features essential to the conservation of the species. The physical feature considered essential to the conservation of the Rice's whale includes the Gulf of Mexico (now Gulf of America) continental shelf and slope associated waters between the 100 and 400 m isobaths that support individual growth, reproduction, and development, social behavior, and overall population growth. The following biological attributes of this physical feature support Rice's whales' ability to forage, develop, communicate, reproduce, rear calves, and migrate throughout the Gulf of America continental shelf and slope waters:

1. *Prey Species* – sufficient density, quality, abundance, and accessibility of small demersal and vertically migrating prey species, including scombriformes, stomiiformes, myctophiformes, and myopsida;
2. *Marine Waters* – marine water with (i) elevated productivity, (ii) bottom temperatures of 10–19 degrees Celsius, and (iii) levels of pollutants that do not preclude or inhibit any demographic function; and

3. *Underwater Noise* – sufficiently quiet conditions for normal use and occupancy, including intraspecific communication, navigation, and detection of prey, predators, and other threats (NMFS 2023a).

The proposed critical habitat area is approximately 60 nm (113 km) southwest of the proposed Reditus capsule splashdown location and debris area and 9 nm (16 km) south of the proposed recovery vessel transit corridor (**Figure 3.4-1**).

Located within the northwestern portion of the proposed critical habitat, the Rice's whale core distribution area is within the northeastern Gulf of America centered along the -200-m isobath (Continental Shelf break) and between the -100-m and -400-m isobaths (**Figure 3.4-2**) (NMFS 2020; Rosel & Garrison 2022; Garrison et al. 2024). As with the proposed critical habitat, the core distribution area is approximately 60 nm (113 km) southwest of the proposed Reditus capsule recovery area and 9 nm (16 km) south of the proposed recovery vessel transit corridor.

- *Sea Turtles*

The threatened green turtle North Atlantic Distinct Population Segment (DPS) occurs in inshore and nearshore waters from Texas to Maine, the U.S. Virgin Islands, and Puerto Rico (NOAA Fisheries 2025). In July 2023, NMFS proposed migratory and surface-pelagic foraging/resting critical habitat for green turtles in the marine environment. Proposed migratory critical habitat occurs from the mean high water line to 20 m depth, with sufficiently unobstructed waters that allow for unrestricted transit of reproductive individuals between benthic foraging/resting and reproductive areas. Surface-pelagic foraging/resting include convergence zones, frontal zones, surface-water downwelling areas, the margins of major boundary currents, and other areas that result in concentrated components of the *Sargassum*-dominated drift community, as well as the currents which carry turtles to *Sargassum*-dominated drift communities, which provide sufficient food resources and refugia to support the survival, growth, and development of post-hatchlings and surface-pelagic juveniles (NMFS 2023b). The Reditus study area is within both the proposed migratory critical habitat area and the proposed surface-pelagic foraging/resting critical habitat area.

Hawksbill, Kemp's ridley, leatherback, and loggerhead turtles are considered rare in the Gulf of America (NOAA Fisheries 2025). Although there is designated critical habitat for hawksbill and loggerhead turtles, it does not occur within the Reditus study area.

- *Fish*

Gulf sturgeon occur in rivers during summer and in marine and estuarine environments during winter. Their present range extends from Lake Pontchartrain and the Pearl River system in Louisiana and Mississippi respectively, east to the Suwannee River in Florida, which includes a portion of the proposed recovery vessel transit corridor (NOAA Fisheries 2025).

Smalltooth sawfish are primarily found in shallow, coastal waters near mangroves and estuaries, and sometimes enter the lower reaches of freshwater river systems. In the United States, smalltooth sawfish are most often found off the southwest coast of Florida south of the study area, from about Charlotte Harbor through the Everglades and Florida Keys region at the southern tip of Florida (NOAA Fisheries 2025).

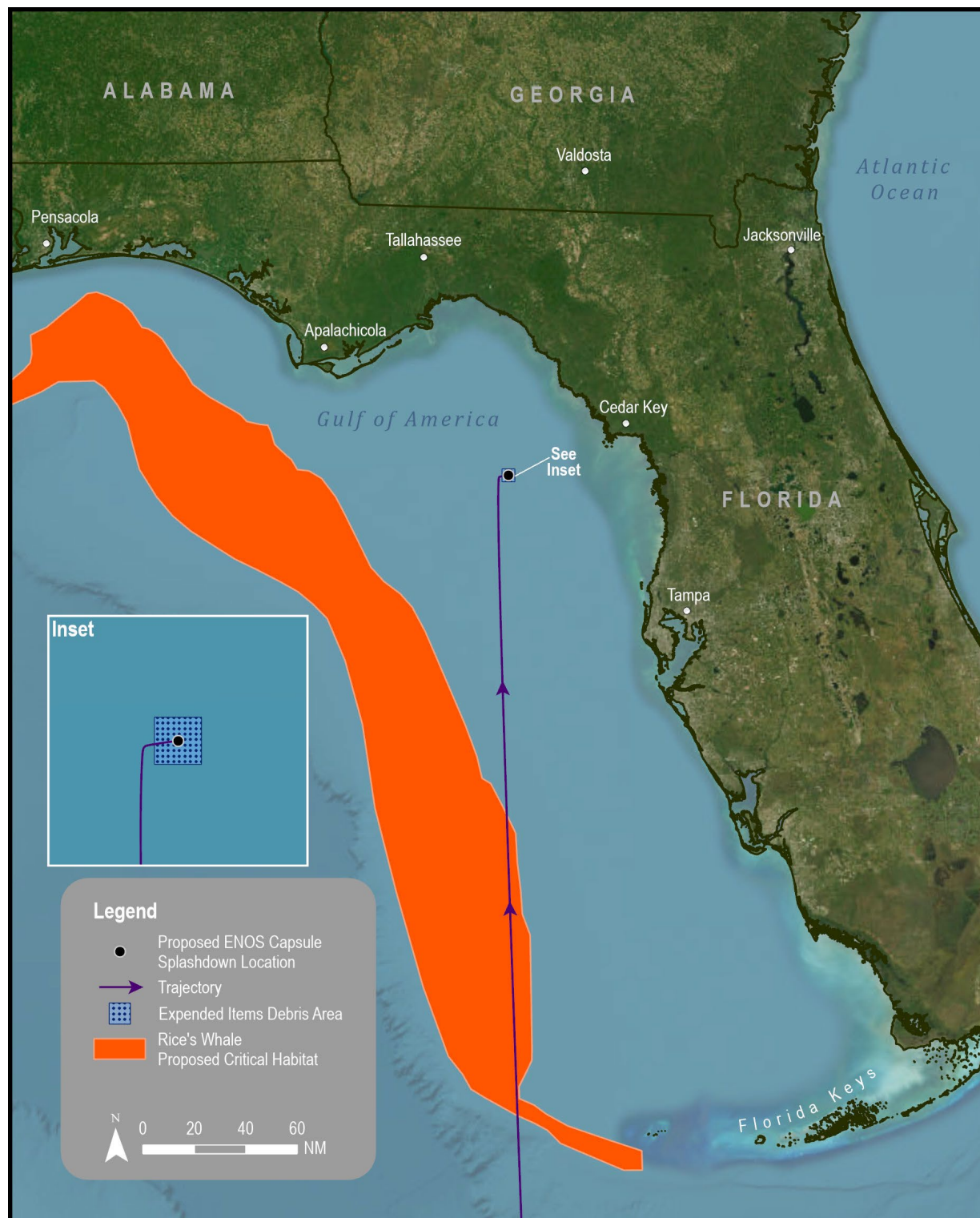


Figure 3.4-1. Location of ENOS Capsule Reentry Trajectory, Splashdown Location, and Expended Debris Area and Rice's Whale Proposed Critical Habitat within the Gulf of America
(Source: NMFS [2023a]).

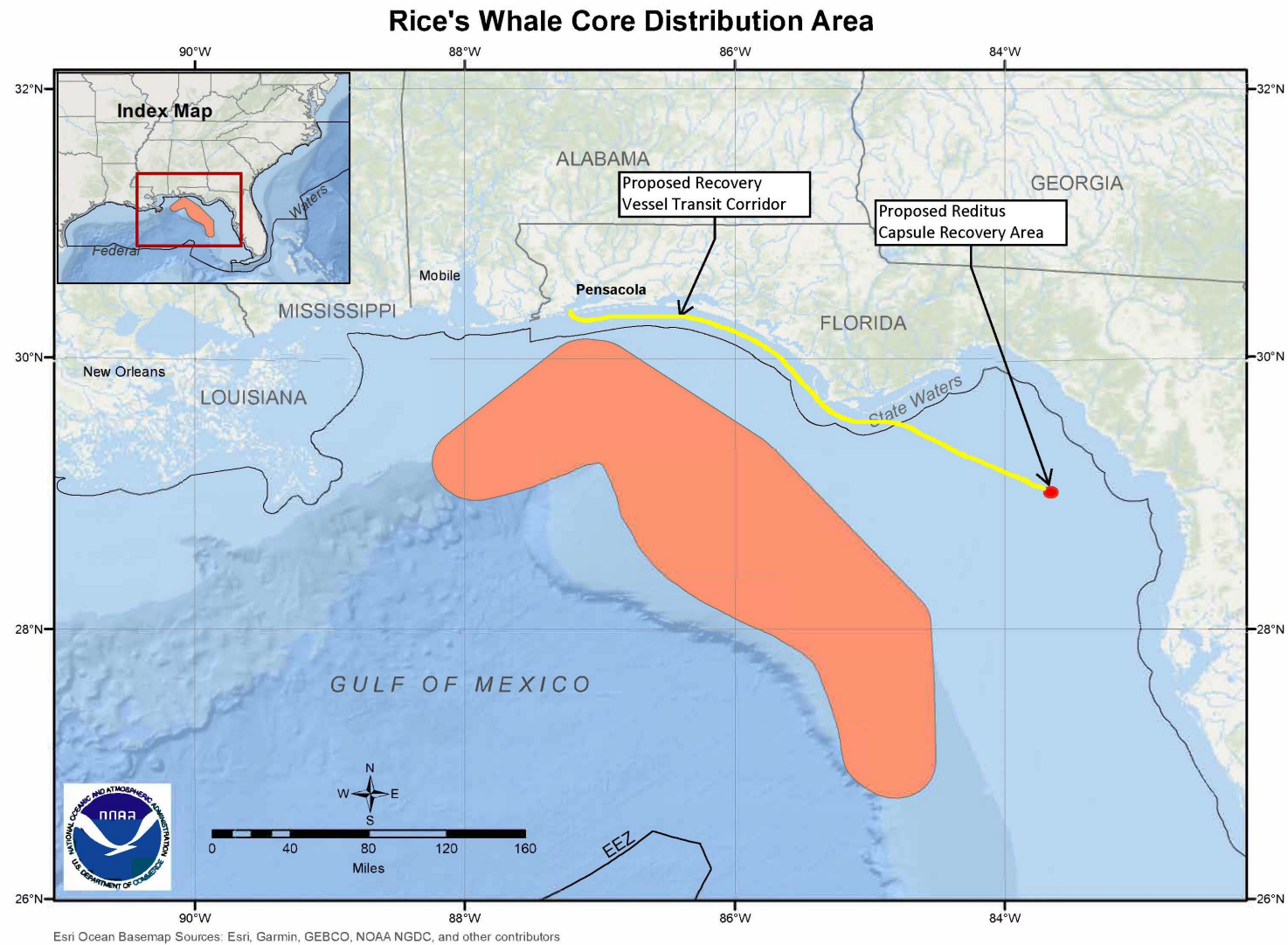


Figure 3.4-2. Location of Rice's Whale Core Distribution Area within the Gulf of America (previously Gulf of Mexico)
(Source: Rosel and Garrison [2022]).

MMPA-listed Species

Of the 28 species of marine mammals known to occur in the Gulf of America, only 3 species of dolphins commonly occur in nearshore waters (i.e., estuarine waters to the continental shelf edge): common bottlenose dolphin (*Tursiops truncatus*), Atlantic spotted dolphin (*Stenella frontalis*), and Risso's dolphin (*Grampus griseus*) (NMFS 2012; NOAA Fisheries 2025). However, Atlantic spotted dolphins and Risso's dolphins are typically found along the continental shelf edge approximately 120 nm (222 km) to the southwest of the proposed recovery vessel transit corridor and 120 nm (222 km) southwest of the capsule recovery area and are not expected to occur within the Reditus study area. In addition, humpback whales may be found in nearshore waters of the Gulf of America, usually during the winter season. However, sightings are uncommon (NOAA Fisheries 2025). Therefore, only the bottlenose dolphin is expected to occur within the Reditus study area.

MBTA-listed Species

Bird species likely to occur within the Reditus study area greater than 16 nm (30 km) from shore include those typically found in the open ocean and pelagic zone, including sooty tern (*Onychoprion fuscatus*), bridled tern (*Onychoprion anaethetus*), royal tern (*Thalasseus maximus*), Cory's shearwater (*Calonectris borealis*), greater shearwater (*Puffinus gravis*), Sargasso shearwater (*Puffinus lherminieri*), brown booby (*Sula leucogaster*), and magnificent frigatebird (*Fregata magnificens*) (Haney et al. [2025]; USFWS [2026]; see Appendix B).

3.4.4 Environmental Consequences

A significant impact on biological resources would occur if the USFWS or NMFS determines that the action would likely jeopardize the continued existence of a federally listed threatened or endangered species or would result in the destruction or adverse modification of federally designated critical habitat. The FAA has not established a significance threshold for unlisted species. Factors to consider when assessing the significance of potential impacts on unlisted species include whether the action would have the potential for:

- A long-term or permanent loss of unlisted plant or wildlife species (i.e., extirpation of the species from a large project area [e.g., a new commercial service airport];
- Adverse impacts on special-status species (e.g., state species of concern, species proposed for listing, migratory birds, bald and golden eagles) or their habitats;
- Substantial loss, reduction, degradation, disturbance, or fragmentation of native species' habitats or their populations; or
- Adverse impacts on a species' reproductive success rates, natural mortality rates, non-natural mortality (e.g., road kills and hunting), or ability to sustain the minimum population levels required for population maintenance (FAA 2025b).

Implementation of the Proposed Action may result in impacts to marine biological resources, particularly marine wildlife, from: (1) a recovery vessel/ship strike of ESA-listed and MMPA-listed species; (2) expended capsule debris settling on the ocean bottom; (3) strikes of marine species from capsule debris and the capsule during reentry and splashdown, respectively; and (4) entanglement of marine species with the drogue parachute. As stated below in Section 3.5 (*Noise and Noise-Compatible Land Use*), based on noise modeling of the capsule during reentry, a sonic boom would intersect with the Earth's surface, though at a very low level (<0.1 psf). The vehicle is simply too small, too light, and too high (before slowing to subsonic speeds) to generate a large amount of energy that would reach the

earth's surface. Therefore, there would be no potential for acoustic impacts to wildlife species from the Reditus capsule reentry.

3.4.4.1 Essential Fish Habitat (EFH)

During each proposed Reditus capsule reentry, up to four items would be jettisoned from the capsule and not recovered (**Table 3.4-2**). All items are expected to sink relatively quickly and settle on the ocean bottom.

Table 3.4-2. Summary of Non-recovered Expended Items Associated with the Reentry and Splashdown of the Reditus ENOS Capsule

Item	Material	Recovered/ Fate	Weight	Size	Surface Area*
Lid for drogue parachute	High-performance polymer	No/ Sink to the seafloor	4.4 lb	6 x 6 inches	0.25 ft ²
Container for drogue parachute	Stainless steel		0.8 lb	6.1 x 1.1 inches	0.05 ft ²
Drogue parachute	Kevlar and nylon		2.4 lb	6-ft in diameter	56.5 ft ²
Kevlar deployment bag	Kevlar		0.4 lb	4.8 x 3.6 inches	0.1 ft ²
Potential Maximum Total			8.0 lb		56.9 ft ²

Notes: *Assumes that the drogue parachute is not fully opened when it comes to rest on the seafloor.

The proposed splashdown location and expended items debris area where the expended items would potentially impact the ocean is located approximately 40 nm (74 km) from the closest point of land (**Figure 2.2-2**). It overlies EFH for shrimp species, highly migratory species, coastal migratory pelagic species, and reef fish species. The capsule and associated expended materials are expected to splash down within the center of the proposed expended items debris area. However, the total area of EFH that would be impacted with the settling of the expended items onto the seafloor would be a maximum of approximately 57 ft² (5 m²) (**Table 3.4-2**). Given the potential impact to EFH from this very small area of debris relative to the total area of EFH in the study area, there would be minimal adverse effects to EFH with implementation of the Proposed Action. Therefore, in accordance with 50 CFR § 600.920(f), the FAA will use this EA as the EFH Assessment to support the EFH consultation process with NMFS.

3.4.4.2 Special-Status Species

ESA-listed and MMPA-listed Species

In January 2022, NMFS completed a programmatic ESA section 7 consultation with the FAA, NASA, and U.S. Space Force (USSF) for commercial space launches and reentries and their potential impacts to ESA-listed marine species in the Pacific and Atlantic oceans and Gulf of Mexico (now Gulf of America). NMFS concurred with the FAA, NASA and the USSF, that the proposed action may affect, but is not likely to adversely affect ESA-listed species and designated critical habitat and issued a Programmatic Letter of Concurrence (PLOC) (NMFS 2022). The programmatic consultation addressed the effects of RSR operations activities, similar to those currently proposed by Reditus. The FAA reinitiated consultation with NMFS on July 29, 2025, to expand the geographic and operational scope of the consultation, which would cover Reditus's proposed 12 RSR operations in the Gulf of America. NMFS issued a PLOC for the reinitiated consultation on May 4, 2026 (NMFS 2026).⁽¹⁾

- *Ship Strike*. Marine vessels are used to recover spacecraft and other associated materials. Vessels may also be used for surveillance to ensure that designated hazard areas are clear of non-participating crafts. These watercraft operations have potential to result in a ship strike of ESA-

⁽¹⁾Available at https://www.faa.gov/space/environmental/FAA-USSF-NASA_PLOC_Reinitiation_2026_signed.pdf.

listed and MMPA-listed species that spend time at or near the surface of the water (e.g., marine mammals and sea turtles). ESA-listed marine mammals and sea turtles can spend time at the surface, but most of their time is spent submerged.

All marine vessels would be required to comply with the 2026 PLoC project design criteria for vessel operations (NMFS 2026) (see Section 3.4.4.3 *Avoidance, Minimization, and/or Mitigation Measures*).

During the portion of time that ESA-listed marine mammals and sea turtles may spend near the ocean surface, NMFS concluded that ship strikes are considered extremely unlikely to occur and therefore discountable, due to the use of dedicated observation personnel and safety procedures for avoidance. Based on previous operation reports provided as part of ESA section 7 consultations for similar operations, there have been no reported ship strikes of ESA-listed marine species. Therefore, NMFS concluded that the potential for ship strikes to ESA-listed marine species in the action area due to marine vessel operations covered under the PLoC may affect, but are not likely to adversely affect ESA-listed marine species (NMFS 2026).

- *Debris Strikes and Entanglement.* The area where expended debris would splashdown from proposed reentry operations is a 25 nm² (86 km²) area surrounding the proposed ENOS capsule splashdown location within the Gulf of America (**Figure 3.4-1**). ESA-listed species are sparsely distributed across the marine environment, resulting in very low densities of species overall. The probability of any ESA-listed species being in the same spot where reentry materials happen to strike the ocean is highly unlikely, and therefore, the risk of being directly hit by any falling objects from reentry operations is extremely low. In summary, because it would be extremely unlikely for an ESA-listed species to be directly struck by reentry-related debris, the potential for effects to ESA-listed species from a direct impact by those fallen objects are discountable. For those species under NMFS jurisdiction, NMFS concluded in the PLoC that direct impacts from fallen objects to ESA-listed marine mammals, sea turtles, and fish because of reentry activities may affect, but are not likely to adversely affect these species (NMFS 2026). For the single seabird species under the jurisdiction of the USFWS (black-capped petrel), given it primarily occurs within the offshore waters associated with the continental shelf and would rarely occur within the coastal area where proposed debris would strike the ocean surface, the probability of a petrel being in the same spot where reentry materials happen to strike the ocean is highly unlikely, and therefore, the risk of being directly hit by any falling objects from reentry operations is extremely low and discountable. Therefore, direct impacts from fallen objects associated with reentry activities *may affect, but are not likely to adversely affect* the black-capped petrel. In accordance with ESA section 7, FAA is consulting with USFWS on potential impacts to the black-capped petrel.

Debris associated with the Reditus RSR operations would fall within a 25 nm² (86 km²) area surrounding the proposed ENOS capsule splashdown location approximately 60 nm (111 km) northeast of the proposed critical habitat for Rice's whale. Implementation of the proposed Reditus RSR operations would include recovery of the main parachute to the maximum extent practicable. Parachutes that are not recovered would sink quickly. With the proposed recovery of parachutes associated with reentry operations, and in the rare occasion they are not recovered, NMFS (2026) concluded that due to the limited time they would spend in the water column, exposure of ESA-listed mammals, sea turtles, or fishes to the parachutes is extremely unlikely and therefore the risk of entanglement is discountable. In addition, NMFS concluded that impacts to proposed critical habitat in the action area from unrecovered debris because of activities covered

under the PLoC may affect, but are not likely to adversely affect, proposed critical habitat (NMFS 2026).

MBTA-listed Species

Potential impacts to seabirds from Reditus capsule debris during reentry operations would be the same as that previously discussed above for Special-status Species. Because it would be extremely unlikely for a seabird species to be directly struck by reentry-related debris, the potential for effects to MBTA-listed species from a direct impact by those fallen objects is discountable.

3.4.4.3 Avoidance, Minimization, and/or Mitigation Measures

ESA-listed and MMPA-listed Species

In accordance with the 2026 PLoC (NMFS 2026) for effects on ESA-listed species from commercial space launch and reentry operations, the following Project Design Criteria (PDCs) will be implemented by Reditus as part of the Proposed Action. As stated in the PLoC, PDCs include environmental protection measures developed by the FAA to limit the effects of launch and reentry operations. These environmental protection measures will lead to avoidance and minimization of effects to ESA-listed and MMPA-listed species in the study area to assist in the conservation of these resources.

Recovery Vessel Operations. All vessel operators will be on the lookout for and attempt to avoid collision with ESA-listed and MMPA-protected species. A collision with an ESA-listed species will require reinitiation of consultation. Marine vessel operators will ensure the vessel strike avoidance measures and reporting are implemented and will maintain a safe distance by following these protective measures (NMFS 2026):

- All vessel operators will be on the lookout for and attempt to avoid collision with ESA-listed and MMPA-protected species.
- When an ESA-listed or MMPA-protected species is observed, vessel operators will do the following:
 - Maintain a minimum distance of 150 ft (45.7 m) from sea turtles.
 - Maintain a minimum distance of 300 ft (91.4 m) from all other ESA-listed and MMPA-protected species.
 - If the distance from the vessel to the ESA-listed or MMPA-protected species becomes less than the distance specified in these PDCs, reduce vessel speed and shift the engine to neutral. Do not engage the engines until the animals are clear of the area and transit route.
 - Reduce vessel speed to 10 knots or less when mother/calf pairs or groups (more than two individuals) of marine mammals are observed.
 - Attempt to remain parallel to (e.g., when animals are bow-riding), or move the vessel away from, an ESA-listed or MMPA-protected species' course while the vessel is in transit and avoid excessive speed or abrupt changes in direction until the animal(s) have left the area or transit route.
- No operations will occur within Rice's whale core distribution area.
- No operations will occur within 20 NM (37 km) of the Flower Garden Banks National Marine Sanctuary and the Florida Keys National Marine Sanctuary or listed coral reef areas.

- Vessels will slow to 10 knots or less and maintain a minimum distance of 1,500 ft (457.2 m) from Rice's whale. If a whale is observed but cannot be confirmed as a species other than a Rice's whale, the vessel operator must assume that it is a Rice's whale.
- Vessels will maintain speeds to 10 knots or less in Rice's whale proposed critical habitat.

Annual Reporting. To assist the FAA in its annual reporting requirements to NMFS in accordance with the PLoC (NMFS 2026), Reditus will provide the following annually:

1. The dates and locations of all missions, including launch site, launch and reentry vehicles and any relevant license or permit that authorized the activities;
2. Contact information for the agencies and commercial entities involved in the events;
3. Details of launch and reentry operations that may affect the marine environment or ESA-listed species, such as stage landings at sea, activities that involve entry of materials into the marine environment, and activities that may indirectly affect the marine environment;
4. Dates of reentry and recovery operations if different from launch date;
5. Approximate locations with GPS coordinates (or last known GPS coordinates) of all landing locations, including recovered and unrecovered stages, fairings, skirt rings, parachutes, debris, and any other components that end up in the marine environment.
6. Information regarding vessels used during operations and transit routes, as well as aircraft activity associated with an event;
7. Any available information on the location and fate of unrecovered parachutes, parafoils, expended components, and debris;
8. Information regarding the implementation of the PDCs described above, including any relevant PDCs not implemented or issues with implementing the PDCs;
9. Information regarding any potential effects to ESA-listed species and critical habitat due to the activities; and
10. Sighting logs with observations of ESA-listed species with date, time, location, species, number of animals, distance and bearing from the vessel, direction of travel, behavior, and other relevant information.

3.4.4.4 Impact Conclusion

Based on the analysis presented above in Sections 3.4.4.1 and 3.4.4.2, and implementation of the avoidance, minimization, and/or mitigation measures listed in Section 3.4.4.3, there would be no significant impacts to biological resources from Reditus's proposed 12 RSR operations per year for the ENOS capsule within the northeastern portion of the Gulf of America.

3.5 NOISE AND NOISE-COMPATIBLE LAND USE

3.5.1 Definition of Resource and Regulatory Setting

Sound is a physical phenomenon consisting of pressure fluctuations that travel through a medium, such as air, and are sensed by the human ear. Noise is considered any unwanted sound that interferes with normal activities (such as sleep, conversation, student learning) and can cause annoyance. Noise sources can be constant or of short duration and contain a wide range of frequency (pitch) content. Determining the character and level of sound aids in predicting the way it is perceived. Both launch noise and sonic booms are classified as short-duration events.

The compatibility of existing and planned land uses with proposed FAA actions is usually determined in relation to the level of reentry vehicle noise. Federal compatible land use guidelines for a variety of land

uses are provided in Table 1 in Appendix A of 14 CFR part 150, Land Use Compatibility with Yearly Day-Night Average Sound Levels. Compatible land use analysis considers the effects of noise on special management areas, such as national parks, national wildlife refuges, and other sensitive noise receptors. The concept of land use compatibility corresponds to the objective of achieving a balance between the Proposed Action and the surrounding environment.

The FAA has determined that the cumulative noise energy exposure of individuals to noise resulting from FAA actions must be established in terms of yearly Day-Night Average Sound Level (DNL), the FAA's primary noise metric. DNL accounts for the noise levels of all individual reentry vehicle events, the number of times those events occur, and the period of day/night in which they occur. The DNL metric logarithmically averages sound levels at a location over a complete 24-hour period, with a 10-decibel (dB) adjustment added to those noise events occurring from 10:00 p.m. to 7:00 a.m. The 10 dB adjustment is added because of the increased sensitivity to noise during normal nighttime hours and because ambient (without aircraft/launch/reentry vehicles) sound levels during nighttime are typically about 10 dB lower than during daytime hours. More information about noise and noise-compatible land use can be found in Chapter 11 of the 1050.1 Desk Reference (FAA 2023).

3.5.2 Study Area

The study area for noise encompasses the areas exposed to sonic booms generated during reentry, as well as the transit corridor for recovery vessels between the splashdown location and the port of Pensacola, Florida. The study area is entirely over the open ocean.

3.5.3 Existing Conditions

As the study area is over the open ocean, the existing noise levels are low. Ambient noise levels are dominated by natural ocean sounds, wind, and occasional vessel traffic. Regularly occurring sources of instantaneous noise include vocalizations from marine mammals and birds while existing sources of anthropogenic noise include commercial shipping, fishing vessels, and aircraft overflights. Ships and aircraft overflights create louder intermittent noise levels. While maritime traffic occurs in the broader region, vessels are generally dispersed and would be distant from the reentry splashdown location with the issuance of NOTMARs.

3.5.4 Environmental Consequences

Reditus ENOS capsule reentries would generate a sonic boom. The modeling program PCBoom (version 7.5) was used to predict the peak overpressures and impact locations of the sonic boom (see Appendix A). Based on the modeling, a sonic boom is predicted to intersect the Earth's surface over the ocean, with maximum predicted overpressures less than 0.1 psf over a small area (0.5 nm²). For context, an overpressure of 1 psf is similar to a thunderclap. The sonic boom is not expected to be heard by the general public.

Potential noise impacts could occur from vessel engines during ENOS capsule recovery efforts. This noise would be short-term and infrequent and similar to noise already occurring in the study area due to common maritime operations and would therefore not be expected to cause significant impacts.

Airspace closures associated with the Proposed Action could result in temporarily grounded aircraft at affected airports and re-routing of en-route flights on other established flight paths. Aircraft could be temporarily grounded if airspace above or around the airport is closed. Ground delays are also used under some circumstances to avoid airborne reroutes. If aircraft were grounded, noise levels at the airport could temporarily increase if the planes sit idle; some aircraft would likely shut down engines

altogether until the closure has lifted. Also, depending on the altitude at which aircraft approach an airport, there could be temporary increases in noise levels in communities around the airports. Aircraft would travel on existing routes and flight paths that are used on a regular basis to account for weather and other temporary restrictions. Any incremental increases in noise levels at individual airports would only last the duration of the airspace closure on a periodic basis and are not expected to meaningfully change existing day-night average sound levels at the affected airports and surrounding areas. Therefore, airspace closures due to the Proposed Action are not expected to result in significant noise impacts.

In summary, the Proposed Action is not expected to result in significant noise impacts.

3.6 WATER RESOURCES (SURFACE WATERS)

3.6.1 Definition of Resource and Regulatory Setting

Water resources are surface waters and groundwater that are vital to society; they are important in providing drinking water and in supporting recreation, transportation and commerce, industry, agriculture, and aquatic ecosystems. For the reasons described in Section 3.1, this EA focuses only on surface waters (ocean waters). The major law pertaining to water resources includes the Clean Water Act (CWA). The CWA establishes the basic structure for regulating the discharge of pollutants into waters of the United States. More information about water resources can be found in Chapter 14 of the 1050.1 Desk Reference (FAA 2023).

3.6.2 Study Area

The study area for water resources is the ocean waters where the ENOS capsule would splash down and be recovered (**Figure 2.2-2**), as well as waters along the vessel transit routes.

3.6.3 Existing Conditions

Pensacola Bay and adjacent nearshore waters within the study area exhibit shallower depths, along with water quality and habitat conditions typical of estuarine environments, and more concentrated commercial vessel activity due to the proximity of established port facilities and navigation channels. Ocean waters within the study area consist of offshore, deep, high-salinity environments defined by prevailing current systems. Water quality in ocean waters may be characterized by temperature, salinity, dissolved oxygen, and nutrient levels. The study area also supports ongoing marine vessel traffic and military operations, which contribute to the overall activity profile.

3.6.4 Environmental Consequences

Upon reentry and splashdown, the Reditus capsule would not contain any hazardous materials or fuels. However, the capsule would contain Panasonic 18650 lithium-ion batteries. As the batteries are expected to remain intact inside the capsule upon splashdown and be fully recovered, the potential for the lithium-ion batteries to be exposed to the marine environment is considered very low. In the unlikely event that the capsule is not recovered or breaks apart upon splashdown thereby exposing the lithium-ion battery to the environment, there would only be an approximately 43 grams of lithium released into the marine environment per RSR operation, or 516 grams per year (see above discussion under *Hazardous Materials, Solid Waste, and Pollution Prevention*). Therefore, given the very small amount of lithium within the batteries, and the lithium would be quickly diluted within the water column, adverse effects to the marine environment are not expected.

Recovery vessel operations would also have the potential to release small amounts of oil and gas into the water. However, vessel operations would be conducted in accordance with the International

Convention for the Prevention of Pollution from Ships (MARPOL 73/78), which prohibits certain discharges of oil, garbage, and other substances from vessels. The Proposed Action is therefore not expected to have a significant impact on ocean water resources due to hazardous materials.

In addition, those items that would not be recovered and would sink to the sea floor (see **Table 2.2-1**) are comprised of inert materials which are neither chemically or biologically reactive and contain no hazardous materials, and are anticipated to sink relatively quickly. Accordingly, they would not affect the marine environment in the short term (while the debris is floating or descending through the water column) or in the long term (when the debris has settled into benthic habitats). Therefore, there would be no significant impacts to water resources from proposed Reditus RSR operations.

Chapter 4

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Chapter 5

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Appendix A. Sonic Boom Modeling Report

APPENDIX A

Sonic Boom Modeling Report in Support of the Environmental Assessment for the Proposed Reditus Space ENOS Capsule Reentries in the Gulf of America

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A.1 PURPOSE

To determine the potential for a sonic boom to be generated by the Reditus ENOS capsule during reentry, the modelling program PCBoom (version 7.5) was used to predict the peak overpressures and impact locations of a potential sonic boom. During reentry and its descent from orbit, the Reditus capsule would exceed the speed of sound (i.e., becomes supersonic) and produce a sonic boom.

A.2 METHODS

PCBoom considers the size and shape of the vehicle and the trajectory in relationship to the thrust, drag, and weight of the vehicle, which vary during the flight of the vehicle, to estimate the initial signature of the overpressure. PCBoom propagates the overpressure a standard meteorological condition (atmospheric profile). The PCBoom model is run, results are projected within a Geographic Information System (GIS), and sonic boom contours (using pounds per square foot [psf] as the interval) are generated to show the sonic boom footprint.

A.3 RESULTS

Based on the noise modeling conducted for the reentry of the ENOS capsule, a sonic boom associated with the reentry of the ENOS capsule would intersect with the Earth's surface, though at a very low level (<0.1 psf). The vehicle is simply too small, too light, and too high (before slowing to subsonic speeds) to generate a large amount of energy that would reach the earth's surface.

Appendix B. USFWS IPaC Resource List – Proposed Reditus ENOS Capsule Reentry

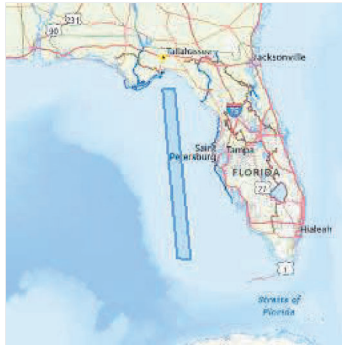
APPENDIX B

USFWS IPaC Resource List – Proposed Reditus ENOS Capsule Reentry

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This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Location



777 37th St
Suite D-101
Vero Beach, FL 32960-3559

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species¹ and their critical habitats are managed by the [Ecological Services Program](#) of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries²).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact [NOAA Fisheries](#) for [species under their jurisdiction](#).

- 1 Species listed under the [Endangered Species Act](#) are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the [listing status page](#) for more information. IPaC only shows species that are regulated by USFWS (see FAQ).
2. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Birds

NAME	STATUS
Black-capped Petrel <i>Pterodroma hasitata</i> Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4748	Endangered

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

There are no critical habitats at this location.

You are still required to determine if your project(s) may have effects on all above listed species.

Bald & Golden Eagles

Bald and Golden Eagles are protected under the Bald and Golden Eagle Protection Act ² and the Migratory Bird Treaty Act (MBTA) ¹. Any person or organization who plans or conducts activities that may result in impacts to Bald or Golden Eagles, or their nests, should follow appropriate regulations and implement required avoidance and minimization measures, as described in the various links on this page.

The [data](#) in this location indicates that no eagles have been observed in this area. This does not mean eagles are not present in your project area, especially if the area is difficult to survey. Please review the 'Steps to Take When No Results Are Returned' section of the [Supplemental Information on Migratory Birds and Eagles document](#) to determine if your project is in a poorly surveyed area. If it is, you may need to rely on other resources to determine if eagles may be present (e.g. your local FWS field office, state surveys, your own surveys).

Additional information can be found using the following links:

- Eagle Management <https://www.fws.gov/program/eagle-management>
- Measures for avoiding and minimizing impacts to birds <https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds>
- Nationwide avoidance and minimization measures for birds <https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf>
- Supplemental Information for Migratory Birds and Eagles in IPaC <https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action>

Bald & Golden Eagles FAQs

What does IPaC use to generate the potential presence of bald and golden eagles in my specified location?

The potential for eagle presence is derived from data provided by the [Avian Knowledge Network \(AKN\)](#). The AKN data is based on a growing collection of [survey, banding, and citizen science datasets](#) and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are an eagle ([Bald and Golden Eagle Protection Act](#) requirements may apply).

Proper interpretation and use of your eagle report

On the graphs provided, please look carefully at the survey effort (indicated by the black vertical line) and for the existence of the "no data" indicator (a red horizontal line). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort line or no data line (red horizontal) means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list and associated information help you know what to look for to confirm presence and helps guide you in knowing when to implement avoidance and minimization measures to eliminate or reduce potential impacts from your project activities or get the appropriate permits should presence be confirmed.

How do I know if eagles are breeding, wintering, or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating, or resident), you may query your location using the [RAIL Tool](#) and view the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If an eagle on your IPaC migratory bird species list has a breeding season associated with it (indicated by yellow vertical bars on the phenology graph in your "IPaC PROBABILITY OF PRESENCE SUMMARY" at the top of your results list), there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

Interpreting the Probability of Presence Graphs

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. A taller bar indicates a higher probability of species presence. The survey effort can be used to establish a level of confidence in the presence score.

How is the probability of presence score calculated? The calculation is done in three steps:

The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.

To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is $0.25/0.25 = 1$; at week 20 it is $0.05/0.25 = 0.2$.

The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

Breeding Season ()

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort ()

Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data ()

A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

Migratory birds

The Migratory Bird Treaty Act (MBTA) ¹ prohibits the take (including killing, capturing, selling, trading, and transport) of protected migratory bird species without prior authorization by the Department of Interior U.S. Fish and Wildlife Service (Service).

1. The [Migratory Birds Treaty Act](#) of 1918.
2. The [Bald and Golden Eagle Protection Act](#) of 1940.

Additional information can be found using the following links:

- Eagle Management <https://www.fws.gov/program/eagle-management>
- Measures for avoiding and minimizing impacts to birds <https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds>
- Nationwide avoidance and minimization measures for birds
- Supplemental Information for Migratory Birds and Eagles in IPaC <https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action>

Measures for Proactively Minimizing Migratory Bird Impacts

Your IPaC Migratory Bird list showcases [birds of concern](#), including [Birds of Conservation Concern \(BCC\)](#), in your project location. This is not a comprehensive list of all birds found in your project area. However, you can help proactively minimize significant impacts to all birds at your project location by implementing the measures in the [Nationwide avoidance and minimization measures for birds](#) document, and any other project-specific avoidance and minimization measures suggested at the link [Measures for avoiding and minimizing impacts to birds](#) for the birds of concern on your list below.

Ensure Your Migratory Bird List is Accurate and Complete

If your project area is in a poorly surveyed area, your list may not be complete and you may need to rely on other resources to determine what species may be present (e.g. your local FWS field office, state surveys, your own surveys). Please review the [Supplemental Information on Migratory Birds and Eagles document](#), to help you properly interpret the report for your specified location, including determining if there is sufficient data to ensure your list is accurate.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the "Probability of Presence Summary" below to see when these birds are most likely to be present and breeding in your project area.

Review the FAQs

The FAQs below provide important additional information and resources.

NAME	BREEDING SEASON
Great Shearwater <i>Puffinus gravis</i> This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Royal Tern <i>Thalasseus maximus</i> This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Apr 15 to Aug 31

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read ["Supplemental Information on Migratory Birds and Eagles"](#), specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in

week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is $0.25/0.25 = 1$; at week 20 it is $0.05/0.25 = 0.2$.

3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)

Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

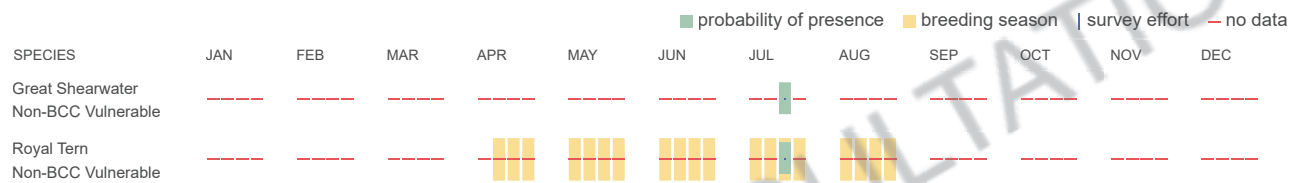
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (—)

A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



Migratory Bird FAQs

Tell me more about avoidance and minimization measures I can implement to avoid or minimize impacts to migratory birds.

[Nationwide Avoidance & Minimization Measures for Birds](#) describes measures that can help avoid and minimize impacts to all birds at any location year-round. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is one of the most effective ways to minimize impacts. To see when birds are most likely to occur and breed in your project area, view the Probability of Presence Summary. [Additional measures](#) or [permits](#) may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of [Birds of Conservation Concern \(BCC\)](#) and other species that may warrant special attention in your project location, such as those listed under the Endangered Species Act or the [Bald and Golden Eagle Protection Act](#) and those species marked as "Vulnerable". See the FAQ "What are the levels of concern for migratory birds?" for more information on the levels of concern covered in the IPaC migratory bird species list.

The migratory bird list generated for your project is derived from data provided by the [Avian Knowledge Network \(AKN\)](#). The AKN data is based on a growing collection of [survey, banding, and citizen science datasets](#) and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) with which your project intersects. These species have been identified as warranting special attention because they are BCC species in that area, an eagle ([Bald and Golden Eagle Protection Act](#) requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, and to verify survey effort when no results present, please visit the [Rapid Avian Information Locator \(RAIL\) Tool](#).

Why are subspecies showing up on my list?

Subspecies profiles are included on the list of species present in your project area because observations in the AKN for **the species** are being detected. If the species are present, that means that the subspecies may also be present. If a subspecies shows up on your list, you may need to rely on other resources to determine if that subspecies may be present (e.g. your local FWS field office, state surveys, your own surveys).

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the [Avian Knowledge Network \(AKN\)](#). This data is derived from a growing collection of [survey, banding, and citizen science datasets](#).

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go to the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating, or resident), you may query your location using the [RAIL Tool](#) and view the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your IPaC migratory bird species list has a breeding season associated with it (indicated by yellow vertical bars on the phenology graph in your "IPaC PROBABILITY OF PRESENCE SUMMARY" at the top of your results list), there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are [Birds of Conservation Concern](#) (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the [Bald and Golden Eagle Protection Act](#) requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially BCC species. For more information on avoidance and minimization measures you can implement to help avoid and minimize migratory bird impacts, please see the FAQ "Tell me more about avoidance and minimization measures I can implement to avoid or minimize impacts to migratory birds".

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the [Northeast Ocean Data Portal](#). The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the [NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf](#) project webpage.

Proper interpretation and use of your migratory bird report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please look carefully at the survey effort (indicated by the black vertical line) and for the existence of the "no data" indicator (a red horizontal line). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list does not represent all birds present in your project area. It is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list and associated information help you know what to look for to confirm presence and helps guide implementation of avoidance and minimization measures to eliminate or reduce potential impacts from your project activities, should presence be confirmed. To learn more about avoidance and minimization measures, visit the FAQ "Tell me about avoidance and minimization measures I can implement to avoid or minimize impacts to migratory birds".

Interpreting the Probability of Presence Graphs

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. A taller bar indicates a higher probability of species presence. The survey effort can be used to establish a level of confidence in the presence score.

How is the probability of presence score calculated? The calculation is done in three steps:

The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.

To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is $0.25/0.25 = 1$; at week 20 it is $0.05/0.25 = 0.2$.

The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

Breeding Season ()

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort ()

Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data ()

A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the [National Wildlife Refuge](#) system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuge lands at this location.

Fish hatcheries

There are no fish hatcheries at this location.

Wetlands in the National Wetlands Inventory (NWI)

Impacts to [NWI wetlands](#) and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local [U.S. Army Corps of Engineers District](#).

This location did not intersect any wetlands mapped by NWI.

NOTE: This initial screening does **not** replace an on-site delineation to determine whether wetlands occur. Additional information on the NWI data is provided below.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tubercid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.