Federal Aviation Administration

Executive Summary of the Final Tiered Environmental Assessment for SpaceX Starship/Super Heavy Vehicle Increased Cadence at the SpaceX Boca Chica Launch Site in Cameron County, Texas

April 2025

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ES.1. Introduction

The Federal Aviation Administration (FAA) is evaluating Space Exploration Technologies Corporation's (SpaceX) proposal to increase the launch and landing cadence of the Starship/Super Heavy launch vehicle at its existing Boca Chica Launch Site in Cameron County, Texas. SpaceX must obtain a new license or a license modification from the FAA in order to launch and land Starship and Super Heavy, and to use associated launch systems at a higher cadence than analyzed in the 2022 *Final Programmatic Environmental Assessment (PEA) for the SpaceX Starship/Super Heavy Launch Vehicle Program at the SpaceX Boca Chica Launch Site in Cameron County, Texas* (2022 PEA; FAA 2022). The PEA analyzed up to five annual Starship launches, up to five annual Super Heavy launches (with Starship attached as the second stage of the launch vehicle), up to ten annual Starship landings, and up to five annual Super Heavy landings. The FAA considers the issuance or modification of a license to be a major federal action in accordance with FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures* (July 16, 2015), to meet the agency's obligations under Section 102(2)(C) of the National Environmental Policy Act of 1969 (NEPA), §§ 4321-4336, as amended through P.L. 118–5 (June 3, 2023),[1] and requires an environmental review.

The FAA is the lead federal agency for this Environmental Assessment (EA), which is tiered from the 2022 PEA. The Final Tiered EA evaluates the potential environmental impacts of activities associated with the federal action of modifying SpaceX's vehicle operator license (see Section 2.2 of the Final Tiered EA for a more detailed description). The completion of the environmental review process does not guarantee that the FAA will issue a license modification to SpaceX for the proposed action. SpaceX's license application must also meet FAA safety, risk, and financial responsibility requirements per 14 CFR Chapter III, Parts 400 - 460.

The affected environment and environmental impacts of Starship/Super Heavy operations at the Boca Chica Launch Site were analyzed in the 2022 PEA. The FAA issued a Mitigated Finding of No Significant Impact (FONSI) and Record of Decision (ROD) based on the 2022 PEA on June 13, 2022. Subsequent to that decision, the FAA issued a Written Re-evaluation (WR) in April 2023 that evaluated additional information concerning SpaceX's Starship/Super Heavy ocean landings and launch pad detonation suppression system (FAA 2023a). In November 2023, the FAA issued a WR that evaluated additional information 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 of 2024, the FAA issued a FONSI based on an EA tiered from the PEA evaluating the potential

[1] On January 20, 2025, President Trump issued Executive Order (EO) No. 14154, *Unleashing American Energy*, which revoked EO 11991, *Relating to Protection and Enhancement of Environmental Quality* (May 24, 1977), and instructed the Chair of the CEQ to rescind its NEPA-implementing regulations. On February 25, 2025, the CEQ issued an interim final rule to remove the existing implementing regulations for NEPA (90 Fed. Reg. 10610 (Feb. 25, 2025)), effective April 11, 2025. The Draft Tiered EA was prepared in accordance with CEQ's National Environmental Policy Act Implementing Regulations Revision Phase 2, 89 Fed. Reg. 35442 (May 1, 2024) (Phase 2 final rule).

environmental impacts of the Starship's proposed landings in the Indian Ocean (FAA 2024a). In October 2024, the FAA issued a WR that evaluated 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 (FAA 2024c).

The proposed launch operations analyzed in the 2022 PEA consisted of launch and landing activities: up to five annual Starship launches, up to five annual Super Heavy launches (with Starship attached as the second stage of the launch vehicle), up to ten annual Starship landings, and up to five annual Super Heavy landings. SpaceX is proposing to modify the Starship/Super Heavy operations described in the 2022 PEA as detailed in ES.5 below.

ES.2. 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).

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. Public interests largely intersect with the government interests identified, including greater mission capability for space exploration and advancing reliable and affordable access to space which in turn advances the scientific and national security benefits of the U.S. space program as a whole. 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.

ES.3. Public Involvement

A 30-day public comment period began on July 29, 2024, with the publication of the Draft EA, and ended on August 29, 2024; FAA received 112 public, state, and federal government agency comments during that period. FAA initiated a new 58-day public comment period for the Revised Draft EA that began on November 20, 2024, and ended on January 17, 2025; FAA received 12,303 public, state, and federal government agency comments during that period. The Final EA considers all input provided on the Draft

and Revised Draft EAs and addresses comments received, as appropriate. Appendix C of the EA details the methods used to review the comments received and summarizes the responses by topic.

ES.4. Other Licenses, Permits, and Approvals

The FAA has identified the following additional environmental approvals for this SpaceX proposal, but others may be required.

- **Endangered Species Act (ESA).** In accordance with ESA Section 7, the FAA reinitiated consultation with USFWS and NMFS. NMFS concurred with the FAA's determination that the Proposed Action is not likely to adversely affect most ESA-listed species and critical habitat under NMFS jurisdiction. The only species that the FAA and NMFS agreed would likely face adverse effects from the Proposed Action would be sea turtles in the event of a shear horizontal explosion. ESA-listed species and critical habitat that would be affected are listed in Section 3.2.8 of the EA. The NMFS Biological and Conference Opinion and USFWS Amended Biological and Conference Opinion are included in Appendix A of the EA. The 2022 USFWS Biological Conference Opinion (BCO), 2023 Addendum to the BCO, and the 2025 Addendum to the BCO issued by USFWS, concluded the Proposed Action is not likely to jeopardize the continued existence of any federally listed species or adversely modify designated critical habitat. The prior BCO and Addendums contain Reasonable and Prudent Measures and associated Terms and Conditions to avoid, minimize, and mitigate the effects on listed species and critical habitat.

- **Magnuson-Stevens Fishery Conservation and Management Act.** The FAA determined there may be temporary adverse effects to Essential Fish Habitat (EFH), particularly in the event of launch failure involving the spread of debris. The FAA consulted NMFS regarding potential adverse effects to EFH, and NMFS provided Conservation Recommendations pursuant to 50 CFR § 600.920, which SpaceX and the FAA have agreed to implement as stated in the 2022 PEA and mitigated FONSI/ROD.

- **Marine Mammal Protection Act (MMPA).** The FAA evaluated the MMPA-protected marine mammals that have the potential to be disturbed during ocean landing operations. SpaceX would coordinate with NMFS prior to any landing activity that may impact species protected under MMPA. During coordination with the FAA, NMFS determined the Proposed Action did not warrant an Incidental Harassment Authorization.

- **Clean Water Act (CWA).** The CWA, 33 U.S.C. §§ 1251 *et seq.*, addresses water quality by prohibiting the unpermitted discharge of pollutants from point sources to waters of the United States. SpaceX previously obtained coverage for discharges from the site's water deluge system, which the FAA previously evaluated in the PEA and the November 2023 Written Re-evaluation (WR), under the Texas Multi-Sector General Permit administered by the Texas Commission on Environmental Quality (TCEQ). The U.S. Environmental Protection Agency (EPA) and TCEQ subsequently found that the deluge water discharges require an individual Texas Pollutant Discharge Elimination System (TPDES) permit. The TEQC issued the final industrial wastewater discharge permit for operation of the deluge system on February 18, 2025.

ES.5. Proposed Action and Alternatives

The Revised Final EA evaluates two alternatives in detail: the Proposed Action and the No Action Alternative. Refer to the Revised Final EA Section 2.7 for additional action alternatives considered but eliminated from further consideration.

Proposed Action (Preferred Alternative)

The FAA's federal action is to modify SpaceX's existing vehicle operator license to authorize SpaceX's proposed action to increase the cadence of the Starship/Super Heavy launch program at the Boca Chica vertical launch area (VLA) in Cameron County, Texas to up to 25 annual launches and 50 total annual landings (25 of the Starship and 25 of the Super Heavy) and make vehicle and operational upgrades. Up to three launches (of the total 25) would occur during nighttime hours from the VLA. Landings at the VLA would only take place during the daytime, with up to 22 Starship and 22 Super Heavy landings at the VLA. Daytime landings of either vehicle may also take place offshore as well. Up to three landings of Starship and three landings of Super Heavy may occur at night, only offshore. SpaceX would also conduct up to 90 seconds of licensed daytime Starship static fire tests and 70 seconds of licensed daytime Super Heavy static fire tests a year. The federal action also includes the FAA's issuance of temporary airspace closures.

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 PEA)
- Nominal Operational Access Restrictions (Section 2.1.3.5 of the PEA)
- Personnel Levels (Section 2.1.3.6 of the PEA)
- Anomalies (Section 2.1.3.7 of the PEA)

The 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 and will occur regardless of whether a license is issued are not included in this analysis. 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 3.3 of the EA).

Launch Operations

Since the publication of the 2022 PEA, SpaceX has changed the location of Pad B within the VLA. However, operations on Pad B for FAA-licensed activity would remain as previously analyzed in the 2022 PEA. SpaceX proposes to increase Starship/Super Heavy operations, as described Table ES.1, as well as implement potential launch vehicle modifications that will increase the amount of thrust produced by the vehicle (Table ES.2). Heat plume assumptions associated with Starship/Super Heavy orbital launches did not change from the 2022 PEA.

Table ES.1 Comparison of Activities in the 2022 PEA and Current Proposed Action

Activity	2022 PEA Proposed Action	Current Proposed Action
Starship Static Fire Engine Test	150 seconds	90 seconds (daytime)
Super Heavy Static Fire Engine Test	135 seconds	70 seconds (daytime)
Starship Suborbital Launch	5 (4 daytime/1 nighttime)	0
Super Heavy Launch	5 (4 daytime/1 nighttime)	25 (22 daytime/3 nighttime)
Starship Landing	10 (2 daytime/8 nighttime) Starship landing at the VLA, on a floating platform in the Gulf of America or the Pacific Ocean, or expended in the Gulf of America or Pacific Ocean	22 daytime Starship landings at the VLA, on a floating platform or expended in the Pacific Ocean or Indian Ocean 3 nighttime Starship landings on a floating platform or expended in the Pacific or Indian Ocean
Super Heavy Landing	5 (4 daytime/1 nighttime) Super Heavy landing at the VLA, on a floating platform in the Gulf of America, or expended in the Gulf of America	22 daytime Super Heavy landings at the VLA, on a floating platform, or expended in the Gulf of America. 3 nighttime Super Heavy landings on a floating platform or expended in the Gulf of America.

Table ES.2 Launch Vehicle Specifications

Specification	2022 PEA Starship	2022 PEA Super Heavy	Upgraded Starship	Upgraded Super Heavy
Length (meters; m)	50	71	70	80
Diameter (m)	9	9	9	9
Number of Engines	6	37	9	35
Thrust	12 MN	74 MN	28.7 MN	103 MN
Propellant quantity (metric ton; MT)	1,500	3,700	2,650	4,100

As described in the 2022 PEA, Starship/Super Heavy missions would continue to include lunar and Mars missions and satellite payload missions. Approved trajectories would be based on specific launch vehicle performance and characteristics and would satisfy 14 CFR Part 400 regulations.

SpaceX plans to add additional water tanks to the site to store the increased quantities of water, increasing the maximum volume of water from 361,000 gallons to 422,000 gallons, and would operate the deluge system during a Super Heavy landing at the VLA. SpaceX may use up to the maximum amount of deluge water per Super Heavy static fire, launch, or landing under the Proposed Action. During a Super Heavy landing at the VLA, the deluge system would be reactivated and would run for approximately 30 seconds. At this time, Starship landings at the VLA are not anticipated to require deluge water. Brownsville Public Utilities Board is contemplating the installation of a public water line from Brownsville to Boca Chica that would remove trucks transporting water along State Highway 4 (SH 4). Site groundwater quality is unsuitable for use due to high levels of total dissolved solids (FAA 2022 pp.108). The additional volume is to facilitate recycling of applied and recaptured water, provide water for cooling the launch mount deck after vehicle lift-off, and suppress sound.

SpaceX is not proposing any additional operational access restrictions and would continue to adhere to the terms outlined in Section 2.1.3.5 of the 2022 PEA.

Landings

SpaceX proposes to increase Starship/Super Heavy landings from up to 10 annual Starship landings and up to 5 annual Super Heavy landings to up to 25 Super Heavy landings and up to 25 Starship landings annually.

SpaceX plans to land the reusable Super Heavy and Starship back on land at the VLA or on floating platforms in the ocean. As SpaceX continues to develop the capability to perform a return to launch site landing of Super Heavy and Starship, some vehicles may not be reused and are instead expended in the ocean in the following three conditions depending on the stage of development of the program:

1. Hard water landing at terminal velocity and break up on impact resulting in an explosive event at the surface of the water;

2. Soft water landing and tip over and sink or explode on impact at the surface of the water[2]; or

3. In-flight breakup – Breakup during reentry resulting in debris falling into the ocean (up to 25 times per year of each vehicle stage).

Of the above scenarios, SpaceX anticipates no more than 20 explosive events at the surface of the water (Scenario #1) for each vehicle for the life of the program. These three scenarios would only occur within the first five years of the program. SpaceX currently lands Super Heavy in the Gulf of America and Starship in the Pacific Ocean and the Indian Ocean. For ocean landings, Super Heavy would land on a droneship or continue to be expended in the Gulf of America (in Figure 2 of the Final Tiered EA). Starship could land on a droneship (floating platform) or be expended in any of the four landing areas: the Indian Ocean (in Figure 3 of the Final Tiered EA), the Pacific Ocean (outside the U.S. Exclusive Economic Zone) and the northeast Pacific Ocean (in Figure 4 of the Final Tiered EA), or the southeast Pacific Ocean (in Figure 5 of the Final Tiered EA). The landing area in the Pacific Ocean was adjusted to be located outside the U.S. Exclusive Economic Zone (EEZ) in response to public comments (see Appendix C of the Final Tiered EA). The droneship operations and specifications were assessed in the 2022 PEA and 2022 NMFS consultation (NMFS 2022). Consistent with the 2022 PEA, landings that occurred downrange on a floating platform would continue to be delivered by barge to the Port of Brownsville and transported the remaining distance to the Boca Chica Launch Site over roadways. Additionally, a Starship near-shore contingency landing zone in the Gulf, beginning 1 nautical mile or more from the coast and covering a distance of up to 100 miles north of the VLA near Corpus Christi, and up to 100 miles south of the VLA near El Carrizo, Tamaulipas, Mexico, is included in the Tiered EA.

Under the Proposed Action, the remaining propellant on both Starship and Super Heavy would increase over the amounts previously assessed. Up to approximately 101 metric tons (MT) of residual propellant is projected to remain on the Starship launch vehicle for downrange landing, including expenditures. Up to approximately 74 MT of residual propellant is projected to remain on the Super Heavy vehicle for downrange landing, including expenditures, and would be vented following landing.

[2] A soft water landing is when the launch vehicle intentionally slows its speed to land in the water.

Airspace Closures

In Section 2.1.3.5 of the 2022 PEA, the FAA concluded that the Proposed Action would not require the FAA to alter the dimensions (shape and altitude) of the airspace to accommodate the Proposed Action, comprising 5 suborbital launches, 5 orbital launches, and 10 reentries annually. The FAA also concluded in 2022 that temporary closures of existing airspace may be necessary to ensure public safety during the proposed operations. As of the date of this Revised Final EA, SpaceX has implemented the 2022-contemplated Proposed Action twice in 2023, four times in 2024, and two times in 2025. The FAA temporarily closed airspace to permit these operations.

The FAA Air Traffic Organization (ATO) Space Operations Office completed a generic National Aerospace System (NAS) impact analysis in accordance with the FAA "Notice of Updated Factors for Optimizing Use of the National Aerospace System," dated April 13, 2023. This analysis was generic because SpaceX has yet to identify potential dates for its launch and landing operations. However, based on past practice, the FAA concluded that it would similarly expect to close existing airspace to permit SpaceX to launch or land the Starship/Super Heavy vehicles contemplated in this Proposed Action.

The FAA Air Traffic Organization Space Operations Office uses the Aircraft Hazard Area (AHA) information (described in Section 2.1.3.5 of the 2022 PEA) to produce an airspace management plan, which describes the launch/reentry information and analyzes the effect of each operation on airspace efficiency, capacity, and any other associated effect to the NAS from each licensed launch and reentry operation. The airspace management plan is disseminated to the operators and various impacted ATO facilities. This information helps the FAA determine whether the proposed launch or reentry (programmatically or individually) would result in an unacceptable limitation on air traffic. If that were the case, the FAA would work with the operator to identify appropriate mitigation strategies, such as shortening the requested launch/reentry window or shifting the launch/reentry time if possible. The FAA may also approve fewer launch or reentry operations or shorter launch and reentry windows. The FAA may prioritize operations with a national security purpose or favor launch and reentry windows or favor launch or reentry dates that fall outside of seasonal travel patterns.

The FAA often provides data to launch operators to avoid operations during days with high aviation traffic volume and identifies times with minimal impact to the NAS, such as overnight hours between 10:00 p.m. and 07:00 a.m. CT. The FAA acknowledges, however, that while these operating windows would minimize disruption to the NAS, they are likely to increase disruptions to the traveling public in the vicinity of the proposed launch or landing operations.

It has been determined AHAs could require larger airspace usage, potentially resulting in increased rerouting to other users of the NAS in the area, compared to other existing launch systems. To optimize the use of the NAS for the benefit of all users, the FAA considers the totality of all relevant factors in making a determination on a commercial space operation. Consistent with 49 U.S.C. 40103(b) and FAA joint Order (JO) 7610.4, Special Operations, the FAA will exercise its authority to modify or revoke an airspace assignment when space operations may adversely impact the safety and/or efficiency of the NAS. As part of this coordination, the FAA will ensure that interested parties are taking steps to ensure the safe, efficient, and equitable use of the NAS.

Waterway Closures

All launch and reentry operations would comply with necessary notification requirements, including issuance of Notice to Mariners (NOTMAR)s, as defined in agreements required for a launch license issued

by the FAA. A NOTMAR provides a notification regarding a temporary hazard within a defined area (a Ship Hazard Area [SHA]) to ensure public safety during proposed operations. A NOTMAR itself does not alter or restrict vessel movement; rather, the NOTMAR disseminates relative information regarding maritime activity and temporary hazards within a defined area to ensure public awareness and safety during the proposed operations.

To comply with FAA's licensing requirements, SpaceX has agreed through a Letter of Intent (LOI) with the USCG to establish procedures for the issuance of a NOTMAR prior to a launch or reentry, as well as other measures necessary to protect public health and safety, promoting safe operations over navigable waters. The LOI would describe the required responsibilities and procedures for both SpaceX and USCG during the event, which may include a launch, landing, and/or reentry operation resulting in the issuance of a NOTMAR.

USCG publishes NOTMARs through multiple media platforms to include Local Notice to Mariners, Broadcast Notice to Mariners (BNM), and Navigational Telex (NAVTEX) as needed to inform the maritime community of temporary changes in condition, Limited Access Areas (LAA), Regulated Navigation Areas (RNA), and/or hazards on navigable waterways. Notices in international areas are published by the National Geospatial Intelligence Agency. Advance notice via NOTMAR and the identification of SHAs assists mariners in voyage planning and scheduling around any temporary operation.

USCG has broad authority to establish LAAs, which may include Safety and/or Security Zones, and RNAs on Navigable Waters subject to U.S. authority and schedule in advance to minimize interruption to the maritime community. Launches and reentries would be infrequent, of short duration, and scheduled in advance to minimize interruption to ship traffic.

All landing operations would comply with necessary notification requirements, including issuance of NOTMARs by the USCG, as defined in agreements required for a vehicle operator license issued by the FAA. USCG maintains authority to establish and enforce LAAs and RNAs as needed to support public health and safety during these events.

The use of USCG LAAs and RNAs may require the redirection of vessels to waters outside of the LAA during launch and landing events. The USCG uses all available data and information to provide a level of safety to the maritime community during prescribed launch/landing events.

No Action Alternative

Under the No Action Alternative, the FAA would not modify a license to SpaceX to allow for increased launch and landing cadence from the Boca Chica launch site. As assessed in the 2022 PEA and subsequent Written Re-evaluations (WR), SpaceX could conduct up to five annual Starship and up to five annual Super Heavy launches (with Starship attached as the second stage of the launch vehicle), up to ten annual Starship landings, and up to five annual Super Heavy landings. The Starship/Super Heavy launch vehicles would not be modified and would remain the same as assessed in the 2022 PEA.

Under the No Action Alternative, there would be no new impacts on the environmental impact categories analyzed in this EA. The no-action alternative provides the basis for comparing the environmental consequences of the Proposed Action.

ES.6. Summary of Environmental Consequences

The following environmental impact categories were considered to provide context for understanding and assessing the potential environmental effects of the Proposed Action: air quality; climate; noise and noise compatible land use; visual effects; cultural resources; Department of Transportation Act Section 4(f); water resources; biological resources; land use; hazardous materials, solid waste, and pollution prevention; natural resources and energy supply; socioeconomics and children's environmental health and safety risks; and coastal resources. Table ES.3 provides a summary of potential direct and indirect environmental impacts from the Proposed Action.

SpaceX would continue to implement mitigation measures as described in the 2022 PEA and FONSI/ROD to minimize environmental consequences. SpaceX would also be responsible for conducting its licensed activities in accordance with the representations made in its license application and complying with all applicable Federal, Tribal, State, and local environmental laws, regulations, and standards which are applicable to the location where it is carrying out its license activities. Mitigation measures are described by resource in Section 3.2 of the Final Tiered EA.

Under the No Action Alternative, impacts to the human environment would remain consistent with the 2022 PEA. No new resource impacts would occur.

Table ES.3 Summary of the Proposed Action's Environmental Consequences

Environmental Impact Category	Environmental Consequences
Air Quality	Air emissions would result from the proposed pre-launch static test fires, launch and landing operations, and operation of vehicles and equipment. However, the Proposed Action is not expected to contribute to an exceedance of the National Ambient Air Quality Standards, as established by the U.S. Environmental Protection Agency under the Clean Air Act. The Proposed Action would account for approximately 0.1% of CO emissions and 0.21% of NOx emissions on an annual basis. Emitted quantities of mobile source air toxics would also be small in scale. Therefore, the Proposed Action is not expected to result in significant air quality impacts.
Climate	Proposed operations would involve mobile source fuel combustion that would generate greenhouse gas (GHG) emissions from associated launch, landing, and test operations, resulting in an increase of 53,450 metric tons/year of CO_2e as compared to the 2022 PEA. However, total GHG emissions represent less than 0.0003% of worldwide GHG emissions, approximately 0.002% of US GHG emissions, and approximately 0.012% of the State of Texas GHG emissions, on an annual basis. Therefore, the Proposed Action is not expected to result in significant climate-related impacts.
Noise and Noise Compatible Land Use	**Static Fire Noise:** The Proposed Action would slightly increase noise levels from the increase in thrust. However, the noise from static fires would continue to be infrequent due to the limited duration of these tests. Additionally, SpaceX is proposing to reduce FAA-licensed static fire time for both Starship and Super Heavy, resulting in less frequent impacts described in the 2022 PEA. **Launch (Takeoff) Noise:** Although the frequency of noise impacts is higher than what was presented in the 2022 PEA, an increase from 10 launch events to 25 launches would still be considered intermittent, temporary, and infrequent over the course of a year. No residents or members of the public will experience noise above OSHA's 115-dbA threshold during an orbital launch. Accordingly, significant noise impacts are not expected. **Landings Noise:** Although the updated modeling indicates that landings would be louder than modeled in the 2022 PEA, these differences would be small and would not be meaningfully noticeable. Exposures from coastal landings would be brief (less than one minute), infrequent, and would not exceed OSHA hearing conservation thresholds. **Cumulative Noise**: For the Proposed Action, the DNL 65 contour for the Proposed Action is located within about 3.5 miles of the VLA entirely in areas that are unpopulated, except for Boca Chica Village. SpaceX would enforce the access restriction area during launch operations, as discussed in the 2022 PEA. Thus, no visitors or village residents would be present at noise sensitive areas within the 4-mile radius and the proposed project changes would not result in significant noise impacts.

Environmental Impact Category	Environmental Consequences
	Starship/Super Heavy Orbital Launches: Sonic boom impacts from Starship/Super Heavy launches are consistent with the information contained within the 2022 PEA. **Sonic Booms Caused By Super Heavy Booster Landings:** Updated sonic boom modeling for the booster landings under the Proposed Action predict overpressure events of 15 psf and 21 psf in areas located within the area where only SpaceX personnel are allowed during launches (public hard checkpoint). The predicted overpressure for the area surrounding the public hard checkpoint indicate overpressure events up to 15 psf, with contours extending just beyond the U.S. / Mexico Border. Predicted overpressure levels at the southern tip of South Padre Island and Port Isabel, Tarpon Bend, as well as northeast regions of Tamaulipas, Mexico would be expected to reach 10 psf. The 6 psf sonic boom contour is predicted to extend approximately 10 miles from the launchpad, and encompass portions of South Padre Island, all of Port Isabel, Laguna Heights, and portions of Laguna Vista. Portions of northeastern Tamaulipas, Mexico, including La Burrita and El Conchillal, would also be encompassed in the 6 psf sonic boom contour. The locations associated with predicted overpressure events at lower psf are described in Section 3.2.3.5 in the Final Tiered EA. **Sonic Booms Caused By Starship Landings:** For the Proposed Action, sonic booms are predicted to range between 4 psf and less than 1 psf. The approximate extent of the 1 psf sonic boom contour associated with a near-shore landing of Starship in the Gulf (i.e., approximately 20 miles inland for a distance of approximately 100 miles north and south of the VLA Action Area) is the Starship Contingency Action Area. A sonic boom measurement of 1 psf is similar to a clap of thunder; significant impacts are not expected from sonic booms in the Starship Contingency Action Area. Detailed information on the predicted overpressure events is described in Section 3.2.3.5 in the Final Tiered EA. **Cumulative Day-Night Level and Sonic Booms**: The 60 dB CDNL contour extends approximately 5 miles from the VLA. No noise-sensitive areas are within the 60 dB CDNL contour, accordingly no noise-sensitive areas would experience significant noise impacts under the FAA's current 60 dB CDNL significance threshold. As described in the 2022 PEA, SpaceX would continue to implement their public notification plan to educate the public and announce when a launch or landing event would occur in order to reduce potential startle responses from high-noise activities and thus mitigate the potential effects of high-noise activities by increasing public awareness. Announcements of upcoming Starship/Super Heavy launches and landings would serve to warn people about these noise events. **Structural Damage Potential:** Although recent modeling predicted that Proposed Action noise contours would extend further than predicted in the 2022 PEA, no structural damage or significant impact to third-party structures is anticipated. Areas that would be exposed to sonic boom levels loud enough to result in window breakage are generally limited and would be evacuated during launch and when reentering vehicles may fly supersonic at the lowest altitude before landing. FAA would continue to require SpaceX to maintain insurance in the unlikely event a sonic boom results in claims of structural damage. Property owners may contact SpaceX directly (insurance@spacex.com) to submit claims and evidence in support of the damage claim. In accordance with the 2022 PEA, the PA, and the SpaceX Boca Chica Vibration Monitoring Plan, SpaceX would also continue to monitor the launch vibrations for a total of 5 orbital launches at various locations 2, 3, 5, and 8 miles from the VLA to confirm that vibration does not pose a risk of structural damage. **Hearing Conservation**: Under the Proposed Action, no residents or members of the public would experience noise above OSHA's 115-dBA threshold for the maximum A-weighted noise contours. Additionally, the modeled sonic boom levels would not cause human health or safety risks. Based on the above findings, no significant effects from Proposed Action-related noise or sonic booms are expected to occur.
Visual Effects	The Proposed Action would result in increased impacts on nighttime views compared to the 2022 PEA. Additionally, SpaceX has increased the efficiency of vehicle preparations, requiring less time to prepare per launch event and less nighttime activity requiring lighting on a per launch basis has decreased. Effects from nighttime launch events would be lessened through conformance with the conditions and mitigation in the 2022 PEA, including following the Lighting Management Plan. Therefore, the Proposed Action is not expected to result in significant visual resource impacts.
Cultural Resources	The Proposed Action would not alter the 10-mile APE used in the 2022 PEA and would not include construction for launch operations beyond the boundary analyzed in the 2022 PEA; therefore, there would be no changes regarding the avoidance, minimization, or mitigation recommendations for the previously recorded historic properties in the 2022 PEA. SpaceX would continue to mitigate impacts to cultural resources by implementing the vibration monitoring program and other mitigation measures established in the 2022 PEA and the 2022 PA. Based on vibration monitoring conducted in 2023 and 2024, there would be no significant impacts due to vibration from the Proposed Action. SpaceX anticipates launching Starship/Super Heavy from Pad B and Orbital Launch Mount 2 beginning in 2025. While no additional effects to cultural resources would result from the Proposed Action beyond those

Environmental Impact Category	Environmental Consequences
	previously described in the 2022 PEA, SpaceX will monitor vibration levels at the locations listed in Section 3.2.5 of the Final Tiered EA, as described in the Vibration Monitoring Plan. SpaceX is not proposing any additional access restrictions that would impact visitation to the cultural resources. The avoidance, minimization, or mitigation recommendations in the PA (as currently stands or modified under this EA, if applicable) would continue to be implemented. Although the Proposed Action would result in increased sonic boom levels from landings at the VLA, the sonic booms are not predicted to cause structural damage to cultural resources within the APE. FAA would continue to require SpaceX to maintain insurance in the unlikely event a sonic boom results in claims of structural damage. To mitigate potential effects on cultural resources, the FAA has revised the EA to remove the U.S. Exclusive Economic Zone (EEZ) from the Pacific Ocean action area and establish a buffer zone around the Papahānaumokuākea Marine National Monument.3 The removal of the U.S. EEZ from the Pacific Ocean action area helps to ensure that operations avoid areas of cultural significance, such as World Heritage Sites. Therefore, the Proposed Action would not result in significant impacts to cultural resources.
Department of Transportation Act, Section 4(f)	The Proposed Action would not change limits on access restrictions for launch operations or in the event of an anomaly. SpaceX would continue to implement mitigation measures for access restrictions as described in the 2022 PEA. Therefore, the FAA has determined that the increase in operational activities would not constitute a constructive use due to temporary access restrictions of these Section 4(f) properties. During operations, the Proposed Action would include increased launch cadence and increased thrust, which would increase the 90 dB LAmax contour from the contour assessed in the 2022 PEA by approximately 2 miles for launches and 1 mile for landings. No additional 4(f) resources were identified within modeled noise contours, however additional parts of the Laguna Atascosa National Wildlife Refuge and of the LRGV NWR would be exposed to the 90 dB LAmax contour. A quiet setting was noted as an important attribute to both these wildlife refuges. However, noise effects would be intermittent and short-term in duration (minutes). At all other times, the quiet setting of the Section 4(f) properties would persist. Therefore, the FAA determined that noise from operational activities would not constitute a constructive use of these Section 4(f) properties. The FAA determined there would not be significant impacts to 4(f) resources within the 60 CDNL contour and that sonic boom impacts would still be temporary, of short duration, and would not result in a constructive use of Section 4(f) resources. The Proposed Action would also result in a small increase in noise levels from increased commodity and water truck trips. The location and timing of these trips would be as described in the 2022 PEA and would not constitute a constructive use of affected Section 4(f) properties due to their intermittent nature and rapid noise attenuation over distance. SpaceX has implemented ongoing mitigation measures, including not restricting access on holidays and weekends during summer months, as required in the 2022 PEA, and relocating certain testing operations to Massey's Test Site, reducing the need for extended closures of Boca Chica Beach. The FAA and SpaceX continue to implement measures to minimize closure durations, including implementing precise scheduling to reduce public access disruptions, advance notice to allow for better planning around closures, and efforts to consolidate activities to minimize the frequency of closures. The FAA will ensure that SpaceX continues to mitigate impacts to Section 4(f) resources by means including but not limited to: issuing notifications in accordance with its Access Restriction Notification Plan, collaborating with USFWS to meet environmental education goals, collaboration with Fishing's Future (an organization dedicated to bringing youth closer to nature), implementing the SpaceX Lighting Management Plan, and undertaking research on restoration of algal flats in the area with Texas A&M University (TAMU). SpaceX continues to implement existing measures to reduce noise levels generated by construction equipment and from truck traffic, including placing generators in baffle boxes and the use of mufflers on equipment. In the unlikely event of an anomaly, impacts resulting from such an event would continue to be de minimis. SpaceX would continue to implement the measures specified in the 2022 PEA to mitigate and restore any impacts from anomalies at Boca Chica State Park, Brazos Island State Park, and other TPWD land. SpaceX will also notify TGLO for any anomalies, as appropriate. SpaceX continues to work with TPWD and USFW to remove debris in accordance with the 2022 MOU and to minimize environmental impacts from debris activity, as well as fund research to determine appropriate methods of restoring damaged algal flats. Therefore, the FAA has determined that the increase in operational activities would not lead to a corresponding increase in anomalies affecting the adjacent properties. Impacts resulting from anomalies would continue to constitute a temporary occupancy, but any such impacts are expected to be de minimis on Section 4(f) properties. As required by Section 4(f), the FAA

[3] Presidential Proclamation – Papahanaumokuakea Marine National Monument; Designated by Proclamation 8031 (June 15, 2006) and amended by Proclamation 8112 (February 28, 2007), and 50 CFR part 404 and Presidential Proclamation 9478 – Papahanaumokuakea Marine National Monument Expansion (August 31, 2016).

Environmental Impact Category	Environmental Consequences
	received concurrence on this de minimis finding from the proper officials with jurisdiction over the affected properties. Based on the above findings, the Proposed Action would not result in significant impacts to 4(f) properties.
Water Resources	Under the Proposed Action, SpaceX would continue to adhere to their Spill Prevention, Control, and Countermeasures Plan and Hazardous Materials Management Plan, as well as stormwater best management practices (BMPs), while conducting all FAA-permitted or -licensed operations to prevent or minimize indirect impacts from erosion and sedimentation to the nearby surface water bodies. The Proposed Action would increase the volume of deluge water used annually; however, all water would be managed in accordance with the TCEQ Agreed Order, individual TPDES permit, and Texas Multi-Sector General Permit, which authorizes the discharge of stormwater associated with industrial activity and specific non-stormwater discharges. Retention ponds would continue to capture launch pad water and would continue to be lined to prevent potential percolation of contaminants into the groundwater. Retention ponds would continue to be maintained and monitored by SpaceX in accordance with TCEQ's Texas Surface Water Quality guidance. The operation of the deluge system would apply a maximum of approximately 422,000 gallons per operation (booster static fire, launch, or landing). Most of the water would be collected in the containment structures or vaporized. Although approximately 87,900 gallons of the deluge water may leave the paved area of the VLA per operation, the amount of water that is anticipated to reach the mudflats is expected to be less than an average summer rainfall event. Therefore, this amount of water would be unlikely to alter the habitat or cause adverse impacts to water resources, including existing wetlands or floodplains, beyond what was analyzed in the 2022 PEA. Additionally, the changes would not result in dewatering or drawdown from adjacent areas, as deluge water would continue to be brought in from off-site. The Proposed Action is anticipated to continue to have no significant impacts to soil, air, and water during launch operations from potential ablation. To avoid risk of resource damage associated with oxygen vent/release, SpaceX constructed an 83,000-gallon concrete containment basin to contain vented liquid oxygen in 2022. Based on the above findings, the Proposed Action would not result in significant impacts to water resources.
Biological Resources	**Terrestrial Habitat and Wildlife:** The Proposed Action would increase vehicle traffic and human presence from an estimated 6,040 total trucks per year to 23,771 trucks under the Proposed Action to haul commodities and water to the site. However, SpaceX would continue to implement mitigation measures identified in the PEA, such as operating an employee shuttle to reduce the number of project-related vehicles, to minimize traffic impacts to wildlife, and limiting water truck deliveries to daytime hours to the extent practicable. During launch activities, noise would cause wildlife to be temporarily displaced or disturbed. However, due to the temporary and intermittent nature of these noise sources, wildlife would be expected to resume normal behavior shortly after a launch operation is complete. Significant impacts to wildlife due to sonic booms are not anticipated; impacts would not be measurably different from those reported in the 2022 PEA. SpaceX would also continue to conduct biological monitoring pre- and post-launch to evaluate avian species and vegetation changes due to SpaceX activities. Under the Proposed Action, heat plume temperatures within the immediate VLA and 0.6-mile radius could injure or cause mortality to individual animals or lead to vegetation changes, including loss of plant community structure, reduction in total cover, and replacement of same native species with weed species. These temperatures would be short-lived and would not be expected to permanently damage the vegetation. Infrequent launches and quick dissipation of heat is not anticipated to affect species at the population level. Based on data from the first three test flights, it is expected that the impacts from each launch event would be substantially less than those analyzed in the 2022 PEA. The Final Tiered EA acknowledges recent concerns regarding a "gravel plume." However, ongoing monitoring conducted since 2015 has found no significant evidence of trends, either increasing or decreasing, in any of the monitored avian species. SpaceX would also implement the Minimization and Mitigation Measures established in the Final Tiered EA to avoid or minimize biological impacts from the plume. Nighttime lighting effects would continue to remain short in duration and be minimized and mitigated through implementation of the SpaceX Lighting Management Plan and SpaceX Light Monitoring Plan. **Terrestrial ESA-Listed Species and Critical Habitat**: Terrestrial ESA-listed species and critical habitat impacts under the Proposed Action would be similar to those impacts described in the 2022 PEA. However, six additional species of shorebirds (that were not evaluated in the 2022 PEA) have potential to be impacted by visual disturbance, noise, heat plumes, and lighting associated with the Proposed Action: black-capped petrel (*Pterodroma hasitata*), band-rumped storm-petrel (*Oceanodroma castro*), Hawaiian petrel (*Pterodroma sandwichensis*), Newell's shearwater (*Puffinus auricularis newelli*), roseate tern (*Sterna dougallii*), and short-tailed albatross (*Phoebastria albatrus*). The cactus ferruginous pygmy-owl (newly listed as threatened) and tricolored bat (proposed endangered listing) were also added to the Final Tiered EA due to change in listing/nomination status. In accordance with ESA Section 7, the FAA reinitiated consultation with the USFWS on May 6, 2024. The FAA

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	determined the Proposed Action may affect and is likely to adversely affect ESA-listed species and critical habitat under USFWS jurisdiction, The 2022 USFWS Biological Conference Opinion (BCO), 2023 Addendum to the BCO, and the 2025 Addendum to the BCO (included in Appendix A of the Final Tiered EA), concluded the Proposed Action is not likely to jeopardize the continued existence of any federally listed species or adversely modify designated critical habitat. The 2022 BCO and Addendums contain Reasonable and Prudent Measures and associated Terms and Conditions to avoid, minimize, and mitigate the effects on listed species and critical habitat. Accordingly, it is anticipated that the Proposed Action would not result in significant impacts to terrestrial ESA-listed species and critical habitat. **Marine Resources:** Impacts by fallen objects and hazardous materials under the Proposed Action would remain highly unlikely to occur and thus discountable. Additionally, the 2022 LOC determination that exposure to sonic booms and impulse noise would not affect marine species is likely still valid, even with the increase in launch cadence. SpaceX would still implement the avoidance and minimization measures presented in the 2022 LOC and the 2022 PEA to minimize encounters with ESA-listed species. The FAA consulted with NMFS regarding the Proposed Action increases in overpressure events due to the overall increase in frequency of landings and the jettison of the heat shield. The FAA determined that the Proposed Action may affect and is likely to adversely affect two of the 24 ESA-listed species (Kemp's Ridley Turtle the Loggerhead Turtle) and critical habitat under NMFS jurisdiction. The FAA determined that the Proposed Action may affect but is not likely to adversely affect the remaining 22 ESA-listed species within the Project Area. NMFS issued a Conference and Biological Opinion (NMFS 2025), which is in Appendix A of the Final Tiered EA. SpaceX will implement the Reasonable and Prudent Measures, and Terms and Conditions as noted in the Conference and Biological Opinion. SpaceX also consulted with NMFS regarding potential impacts to MMPA species. NMFS determined the Proposed Action is not likely to result in take in the form of harassment because it is not likely to present either the potential to injure or the potential to disturb marine mammals by causing disruption of behavioral patterns. **Essential Fish Habitat**: The Proposed Action would increase the number of launches, but the risk of an anomaly would remain as described in the 2022 PEA and the probability of an expended vehicle impacting EFH would remain negligible. SpaceX expects fuel onboard the launch vehicle to be consumed during vehicle breakup, as well as all residual propellant, which would combust. Any remaining structural debris would be made of inert materials and are not anticipated to affect water quality and EFH. SpaceX would also continue to either sink or recover any large floating debris, as necessary, and implement previous NMFS Conservation Recommendations. The FAA has revised the Proposed Action to remove the Pacific action area from the EEZ to avoid potential impacts to sensitive ecosystems and protected areas. As discussed under marine ESA-listed species, single event impulse noise levels and sonic booms would not affect marine species or EFH, as little energy is transferred into the water column as a result of these events. The FAA has revised the Proposed Action to remove the Pacific Ocean action area from the U.S. EEZ and establish a buffer zone around the Papahānaumokuākea Marine National Monument. These changes respond to public concerns and ensure that potential environmental impacts will not be significant by: • Avoiding Sensitive Ecosystems: The removal of the Pacific Ocean action area from the Hawaiian EEZ ensures that operations avoid areas of the Pacific Ocean with unique biodiversity, thereby minimizing risks to marine life and ecosystems. • Avoiding Overlap with Protected Areas: The establishment of a buffer zone around the monument ensures that activities remain at a safe distance from the boundary, reducing the likelihood of any adverse impacts on the marine environment. • Mitigating Potential Cross-Boundary Impacts: By revising the action area, the likelihood of debris dispersion affecting the Hawaiian Islands and surrounding waters is significantly decreased and expected to be negligible. Based on the above findings, the Proposed Action would not result in significant impacts to biological resources.
Land Use	The Proposed Action would occur within SpaceX's property boundary and therefore would not change compatibility with zoning ordinances or land use plans. Beach and beach access point restrictions would still be subject to an existing Memorandum of Agreement between Cameron County and TGLO, and SpaceX's Roadway Closure Traffic Control Plan and access restriction text message service would also continue to be utilized to ensure safety and security during launch operations. Licensed access restrictions would not change under the Proposed Action. Although the Proposed Action could increase the frequency of transport due to an increase in launches and landings, transport of rocket components and payloads over this stretch of SH 4 is currently a common occurrence and would represent negligible increase compared to annual average daily traffic counts. SpaceX would continue

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	to notify the public of planned delays on SH 4 through updates to the Cameron County website's "Temporary and Intermittent State Highway 4 Road Delay" updates and through variable message signs posted along SH 4. SpaceX would also continue to notify and coordinate with leaseholders and oil and gas operators prior to launches and landings. Therefore, the Proposed Action would not result in significant land use impacts.
Hazardous Materials, Solid Waste, and Pollution Prevention	Transportation of commodities containing hazardous materials (LOX, methane, liquid nitrogen) would increase under the Proposed Action (from 3,850 to 18,421 trucks per year). However, SpaceX has appropriate plans in place to address accidental spills or releases of hazardous materials (e.g., Spill Prevention, Control, and Countermeasures Plan). Propellent (LOX and methane) quantities used for launch vehicles would also increase. However, most of the hazardous materials would be consumed prior to landing. Any launch anomalies would be subject to the guidance, policies, and protocols regarding hazardous material incidents and associated emergency response described in SpaceX's Anomaly Response Plan and PEA mitigation measures. The increased mission profile would increase the cumulative amount of metal that may be ablated and subsequently deposited outside the VLA. However, SpaceX would continue to conduct contaminant monitoring which, to-date, has showed negligible changes from baseline contaminant levels. SpaceX would continue to salvage or recycle solid waste to the maximum extent practicable and dispose of the remaining solid waste in appropriately permitted landfills. A launch anomaly could result in debris and hazardous materials being distributed in the immediate area of the landing site. If any anomalies occurred during the landing event 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. 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 propellant, ordnance, or chemicals would be transported back to SpaceX in accordance with DOT regulations for transport of hazardous substances. Based on the above findings, the Proposed Action would not result in significant hazardous materials, solid waste, and pollution prevention impacts.
Natural Resources and Energy Supply	The Proposed Action would not alter the potential for impacts to groundwater quality and should not alter rates of potential 20-year aquifer drawdown. It would, however, increase the water required for Super Heavy static fires and launches by approximately 10,270,000 gallons annually. This potential increased demand for municipal water would be approximately 0.1% of the City's 2018 usage and is well within the current and projected capacity for the City of Brownsville. While the source of the water used in the deluge system is potable water trucked to Starbase from the Brownsville Public Utility Board (BPUB), SpaceX's increased water usage accounts for 0.05% of BPUB's annual water delivery capacity. The FAA concludes that the deluge system will not have significant effects. Additional information on potable supplied by the BPUB is provided in Section 3.2.11.1 of the Final Tiered EA. The Proposed Action would not change 2022 PEA conclusions regarding demand for electricity or for diesel and gasoline to fuel ground equipment. With respect to demand for various propellant fuels, the increased launch events and propellant capacity would increase the total propellant to 168,750 MT, which would be an increase of 135,250 MT annually. However, there are large markets in the U.S. for LOX and LCH4 and therefore the relatively minor increased demand would not likely adversely affect prices or supplies at the regional or national level. Therefore, the Proposed Action would not result in significant natural resource or energy supply impacts.
Socioeconomics, Children's Environmental Health and Safety Risks	The Proposed Action would not materially change the expected number of operational personnel, expenditures, or taxes and so would not change expected impacts to economic activity, income, employment, population, sustenance, public services, and/or social conditions. Although the increased launch cadence would incrementally increase noise and traffic in the project area, no obvious trend has emerged to indicate either an increase in home values associated with the higher demand from employment and development in the area or a decrease in home values associated with proximity to the launch area. Therefore, the Proposed Action would not result in significant socioeconomic impacts.
Coastal Resources	The Proposed Action complies with the Coastal Zone Management Act (16 U.S.C. § 1451-1466). The State of Texas, through the TGLO, exercises its authority to implement the Texas Coastal Management Plan under the Coastal Zone Management Act through 31 Texas Administrative Code §501.3. The Proposed Action includes downrange landings no closer than 1 nautical miles offshore and the jettison of the heat shield no closer than 1 nm offshore. SpaceX is proposing to expand the boundary of the Gulf portion of the landing zone action area to within 1 nautical mile of the coast for a distance of 100 miles north and south of the VLA. SpaceX may land the Starship vehicle anywhere within the revised boundary (Section 3.2.8 of the Final Tiered EA). Landing and recovery operations, including the jettisoned heat shield would not take place in intertidal areas, salt marshes, estuaries, or coral reefs. As an applicant of the FAA-license, SpaceX is responsible for coordinating

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	with the TGLO to ensure its activities are consistent with the TCMP. However, the proposed activity is not included on the states "Listed Activities Subject to CZMA Review" and does not require further coordination with TGLO. To mitigate potential effects on marine ecosystems and cultural resources, the FAA has revised the EA to remove the US EEZ from the Pacific Ocean action area. This change ensures that operations avoid areas of unique biodiversity and cultural significance, such as World Heritage Sites, thereby minimizing risks to marine life and ecosystems associated with the monument. By shifting the action area, the likelihood of debris dispersion affecting the Hawaiian Islands and surrounding waters is significantly decreased and expected to be negligible.

ES.7. Reasonably Foreseeable Effects in Context of Past, Present, and Future Actions[4]

Reasonably foreseeable effects may include those that interact with baseline conditions caused by other past and present activity as well as reasonably foreseeable environmental trends and planned activity in the affected environment. Some of these past, present, and future activities include the Starfactory construction at SpaceX's production and manufacturing area, housing developments in Boca Chica Village and at Rio East and West (located near State Highway 4 and Richardson Avenue), vehicle engineering testing at SpaceX's property known as Massey's, and construction of a water and other utility lines from Brownsville to the Boca Chica along State Highway 4. Details are discussed by resource in Section 3.3 of the Final Tiered EA and summarized in Table ES.4. Proposed Action impacts, when combined with other past, present, or reasonably foreseeable future actions, would not result in significant effects.

Table ES.4 Summary of Cumulative Impacts

Environmental Impact Category	Cumulative Impacts
Air Quality	The VLA is located in Cameron County which is in an attainment area for all pollutants. The operational emissions for the Proposed Action represent an extremely small percentage of the Cameron County regional emissions and would not cause an exceedance of any NAAQS. Therefore, air emissions from the Proposed Action when combined with other past, present, or reasonably foreseeable future actions would not result in significant air quality impacts.
Climate	GHG emissions that would result from the Proposed Action would be comparable to those discussed in the 2022 PEA and minute compared to current emissions in the United States and the State of Texas. In combination with the ongoing and reasonably foreseeable actions by SpaceX and others in the Project area, the GHG contributions of these projects would be insignificant and is not expected to result in any changes in climate impacts.
Noise and Noise Compatible Land Use	Construction noise from developments in the area may result in incremental noise impacts; however, noise would be temporary, and in comparison to the current land use, distance to sensitive noise receptors, and distance to other proposed future projects, is not expected to result in any long-term adverse cumulative noise impacts. Operational noise from vehicle testing at Masseys would be temporary and intermittent, and similar to the testing noise impacts described in the 2022 PEA. As a result, any noise impacts from nearby activity would be short-term and temporary, and, combined with the Proposed Action, would not be expected to result in sustained, long-term impacts.

[4] Section 3.3 of the FAA's Draft Revised Tiered EA (Draft) refers to the impacts discussed in this section as "Cumulative Impacts." This term is used in CEQ's NEPA-implementing regulations. 40 CFR § 1508(i)(3) (2024). Since the publication of the Draft, however, CEQ issued an interim final rule to remove these regulations in accordance with E.O. 14154, *Unleashing American Energy*. See n. 1. As explained by CEQ in its February 19, 2025 memorandum, *Implementation of the National Environmental Policy Act*, NEPA, as amended, does not employ the term "cumulative effects" or "cumulative impacts." CEQ instead directs agencies to consider "'reasonably foreseeable' effects, regardless of whether or not those effects might be characterized as 'cumulative,'" consistent with NEPA. 42 U.S.C. § 4332(2)(C)(i). In accordance with this direction, the FAA has removed the term "cumulative effects" and "cumulative impacts" wherever previously used, but retains with edits the underlying analysis in Section 3.3 of the Draft Tiered EA.

Environmental Impact Category	Cumulative Impacts
Visual Effects	SpaceX housing developments known as Rio East and Rio West would introduce new visual elements to the area but are located near existing houses so visual impacts would be similar to existing conditions. Construction of Starfactory at Boca Chica launch site would also result in changes to the viewshed in the area. However, the area is already an industrial setting, and changes to the infrastructure would not change this setting. Vehicle testing at SpaceX's Massey's site may introduce new visual impacts to the Palmito Ranch Battlefield National Historic Landmark. However, these impacts would be temporary, and only occur when a vehicle was present at the testing site. Unlicensed testing activities are not part of the federal action under FAA's jurisdiction; however, this testing is expected to be within the ranges analyzed in the 2022 PEA. Visual impacts would be similar to those evaluated in the 2022 PEA and would not significantly degrade the existing viewshed. Therefore, implementation of the Proposed Action in conjunction with other past, present, or reasonably foreseeable projects would not result in significant impacts to visual resources.
Cultural Resources	Within the 10-mile APE for architectural resources, visual and temporary noise intrusions from ongoing and reasonably foreseeable actions by SpaceX and others would result in effects on historic properties. The extent of the impacts may vary depending on factors such as visibility of the infrastructure from the historic resource itself, and distance from the noise source. However, SpaceX will continue to implement the mitigation measures identified in the Section 106 Programmatic Agreement to offset impacts to cultural resources protected under Section 106 of the National Historic Preservation Act. To mitigate potential effects on cultural resources, the FAA has revised the EA to remove the U.S. Exclusive Economic Zone (EEZ) from the Pacific Ocean action area and establish a buffer zone around the Papahānaumokuākea Marine National Monument. Therefore, implementation of the Proposed Action in conjunction with other past, present, or reasonably foreseeable projects would not result in significant impacts to cultural resources.
Department of Transportation Act, Section 4(f)	Ongoing development in the vicinity of the Boca Chica launch site and continued commercial and recreational activity could have an impact on identified Section 4(f) properties by introducing new visual elements at the eastern edge of the Palmito Ranch Battlefield National Historic Landmark (see Visual Effects). However, SpaceX housing development is located near existing houses so visual impacts would be similar to existing conditions. Construction noise would be temporary and would not rise to the level of significant impacts to the quiet settings of the 4(f) resources. Unlicensed vehicle testing at the VLA and at SpaceX Massey's site would also be short duration and infrequent, and would not rise to the level of significant impacts to the quiet settings of the 4(f) resources. Therefore, implementation of the Proposed Action in conjunction with other past, present, or reasonably foreseeable projects would not result in significant impacts to Section 4(f) properties.
Water Resources	As discussed in Section 3.2.7 of the EA, deluge water discharged under the Texas Multi-Sector General Permit and July 11, 2022 LOX release did not significantly impact water quality and would not contribute to significant cumulative impacts to water resources. Water usage is not anticipated to be significantly altered by modification and operation of the Starfactory or construction of water lines. SpaceX housing developments would require additional water for household use, but this volume would not significantly impact water usage in Brownsville. Additionally, Best Management Practices to control stormwater runoff, erosion, and sedimentation would be used throughout all phases of construction for each project and projects would comply with permitting requirements to ensure impacts to water resources are avoided, minimized, and mitigated to the extent practicable. Therefore, implementation of the Proposed Action in conjunction with other past, present, or reasonably foreseeable projects would not result in significant impacts to water resources.
Biological Resources	Adverse effects to biological resources from the Proposed Action would be comparable to the 2022 PEA. The construction of water lines from Brownsville to Boca Chica would have a beneficial impact on biological resources by reducing the likelihood of vehicle collisions with wildlife. Construction of the Starfactory would also be unlikely to affect biological resources, as it is an industrial area which does not contain wildlife habitat. However, the development of new houses would remove potential wildlife habitat in the area and could disturb animals. For these reasons, there would be cumulative impacts on biological resources from additional development, human activity, and noise. The mitigation measures identified in the 2022 PEA would help to decrease the impacts but would not eliminate the impacts to biological resources. However, given the context and intensity of the impacts, significant cumulative impacts to biological resources are not expected.
Land Use	Conversion of Massey's site to a SpaceX testing facility would not result in a significant change of land use. Additionally, the Starfactory development is located in an industrial area, and would not result in a change of land use. The housing developments would convert presently undeveloped land, however this land was platted for residential development, so the conversion would be in conformance with development planning for the area. Operational noise from vehicle testing at Masseys would be temporary and intermittent, and similar to the testing noise impacts described in the 2022 PEA. Therefore, the changes in land use associated with Proposed Action and other past and reasonably foreseeable actions are in conformance with current land use and planned land use, and noise impacts would be minor and would not result in adverse noise impacts to land use in the area.

Environmental Impact Category	Cumulative Impacts
Hazardous Materials, Solid Waste, and Pollution Prevention	Management of hazardous materials and hazardous waste would continue to be conducted under all federal, state, and local laws and regulations for all projects. Best management practices would continue to be implemented to reduce the potential for impacts due to an inadvertent release of hazardous materials. Therefore, when past, present, and reasonably foreseeable projects are analyzed in conjunction with the Proposed Action, significant impacts from these projects would not be expected.
Natural Resources and Energy Supply	Cumulative impacts to natural resources and energy supplies could occur due to projects near the Boca Chica project area consuming energy and natural resources (including water resources, covered separately above). However, the Proposed Action is not expected to contribute in any substantive manner to adverse cumulative impacts to supplies of natural resources or energy use. Recent studies indicate that local, regional, and nationwide suppliers would be able to accommodate the increases in consumption of fuel, oil, propellants, electricity, aggregate water, and groundwater, resulting in no significant impacts. Additionally, the municipal supply would also be able to accommodate the increased consumption with no significant impacts. Therefore, when past, present, and reasonably foreseeable projects are analyzed in conjunction with the Proposed Action, the impacts are not anticipated to be significant.
Socioeconomics, and Children's Environmental Health and Safety Risks	SpaceX housing developments would increase the available number of housing units and may have some effect on the local housing market. However, due to the small percentage of SpaceX employees compared to the population of Cameron County, it is not anticipated that the housing market will be significantly impacted by the housing developments. Therefore, no significant impacts to socioeconomics, and children's environmental health and safety risks are anticipated.