Federal Aviation Administration

Draft Tiered Environmental Assessment for Updates to Airspace Closures for Additional Launch Trajectories and Starship Boca Chica Landings of the SpaceX Starship-Super Heavy Vehicle at the SpaceX Boca Chica Launch Site in Cameron County, Texas

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AGENCIES: Federal Aviation Administration (FAA), lead Federal agency.

This final Tiered Environmental Assessment (EA) was prepared in accordance with FAA Order 1050.1G, *FAA National Environmental Policy Act Implementing Procedures* (June 30, 2025), to meet the agency's obligations under Section 102(2)(C) of the National Environmental Policy Act of 1969 (NEPA), §§ 4321-4336, as amended by the Fiscal Responsibility Act of 2023; Section 4(f) of the Department of Transportation Act of 1966 (49 U.S.C. § 303); Section 106 of the National Historic Preservation Act (16 U.S.C. § 470); Executive Order 11988, *Floodplain Management*; and, DOT Order 5650.2, *Floodplain Management and Protection.*

DEPARTMENT OF TRANSPORTATION, FEDERAL AVIATION ADMINISTRATION: FAA is evaluating the Aircraft Hazard Areas necessary to support SpaceX's proposed operations of the Starship-Super Heavy launch program at the Boca Chica launch site in Cameron County, Texas. SpaceX must obtain a modification of its existing vehicle operator license from FAA to operate Starship-Super Heavy for additional launch trajectories and Starship Return to Launch Site mission profiles. Modifying a license is considered a major Federal action (see Section 2.2 for a more detailed description). FAA's issuance of temporary airspace closures is also a major Federal action. The completion of the environmental review process does not guarantee that FAA will issue a license modification to SpaceX for the Proposed Action. SpaceX's license application must also meet FAA safety, risk, policy, payload requirements, and financial responsibility requirements per 14 CFR Chapter III, Parts 400–460.

CONTACT INFORMATION: Questions regarding the Tiered EA can be addressed to Ms. Amy Hanson, Environmental Protection Specialist, Federal Aviation Administration, 1902 Reston Metro Plaza, Reston, VA 20190; project email address SpaceXBocaChica@icf.com.

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Acronyms & Abbreviations

AHA	Aircraft Hazard Area
ANSP	Air Navigation Service Providers
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
DOD	Department of Defense
DOT	Department of Transportation
EA	Environmental Assessment
EO	Executive Order
FAA	Federal Aviation Administration
FONSI	Finding of No Significant Impact
GHG	Greenhouse Gas
NAS	National Airspace System
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act of 1969, as amended
NOTAM	Notice to Airmen
PEA	Programmatic Environmental Assessment
ROD	Record of Decision
U.S.C.	United States Code
WR	Written Re-evaluation

1. INTRODUCTION AND BACKGROUND

Space Exploration Technologies Corporation (SpaceX) is seeking to obtain a modification of its existing vehicle operator license from FAA to account for updates to Starship-Super Heavy operations at the Boca Chica Launch Site in Cameron County, Texas. This Tiered EA analyzes these updates, which include new information related to airspace closures for additional Starship-Super Heavy launch trajectories and Starship Return to Launch Site mission profiles at the Boca Chica Launch Site. The affected environment and environmental impacts of Starship-Super Heavy operations at the Boca Chica Launch Site were first analyzed in the 2022 Final Programmatic Environmental Assessment for the SpaceX Starship-Super Heavy Launch Vehicle Program at the SpaceX Boca Chica Launch Site in Cameron County, Texas (2022 PEA; FAA 2022). FAA issued a Mitigated Finding of No Significant Impact (FONSI)/Record of Decision (ROD) based on the 2022 PEA on June 13, 2022.

1.1 Background

FAA prepared the 2022 PEA to analyze the potential environmental impacts of constructing launch-related infrastructure and operating the Starship-Super Heavy launch vehicle at the Boca Chica Launch Site. As documented in FAA's June 13, 2022 FONSI/ROD and detailed in the 2022 PEA, FAA found that SpaceX's proposed Starship-Super Heavy program, under which SpaceX planned to conduct up to 5 orbital Starship-Super Heavy launches and landings per year and up to 5 suborbital Starship launches per year from the Boca Chica launch site, and implement identified mitigation measures, would not significantly impact the environment.

Subsequent to that decision, the FAA issued a written re-evaluation (WR) in April 2023 that evaluated additional information received from SpaceX concerning its Starship-Super Heavy ocean landings and launch pad detonation suppression system (FAA 2023a). In November 2023, FAA issued a WR that evaluated additional information received from SpaceX about the operation of the deluge system, the addition of a forward heat shield to the Starship-Super Heavy vehicle, and the expansion of the area of potential effects for cultural resources (November 2023 WR; FAA 2023b). In March 2024, FAA issued a FONSI based on an EA tiered from the 2022 PEA evaluating the potential environmental impacts of SpaceX's proposal to land the Starship in the Indian Ocean (March 2024 Tiered EA; FAA 2024a). In October 2024, FAA issued a WR that evaluated additional information received from SpaceX about updates to the Forward Heat Shield Interstage Landing Area, Sonic Boom Coverage, Use of the Deluge System During Return to Launch Site Landings, and use of US Coast Guard Safety Zones (October 2024 WR; FAA 2024b). In April 2025, FAA issued a Mitigated FONSI/ROD based on an EA tiered from the 2022 PEA evaluating the potential environmental impacts of SpaceX's proposal to increase the number of Starship-Super Heavy operations at the Boca Chica Launch Site to 25 per year (April 2025 Tiered EA; FAA 2025). In May 2025, the FAA issued a FONSI/ROD based on an EA tiered from the 2022 PEA evaluating the potential environmental impacts of updated Aircraft Hazard Areas associated with the Flight 9 mission profile. This Draft EA tiers from the 2022 Final PEA and the April 2025 Tiered EA.

Based on preliminary safety analyses for additional Starship-Super Heavy launch trajectories and Starship Return to Launch Site mission profiles, an Aircraft Hazard Area and associated NOTAM would necessitate the FAA to close airspace over a portion of Mexico and portions of the United States, as well

as additional areas over the Atlantic and Pacific Oceans, the Gulf of America, and the Caribbean Sea. This is an update to the existing operations involving the Starship-Super Heavy described in the 2022 PEA and April 2025 Tiered EA as detailed below.

1.2 Federal Agency Roles

1.2.1 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 U.S.C. §§ 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 regulatory requirements pertaining to commercial launches and individual launch operators are described in 14 CFR Chapter III, Parts 400–460. SpaceX is the exclusive user of the Boca Chica Launch Site. Therefore, SpaceX is not required to apply for and obtain a launch site operator license for that site.

The FAA is also responsible for creating airspace closure areas consistent with the statutory mandate in 49 U.S.C. § 40103 to ensure the safe and efficient use of the National Airspace System. The FAA carries out this mandate in accordance with FAA Order 7400.2R, *Procedures for Handling Airspace Matters*, to ensure public safety.

Regarding potential environmental impacts in Mexico, Jamaica, and Cayman Islands, the FAA is coordinating with the U.S. State Department and the countries in accordance with Executive Order 12114, *Environmental Effects Abroad of Major Federal Actions*, 44 *Fed. Reg.*1957 (January 9, 1979).

1.3 Purpose and Need

The purpose of SpaceX's proposed action is to provide greater mission capability to NASA and the Department of Defense (DOD). SpaceX's activities would continue to fulfill the U.S. expectation that increased capabilities and reduced space transportation costs will enhance exploration (including within the Artemis and Human Landing System programs), support U.S. national security, and make space access more affordable. The Space Transportation section of the National Space Transportation Policy of 1994 addressed the commercial launch sector, stating that "assuring reliable and affordable access to space through U.S. space transportation capabilities is a fundamental goal of the U.S. space program." Additionally, the 2021 Space Priorities Framework's Mission states, "The United States will bolster the health and vitality of our space sectors – civil, commercial, and national security – for the benefit of the American people and leverage that strength to lead the international community in preserving the benefits of space for future generations" (White House 2021). In addition, Executive Order 14335,

Enabling Competition in the Commercial Space Industry, states, as follows: "Ensuring that United States operators can efficiently launch, conduct missions in space, and reenter United States airspace is critical to economic growth, national security, and accomplishing Federal space objectives."

SpaceX's proposed action is needed to facilitate frequent launch and landing operations to allow iterative development of Starship-Super Heavy vehicles to achieve rapid launch capability and increase operational efficiency, capabilities, and cost effectiveness of the Starship-Super Heavy program. Satisfaction of these needs benefit government and public interests and reduces operational costs. Demand for launch services has continued to increase over the past 20 years, and the space industry's growth projections indicate this will continue into the foreseeable future. By providing a reusable launch vehicle that returns to its launch site, the proposed action would reduce the cost of launch and increase efficiency, delivering greater access to space and enabling cost-effective delivery of cargo and people to the Moon and Mars. SpaceX's proposed action would satisfy requirements for more efficient and effective space transportation methods and continue the U.S. goal of encouraging activities by the private sector to strengthen and expand U.S. space transportation infrastructure.

2. Description of Proposed Action and Alternatives

NEPA requires that the FAA consider the purpose and need for the Proposed Action and from that, "study, develop, and describe technically and economically feasible alternatives ."[1] As discussed in Chapter 3, the FAA has not identified any unresolved conflicts concerning alternative uses of available resources associated with SpaceX's proposal. Therefore, in accordance with NEPA and FAA Order 1050.1G, § 1.5(b)(ii), this Tiered EA considers the no action alternative and Proposed Action.

2.1 No Action Alternative

The No Action Alternative is consistent with that contained in the April 2025 Tiered EA. Under the No Action Alternative, the FAA would not modify SpaceX's license for Starship Return to Launch Site mission profiles or additional Starship-Super Heavy launch trajectories with updates to the airspace closure areas. Without these updates, SpaceX would not be able to continue the iterative development of Starship-Super Heavy and strive towards its goal of providing greater mission capability for the government and commercial space sectors. This alternative does not meet the purpose and need of the Proposed Action and is only included to provide the basis for comparing the environmental consequences of the Proposed Action.

2.2 Proposed Action

SpaceX is seeking to conduct operations for a range of different mission profiles, which would require the FAA to issue a modification of its existing vehicle operator license for updated operations for additional launch trajectories and Starship Return to Launch Site mission profiles for Starship-Super Heavy operations at the Boca Chica Launch Site. The federal action also includes FAA's issuance of temporary airspace closures.

[1] 42 U.S.C. § 4332(2)(F).

The following aspects of SpaceX's operations remain unchanged and are assessed by the existing environmental documentation supporting the program:

- Pre-flight Operations (Section 2.1.3.2 of the 2022 PEA)
- Nominal Operational Access Restrictions (Section 2.1.3.5 of the 2022 PEA)
- Personnel Levels (Section 2.1.3.6 of the 2022 PEA)
- Anomalies (Section 2.1.3.7 of the 2022 PEA)
- Launch Operations (Section 2.2 of the April 2025 Tiered EA)
- Landings (Section 2.3 of the April 2025 Tiered EA)
- Waterway Closures (Section 2.5 of the April 2025 Tiered EA)

FAA's authority under the Commercial Space Launch Act only extends to licensed launch activities. Additional activities in and around the Boca Chica Launch Site, such as production and manufacturing, engine, stage, and tank testing that are not within the scope of the license are not included in this analysis.[2] The effects of such activities are considered as part of the environmental baseline and in conjunction with the effects of the Proposed Action (see Section 3).

2.2.1 Orbital Launches

As described in Section 2.1.3.4 of the 2022 PEA, orbital launches would primarily be to low inclinations with flight trajectories north or south of Cuba that minimize land overflight. SpaceX currently launches from the Boca Chica Launch Site through the Straights of Florida, north of Cuba, for a suborbital trajectory. Additional launch trajectories are needed to support orbital trajectories for Starship for Return to Launch Site mission profiles. This Tiered EA evaluates notional orbital trajectories developed with limited population overflight.

2.2.2 Airspace Closures

As described in Section 2.1.3.5 of the 2022 PEA, all launch and reentry operations would comply with necessary notification requirements, including issuance of Notices to Airmen (NOTAMs), as defined in agreements required for a launch license issued by the FAA. A NOTAM provides notice of unanticipated or temporary future closures to components of, or hazards in, the National Airspace System (NAS). These temporary closures are determined at least 72 hours prior to a launch or reentry activity in the airspace; the corresponding NOTAM is subsequently issued to notify pilots and other interested parties of temporary conditions. NOTAMs are similarly used by Air Navigation Service Providers (ANSPs) to provide notice of temporary airspace closures in foreign airspace. Advance notice via NOTAMs and the

[2] *See* Seven Cnty. Infrastructure Coal. v. Eagle Cnty., Colo., 605 U.S., 145 S. Ct. 1497 (2025) ("The effects from a separate project may be factually foreseeable, but that does not mean that those effects are relevant to the agency's decision-making process or that it is reasonable to hold the agency responsible for those effects."

identification of Aircraft Hazard Areas (AHAs)[3] 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 size of airspace closures can grow or shrink as reliability is either decreased or increased with results and analysis from each launch.

The FAA conducted a NAS assessment of notional additional launch trajectories and Starship Return to Launch Site AHAs, based on 2024 commercial aircraft data.

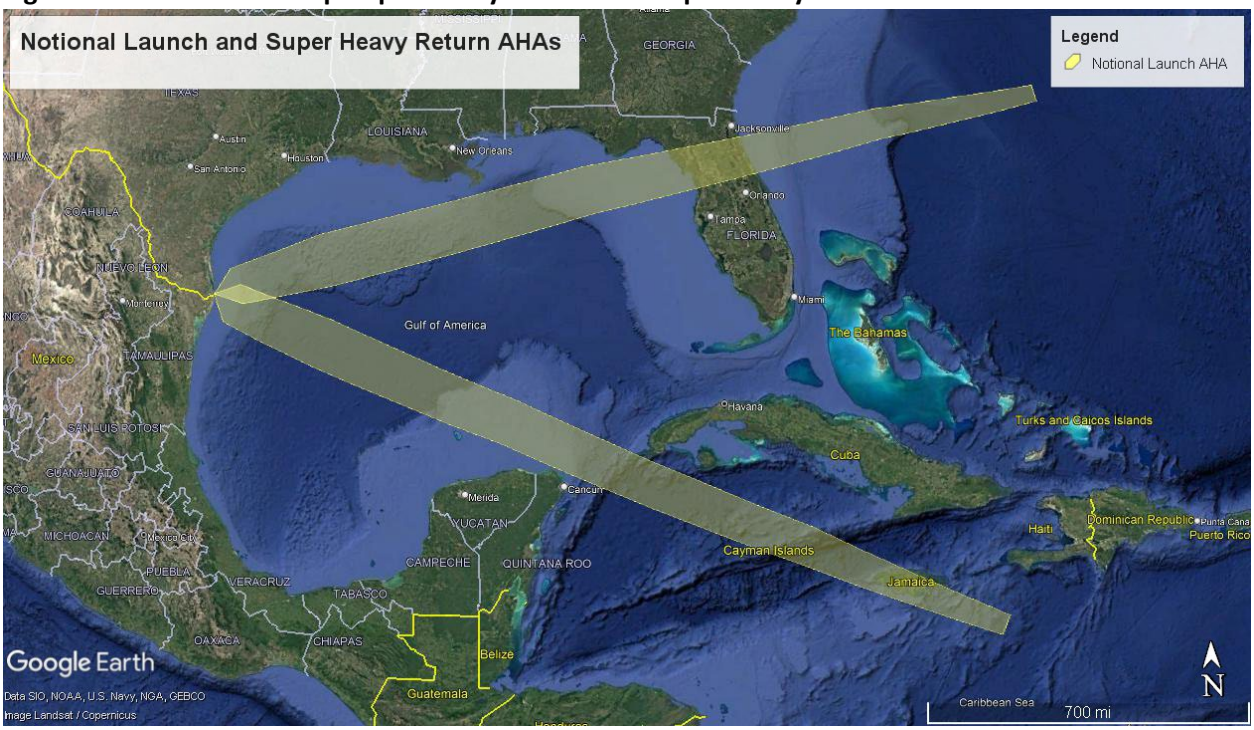
Additional Launch Trajectories

Starship-Super Heavy launches and Super Heavy booster reentries[4] with a Florida overflight would impact air routes extending eastward from the launch site over portions of the Gulf of America, northern Florida, and Atlantic Ocean, covering approximately 1,600 nautical miles. AHAs may necessitate the closure of dozens of coastal and deep-water oceanic airways over the Gulf of America and Atlantic Ocean, requiring substantial aircraft rerouting to avoid the AHAs. The southernmost launch and Super Heavy booster reentry trajectory could impact the airspace of Mexico, Cuba, Jamaica, and the Cayman Islands. Mexico, Cuba, Jamaica, and the Cayman Islands would be expected to close their respective airspace. See Figure 1 for a depiction of the range of additional launch and Super Heavy booster landing AHAs.

[3] Hazard areas are any region of land, sea, or air that must be surveyed, publicized, controlled, or evacuated in order 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.

[4] Super Heavy booster landings at the launch site are included in the launch AHAs and are assumed to occur within approximately 10 minutes of a Starship-Super Heavy launch.

Figure 1 – Notional Starship-Super Heavy Launch and Super Heavy Return AHAs



Florida Overflight AHA

The FAA conducted a preliminary NAS assessment of the notional launch and Super Heavy booster landing AHAs, based on 2024 commercial aircraft data. The launch and Super Heavy booster landing AHAs could affect a minimum of 10 commercial aircraft per hour, during the lowest period of midnight hours, or up to a maximum of 200 commercial aircraft per hour, during peak daily travel periods. The April 2025 Tiered EA assumes that up to 22 Starship-Super Heavy launches and Super Heavy landings would occur during the day (7:00 AM to 10:00 PM), and no landings at the Boca Chica launch site would occur during nighttime hours (10:00 PM to 7:00 AM). All nighttime Super Heavy landings are assumed to occur in the Gulf of America. Table 1 shows a range of the approximate number of commercial aircraft impacted per hour and per year for the total operations proposed. Domestic flights that normally take coastal routes are expected to be rerouted via inland routes, which would cause an increase in congestion and flight travel time.

Table 1 Potential Commercial Aircraft Impacted by AHAs for Two Additional Trajectories of Starship-Super Heavy Launches and Super Heavy Landings

Operations / Year	Timing	Aircraft / Hour	Minimum AHA Duration	Maximum AHA Duration	Number of Aircraft Impacted/ Launch	Number of Aircraft Impacted / Year
3	Lowest Period of Midnight Hours	10 (minimum)	40 minutes	2 hours	7 to 120	21 to 360
22	Peak Daily Travel Periods	200 (maximum)	40 minutes	2 hours	133 to 400	2,926 to 8,800

Integrating the Florida overflight Starship-Super Heavy launch operations and Super Heavy booster landings into the NAS from Boca Chica would require the FAA to conduct ground stops commensurate with the timing of the AHA and the miles in trail (distance between aircraft) for spacing and volume control as well as rerouting aircraft around the AHA. Due to the length of the launch and Super Heavy booster landing AHAs, certain flights, especially international, may elect to delay the departure time due to the inability to accept a reroute caused by fuel constraints or the flight time of the reroute. According to the NAS assessment, the average expected flight delay for launches[5] would last approximately 40 minutes and could last up to two hours. General aviation operations would be similarly impacted by the launch and Super Heavy booster landing AHAs; however, general aviation operations typically have more flexibility for flight planning than commercial flights, due to the nature of connecting commercial flights.

South of Cuba AHA

According to a preliminary NAS assessment, the notional AHA for Starship-Super Heavy launch operations south of Cuba and Super Heavy booster landings is projected to affect over 175 flights, with 99% of the identified aircraft involved in international connecting routes. Due to the amount of international airspace affected, the same fidelity of range of affected flights cannot be provided as in Table 1.

Integrating Starship-Super Heavy launch operations south of Cuba and Super Heavy booster landings into the NAS would require ground stops commensurate with the timing of the AHA and the miles in trail (distance between aircraft) for spacing and volume control as well as rerouting aircraft around the AHA. Due to the length of the launch and Super Heavy booster landing AHAs, certain flights, especially international, may elect to delay the departure time due to the inability to accept a reroute caused by fuel constraints or the flight time of the reroute. According to the preliminary NAS assessment, the

[5] The delay could be greater incrementally based on any delay of the start of the launch within the assumed two-hour launch window.

average expected flight delay would last approximately 40 minutes[6] and could last up to two hours. General Aviation operations would be similarly impacted by the aircraft hazard area; however, general aviation operations typically have more flexibility for flight planning than commercial flights, due to the nature of connecting commercial flights.

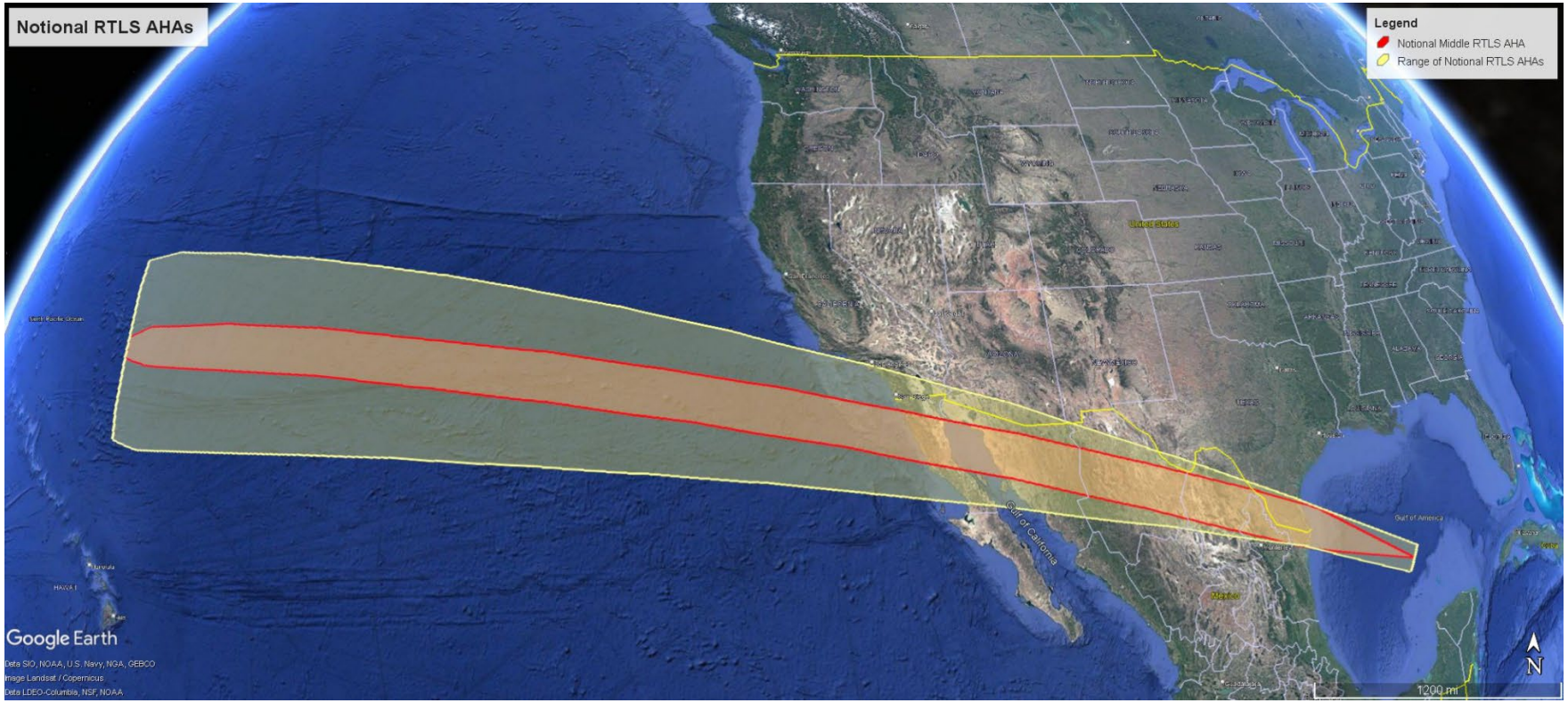
Starship Return to Launch Site

Starship Return to Launch Site operations would impact air routes extending westward from the Boca Chica launch site through Mexico and portions of Texas and California, covering approximately 3,700 nautical miles. Starship reentries would impact air routes extending from the Pacific Ocean, Southern California, across Mexico, Southern Texas and extending into the Gulf of America. AHAs may necessitate the closure of dozens of coastal and deep-water oceanic airways over the Pacific Ocean and Gulf of America, requiring the rerouting of aircraft to avoid the AHAs. The utilization of ground stops at airports under the AHAs in but not limited to Southern California, Mexico, and South Texas, and Airspace Flow Programs[7] could be necessary to control traffic between the United States and Mexico. See Figure 2 for a notional Starship Return to Launch Site AHA and the potential range of the AHAs.

[6] The delay could be incrementally greater based on any delay of the start of the launch within the two-hour launch window.

[7] An Airspace Flow Program is a traffic management tool that assigns specific arrival slots and corresponding Expect Department Clearance Times to manage capacity and demand for a specific area identified by the flight constraint area.

Figure 2 – Notional Range of Starship Return to Launch Site Aircraft Hazard Areas



The Starship Return to Launch Site AHAs could affect up to a maximum of 200 commercial aircraft per hour, for all potential AHA's within the range depicted, during peak daily travel periods during daytime hours. The April 2025 Tiered EA assumed that up to 22 Starship reentries would occur during the day (7:00 AM to 10:00 PM), and no landings would occur during nighttime hours (10:00 PM to 7:00 AM). A total of up to 4,400 flights per year could be affected by the Starship Return to Launch Site AHAs. Table 2 shows a range of the approximate number of commercial aircraft impacted per hour and per year for the total operations proposed.

Table 2 Potential Commercial Aircraft Impacted by AHAs for Starship Return to Launch Site Landings

Operations / Year	Timing	Aircraft / Hour	Minimum AHA Duration	Maximum AHA Duration	Number of Aircraft Impacted/ Launch	Number of Aircraft Impacted / Year
None (no nighttime landings of the Starship)	Lowest Period of Midnight Hours	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
22	Peak Daily Travel Periods	200 (maximum)	40 minutes	60 minutes	133 to 200	2,926 to 4,400

Integrating Starship Return to Launch Site mission profiles into the NAS would require ground stops commensurate with the timing of the AHA and the miles in trail (distance between aircraft) for spacing and volume control as well as rerouting aircraft around the AHA. Due to the length of the hazard area, certain flights may elect to delay the departure time due to the inability to accept a reroute due to the size of the hazard area. According to the NAS assessment, the average expected flight delay would be approximately 40 to 60 minutes.[8] General Aviation operations would be similarly impacted by the AHAs.

3. Affected Environment and Environmental Consequences

The Boca Chica Launch Site is located on SpaceX-owned land in Cameron County, Texas, near the cities of Brownsville and South Padre Island. The larger area around the Boca Chica Launch Site includes several private and public industries, including the SpaceX site known as Starbase, the Port of Brownsville, the City of Port Isabel, San Roman Wind Farm, liquid natural gas facilities, and developments on South Padre Island. Starbase includes infrastructure, such as housing, restaurants, and offices to support SpaceX's production and manufacturing facility near Starbase.

Portions of Southern California, South Texas, Florida, Mexico, Cuba, Jamaica, and the Cayman Islands and are within the expanded affected environment of the additional launch trajectories and Return to Launch Site mission profiles. The change in the Proposed Action results in a change in the potential

[8] The delay could be incrementally greater based on any delay of the start of the reentry within 60-minute reentry window.

impact area for these resources. The analysis in this Tiered EA is focused on the environmental impact categories with the potential to be affected by updates to the airspace closure areas, including: aviation emissions and air quality; hazardous materials; noise and noise-compatible land use; and socioeconomics. There are no potential impacts that could affect biological resources (terrestrial and marine wildlife); cultural resources; Department of Transportation Act, Section 4(f); natural resources and energy supply; visual resources; water resources; children's health and safety risks; farmlands; or wild and scenic rivers; therefore, these environmental impact categories are not analyzed in this Tiered EA.

The 2022 PEA and Mitigated FONSI/ROD and April 2025 Tiered EA and Mitigated FONSI/ROD included mitigation measures to ensure that the potential impacts of SpaceX's launch program would not have significant impacts to the environment. SpaceX maintains ongoing compliance with all mitigation measures.

3.1 Noise and Noise Compatible Land Use

The 2022 PEA and the April 2025 Tiered EA determined the Proposed Action would not be expected to result in significant impacts to noise and noise compatible land use, and that sonic boom and other noise would not significantly impact any resources, including biological, cultural, or Section 4(f) resources.

Airspace closures associated with the Proposed Action could result in temporarily grounded aircraft at affected airports and re-routing of en route flights on established alternate flight paths, which themselves are assessed by the FAA under NEPA. 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 daily 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 and are not expected to meaningfully change existing day-night average sound levels at the affected airports and surrounding areas. Therefore, airspace closures due the Proposed Action are not expected to result in significant noise impacts.

Based on the above findings, the data and analyses are consistent with those discussed in the 2022 PEA and April 2025 Tiered EA, and the Proposed Action would not result in significant impacts to noise and noise compatible land use.

3.2 Aviation Emissions and Air Quality

Airspace closures associated with the Proposed Action would lead to increased emissions from aircraft. This is mainly because aircraft would need to take pre-established alternative flight routes, which themselves are assessed by the FAA under NEPA. This would result in the usage of more fuel. Increases in emissions would result from the additional fuel usage. While rerouting would be a short-lived

scenario for affected aircraft and commensurate with the timing of the airspace closures, the emissions from the effects of the launches and vehicle returns, considering the number of aircraft impacted, would not be significant.

Based on the above findings, the data and analyses are consistent with those discussed in the 2022 PEA and April 2025 Tiered EA, and the Proposed Action would not result in significant impacts to air quality.

3.3 Hazardous Materials, Solid Waste and Pollution Prevention

A launch could result in debris and hazardous materials being distributed below the AHAs. The size of AHAs can grow or shrink as reliability is either decreased or increased with results and analysis from each launch. If any anomalies occurred during the operation, SpaceX would respond to all accidental releases of polluting substances quickly and implement appropriate cleanup measures in accordance with applicable laws to minimize impacts to the environment.

A near-surface ship explosion or a high-altitude breakup of the ship would create a debris field comprised of mostly heavy-weight metals and some composite (e.g., carbon fiber) materials. If deposited in the water, most of these materials would sink rapidly through the water column, while some items may stay buoyant on the surface or suspended in the water column before sinking towards the seafloor.

Starship is constructed primarily of stainless steel, which is non-toxic and inert. Other debris includes thermal heat tiles composed of silica, which has similar properties to glass and is highly resistant to degradation. The heat tiles are considered inert. Impacts on air quality or water chemistry are not expected. Glass is known to shatter or break apart into smaller pieces, with the sharp edges becoming rounded and smooth over time. It is likely that the heat tiles would similarly change if the same environmental conditions were present. Starship's propellants are liquid oxygen and liquid methane which are non-hazardous rather than highly toxic hypergolic fuels. Residual propellant is anticipated to evaporate or be diluted quickly due to surface currents and ocean mixing.

Starship would have approximately 34 gallons of hydraulic fluid. In the event of an anomaly, hydraulic fluid may remain contained in the vehicle, ignite, or be released. Remaining hazardous materials such as ordnance, or chemicals would be transported back to SpaceX in accordance with regulations for transport of hazardous substances.

The are no changes from the Proposed Action that would affect solid waste or pollution prevention. Based on the above findings, the data and analyses are consistent with those discussed in the 2022 PEA and April 2025 Tiered EA, and the Proposed Action would not result in significant impacts to hazardous materials, solid waste and pollution prevention.

3.4 Socioeconomics

The Proposed Action would restrict the use of portions of airspace and initiate ground stops at multiple airports for approximately 40 minutes and up to two hours for Starship-Super Heavy Launches and Super Heavy returns, and approximately 40 minutes and up to 60 minutes for a Starship reentry

window.[9] Under the Proposed Action, the mission profiles would have potential effects to airspace in the form of delays, reroutes, and cancellations. Depending on the timing and duration of the launch and reentry windows, commercial and general aviation flights could be delayed, cancelled or diverted. Though the Proposed Action would include these temporary restrictions, there would be no change in the number of operational personnel or taxes. There would be changes in expenditures due to the delays and associated airline income, but there would be no change expected to economic activity, personal income, employment, population, sustenance, public services, and/or social conditions.

Accordingly, consistent with the data and analyses contained in the 2022 PEA and the April 2025 Tiered EA, the Proposed Action would not result in significant socioeconomic impacts.

4. Conclusion

The 2022 PEA and April 2025 Tiered EA examined the potential for significant environmental impacts from Starship-Super Heavy launch operations at the Boca Chica Launch Site and defined the regulatory setting for impacts associated with Starship-Super Heavy. The areas evaluated for environmental impacts in this Tiered EA include aviation emissions and air quality; noise and noise-compatible land use; hazardous materials; and socioeconomics. In each of these areas, the FAA has concluded that no significant impacts would occur as a result of the Proposed Action.

5. List of Preparers

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[9] The delay could be incrementally greater based on the delay of the start of the reentry within the 60-minute reentry window.

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