SpaceX Starship-Super Heavy
Cape Canaveral Space Force Station

Final Environmental Impact Statement

November 2025

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Privacy Advisory

The Department of the Air Force (DAF) provided opportunities for the public to provide input on DAF decision making, offer alternatives to accomplish DAF proposed actions, and comment on the DAF's analysis of environmental effects. Public input through the National Environmental Policy Act (NEPA) process allows the DAF to make better-informed decisions on its proposed actions. All comments received during scoping and from public review of the Draft Environmental Impact Statement (EIS) have been considered, and those comments that are substantive have been addressed in the preparation of this Final EIS. Providing personal information is voluntary. Private addresses have been compiled to develop a mailing list for those requesting copies of this EIS; however, only the names of the individuals making comments and specific comments are disclosed. Personal information, home addresses, telephone numbers, and email addresses are not published in this Final EIS.

Compliance with Section 508 of the Rehabilitation Act

To the extent possible, this document is compliant with Section 508 of the Rehabilitation Act. This allows assistive technology to be used to obtain the available information from the document. Because of the nature of the graphics, figures, tables, and images in the document, accessibility is limited to a descriptive title for each item.

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DEPARTMENT OF THE AIR FORCE
WASHINGTON DC

OFFICE OF THE ASSISTANT SECRETARY

November 20, 2025

MEMORANDUM FOR WHOM IT MAY CONCERN

FROM: SAF/IE
1665 Air Force Pentagon
Washington, DC 20330-1665

SUBJECT: Final Environmental Impact Statement for Starship-Super Heavy at Cape Canaveral Space Force Station, Florida

This memorandum pertains to the Cape Canaveral Space Force Station (CCSFS) Starship-Super Heavy Environmental Impact Statement (EIS) (attached). In accordance with the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321, et seq., the Department of the Air Force (DAF) has considered the factors mandated by NEPA in the preparation of this EIS.

I certify that the analysis within the EIS has been tailored to comply with page limits and deadlines. The EIS represents DAF's good-faith effort to prioritize and document the most important considerations required by NEPA within the congressionally mandated page limits and timeline. This prioritization reflects DAF's expert judgment. Considerations addressed briefly or unaddressed were, in DAF's judgment, comparatively unimportant or frivolous. The resulting EIS represents DAF's good-faith effort to fulfill NEPA's requirements within the congressional timeline and such effort is now substantially complete.

The analysis contained within the EIS is, in DAF's judgment, adequate to inform and reasonably explain the DAF's final decision regarding the proposed action.

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MICHAEL E. SAUNDERS, P.E., SES, DAF
Acting Assistant Secretary of the Air Force
(Energy, Installations & Environment)

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Cover Sheet

a. ***Responsible Lead Agency***: Department of the Air Force (DAF)

b. ***Cooperating Agencies***: Federal Aviation Administration (FAA), National Aeronautics and Space Administration, U.S. Coast Guard, U.S. Fish and Wildlife Service, and National Park Service

c. ***Title***: *SpaceX Starship-Super Heavy Cape Canaveral Space Force Station Environmental Impact Statement*

d. ***Inquiries*****:** Information regarding the Environmental Impact Statement (EIS) is available at https://spaceforcestarshipeis.com/. For other inquiries, please contact Ms. Hilary Rummel, National Environmental Policy Act (NEPA) Project Manager, at ContactUs@SpaceForceStarshipEIS.com or SLD 45 Public Affairs Office by phone at (321) 494-7732 or email at SLD45.PA.PublicAffairs@SpaceForce.mil.

e. ***Designation***: Final Environmental Impact Statement

f. ***Abstract***: The DAF is preparing this EIS to inform and support the decision on whether to authorize the redevelopment of Space Launch Complex (SLC)-37. This EIS analyzes the potential environmental effects associated with (1) the redevelopment of SLC-37 to support Starship-Super Heavy operations, including launches and landings at Cape Canaveral Space Force Station, and (2) the FAA's issuance or modification of a vehicle operator license to Space Exploration Technologies Corporation (SpaceX) for Starship-Super Heavy operations at Cape Canaveral Space Force Station and approval of related airspace closures. The Proposed Action would result in temporary closures of airspace to ensure public safety. The FAA is responsible for creating these temporary closures in accordance with FAA Order JO 7400.2R, *Procedures for Handling Airspace Matters*. Because it is expected to take months to prepare the site for operational capabilities, and the details of airspace closures to support Starship-Super Heavy operations are unknown at this time, the DAF will assess the supplemental airspace analysis conducted by the FAA upon its completion and finalize a revised Record of Decision prior to Starship-Super Heavy launches or landings occurring.

g. ***EIS Identification Number***: Council on Environmental Quality No.: EISX-007-057-USF-1730277197

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Summary

This Environmental Impact Statement (EIS) assesses the potential environmental, social, economic, historic, and cultural impacts of the Proposed Action and alternatives. This EIS was prepared in compliance with the National Environmental Policy Act (NEPA) (*United States Code* [U.S.C.] Title 42, Sections 4321 et seq.), as amended; Department of Defense National Environmental Policy Act Implementing Procedures, dated June 30, 2025; the Initial Department of the Air Force (DAF) Policy for Implementation of the National Environmental Policy Act, dated July 2025; and Federal Aviation Administration (FAA) National Environmental Policy Act Implementing Procedures, dated June 30, 2025. The Proposed Action includes the potential execution of a real property agreement between the United States Space Force (USSF) and Space Exploration Technologies Corporation (SpaceX) at Cape Canaveral Space Force Station (CCSFS), the issuance of a vehicle operator license for Starship-Super Heavy operations by the FAA, and approval of related airspace closures by the FAA. In addition to a real property agreement, Space Launch Delta 45 (SLD 45) would need to approve the program on the Eastern Range, including modifications to the program. These modifications encompass changes to planning, construction, operations, and vehicle configurations as outlined in the program's jointly tailored Space Systems Command Manual (SSCM) 91-710, relevant Statement of Support, and Commercial Space Operations Support Agreement (CSOSA) and CSOSA Annex between the User and Eastern Range. The real property agreement, license, and approvals would support the proposed Starship-Super Heavy operations at CCSFS, including up to 76 launches and 152 landings annually (76 per stage), with a focus on Starship-Super Heavy missions supporting the DAF, the Department of Defense (DOD), and other national security requirements and objectives. Starship-Super Heavy at CCSFS would ensure mission-essential functions for the DOD, enable USSF to meet current and future mission requirements, and support civilian launch capabilities needed to meet projected rapid increase in launch requirements.

The DAF, as the parent organization of USSF, is the lead federal agency and is responsible for the scope and content of this EIS. The FAA, National Aeronautics and Space Administration (NASA), U.S. Coast Guard (USCG), U.S. Fish and Wildlife Service (USFWS), and National Park Service (NPS) are cooperating agencies.

The FAA has regulatory responsibilities for the Proposed Action under the Commercial Space Launch Act (51 U.S.C. Section 50901 et seq.) for licensing SpaceX Starship-Super Heavy non-DOD operations at CCSFS and approval of related airspace closures. The FAA's federal action is to issue or modify a vehicle operator license to authorize SpaceX Starship commercial launches and landings at CCSFS. The FAA's federal action includes the issuance of temporary airspace closures. The FAA will provide supplemental analysis of airspace impacts. Because it is expected to take months to prepare the site for operational capabilities, and the details of airspace closures to support Starship-Super Heavy operations are unknown at this time, the DAF will assess the supplemental airspace analysis conducted by the FAA upon its completion and finalize a revised Record of Decision prior to Starship-Super Heavy launches or landings occurring. After completion and acceptance of the NEPA process, the FAA may issue its own Record of Decision to support issuing a launch and reentry license to SpaceX and approving related airspace closures. Successfully completing the environmental review process does not guarantee that the FAA would issue a launch and reentry license to SpaceX or approve related airspace closures.

Purpose and Need for the Proposed Action

The purpose of the Proposed Action is to advance U.S. space capabilities by providing launch and landing infrastructure in furtherance of U.S. policy to ensure capabilities to launch and insert national security payloads into space (10 U.S.C. Section 2273, "Policy regarding assured access to space: national security payloads"). The DAF requires super-heavy lift capability to help meet its statutory and regulatory mandates. The Proposed Action would serve to maximize the use, effectiveness, and efficiency of DOD launch infrastructure because such a vehicle offers unique capabilities and potential cost savings currently unachievable by smaller launch vehicles. Additionally, it would diversify the launch program portfolio at CCSFS so the DAF can exploit new technologies and capabilities to increase access to, and defend freedom of, movement in space. The Proposed Action would increase the space launch mission capability of the DOD, NASA, and other federal and commercial customers and enhance the resilience and capacity of the nation's space launch infrastructure, while promoting a robust and competitive national space industry.

The need for the Action is to ensure increasingly assured access to space without substantially compromising current launch capabilities and fulfill (in part) the U.S. Congress's grant of authority to the Secretary of Defense, pursuant to 10 U.S.C. Section 2276(a), "Commercial space launch cooperation," and 10 U.S.C. Section 2273(b) permitting the Secretary of Defense to take action to:

- Maximize the use of the capacity of the space transportation infrastructure of the DOD by the private sector in the U.S.
- Maximize the effectiveness and efficiency of the space transportation infrastructure of the DOD.
- Reduce the cost of services provided by the DOD related to space transportation infrastructure at launch support facilities and space recovery support facilities.
- Encourage commercial space activities by enabling investment by covered entities[1] in the space transportation infrastructure of the DOD.
- Foster cooperation between the DOD and covered entities.
- Provide resources and policy guidance to sustain the availability of at least two space launch vehicles (or families of space launch vehicles) capable of delivering into space any payload designated by the Secretary of Defense or the Director of National Intelligence as a national security payload.

Interagency/Intergovernmental Coordination and Consultations, Government-to-Government Consultation, and Public Engagement

A variety of public involvement activities, tools, and techniques were used to engage the public and agencies during the EIS process, including a project website (https://www.SpaceForceStarshipEIS.com), in-person and virtual public meetings/hearings, stakeholder emails, social media, and newspaper advertisements.

Along with these public involvement activities, the DAF published the Notice of Intent to prepare an EIS in the *Federal Register* on February 21, 2024. Notices were also published in

[1] The term "covered entity" means a non-federal entity that is organized under the laws of the United States or of any jurisdiction within the United States and is engaged in commercial space activities.

local and regional newspapers to inform the public and government agencies of the EIS and announce the scoping comment period and scoping meetings. The scoping period occurred from February 15 to March 22, 2024. Written, oral, and electronic comments were accepted at the scoping meetings and by email or postal mail during the scoping comment period. Three in-person, open-house scoping meetings were held on March 6, 7, and 8, 2024. One virtual scoping meeting was held on March 12, 2024.

The DAF published the Notice of Availability for the Draft EIS in the *Federal Register* on June 13, 2025. Notices were also published in local and regional newspapers to inform the public and government agencies of the Draft EIS and announce the Draft EIS comment period and hearings. The Draft EIS comment period occurred from June 13 to July 28, 2025. Written, oral, and electronic comments were accepted at the Draft EIS public hearings and by email or postal mail during the Draft EIS comment period. Three in-person Draft EIS hearings were held on July 8, 9, and 10. One virtual hearing was held on July 15, 2025.

USSF sent letters to American tribal governments that may be impacted by, or have an interest in, the Action. The DAF coordinated with various local, state, and federal agencies regarding the Action and the DAF will continue to coordinate with these agencies, as required. The DAF also coordinated with regulators in compliance with the provisions of Section 106 of the National Historic Preservation Act; Section 7 of the Endangered Species Act; the Marine Mammal Protection Act; and the consistency determination requirements in the Coastal Zone Management Act.

Description of the Proposed Action and Alternatives

The DAF considered various candidate launch sites, including Space Launch Complex (SLC)-37 at CCSFS, SLC-50 at CCSFS, SLC-40 at CCSFS, Launch Complex (LC)-39A at Kennedy Space Center (KSC), LC-49 at KSC, SLC-4 at Vandenberg Space Force Base (VSFB), SLC-6 at VSFB, SpaceX Starbase, and other undeveloped East Coast locations. The candidate launch sites were evaluated using project-specific selection standards. Based on the site selection standard process, the DAF carried forward SLC-37 at CCSFS (Proposed Action) and the No Action Alternative for analysis in this EIS.

The other sites (including SLC-40, SLC-50, LC-39A, Starbase [Boca Chica], VSFB, and undeveloped/greenfield locations) were eliminated from detailed analysis because they did not meet operational requirements (proximate to a USSF installation, support up to 76 annual launches, eastward trajectory), would have greater environmental impacts, or lacked necessary infrastructure. While SLC-50 was considered during the early scoping phases of the EIS process, it was ultimately eliminated from detailed study. The development of SLC-50, which is currently a greenspace, is less ideal than the redevelopment of an existing SLC because leveraging existing infrastructure would increase efficiency and reduce environmental impacts.

Proposed Action: SLC-37 at CCSFS

If the Proposed Action were implemented, SpaceX would redevelop SLC-37 at CCSFS to support Starship-Super Heavy launch and landing operations. Subsequent to the DAF's decision and issuance of a Record of Decision, the DAF would execute a lease agreement with SpaceX. The DAF's federal action also includes acceptance of the launch vehicle onto the Eastern Range in accordance with the requirements of the CCSFS Range Safety and Operations offices. Various road improvements at CCSFS and KSC would be necessary to facilitate Starship-Super Heavy launch vehicle transport. SpaceX would widen Phillips Parkway from SLC-37 to Pad A Bypass Road on KSC for approximately 7 miles. Old A1A would also be widened and improved for

approximately 1 mile from SLC-37 to Phillips Parkway. SpaceX would also add a turn radius at the northeast corner of Phillips Parkway and Patrol Road, and a second turn radius at the northwest corner of Patrol Road and Beach Road.

The FAA would issue a vehicle operator license to SpaceX for Starship-Super Heavy operations at CCSFS and approval of related airspace closures for launch and landing operations.

Operations and Launch Vehicle

Starship-Super Heavy operations would include the transportation of launch vehicle components, pre-launch operations, Starship-Super Heavy launches, Super Heavy landings, and Starship landings. The Starship-Super Heavy launch vehicle includes two stages: (1) Super Heavy, which is the first stage (or booster), and (2) Starship, which is the second stage. As designed, both stages are reusable.

Launch Frequency

SpaceX would launch Starship-Super Heavy from SLC-37 up to 76 times per year. This would also include up to 76 Starship static-fire tests, 76 Super Heavy static-fire tests, 76 Super Heavy landings, and 76 Starship landings. Approximately half of the launches would occur during daytime (7:00 a.m. to 10:00 p.m.) and half during nighttime (10:00 p.m. to 7:00 a.m.). It is assumed that up to 20% of the annual launches would be scrubbed (meaning cancelled or delayed until a later date and can occur at any point before launch). The large majority of scrubs would occur prior to ignition of the booster. The Super Heavy booster landings would occur within a few minutes of launch, while the Starship landings would occur upon completion of the Starship missions, which could last hours or years. Most of the landings would return directly to the launch site; however, several landings per year could be expendable or occur on a floating platform (also referred to as “droneships”) in the open ocean. This environmental analysis does not guarantee 76 Starship-Super Heavy launches a year.

Launch, Landing, and Support Infrastructure

SpaceX would construct launch, landing, and support infrastructure at SLC-37. This infrastructure would include launch pads; launch mounts; integration towers; launch diverter or trench structures; landing pads; and landing catch towers/test stands. Two of each structure would be built at the complex. Infrastructure would include propellent generation (natural gas pretreatment system, methane (CH_4) liquefier, air separation unit); propellent commodity storage for liquid oxygen, liquid nitrogen, liquid CH_4, gaseous CH_4, gaseous nitrogen, helium, and water; lighting; utilities (power, fiber, water, natural gas, nitrogen, and helium); and staging, storage, and support infrastructure.

No Action Alternative

Under the No Action Alternative, SLC-37 would not be redeveloped for Starship-Super Heavy; the DAF would not enter into any real property agreements with SpaceX for the property, and the FAA would not issue a launch license to SpaceX for Starship-Super Heavy operations at this location. CCSFS and KSC would remain active launch facilities, and future launch activities would likely increase in the future. The No Action Alternative includes all projects currently authorized for implementation with signed NEPA decision documents.

Summary of Impacts and Mitigations

The following is a brief overview of the impact determinations discussed in detail in the EIS for the Proposed Action and the No Action Alternative. Table ES-1 provides a summary of the impacts on resources analyzed in the EIS. Table ES-2 provides a summary of required mitigation measures for each resource.

Due to the nature and maturity of the Starship-Super Heavy program, new information may become available, or the effectiveness of mitigation measures may be different than expected. Therefore, the DAF will employ an adaptive management strategy to monitor and evaluate results of earlier predictions and develop and implement adaptations to eliminate or reduce effects. For example, air quality will use this approach due to the potential significant impacts identified to air quality along with the continued refinement of operational and emissions data.

Table ES-1. Summary of Potential Impacts on Resource Areas

Resource Impact	Impact Description	Impact from Proposed Action SLC-37 at CCSFS	Impact from No Action Alternative
Air Quality Impact-1	Impact from criteria pollutants generated from construction	All emissions would remain below DAF's insignificance indicators for all criteria pollutants or their precursors. Construction would have **no significant impact** on air quality.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.
Air Quality Impact-2	Impact from criteria pollutants generated from operations	Projected emissions would exceed the DAF insignificance indicator for NO_x; therefore, the action is considered to have a **potentially significant impact** to air quality. This potential impact will be addressed through adaptive management.	Ongoing and future activities at CCSFS should have **no significant impact**.
Resiliency Impact-1	Impact from GHG emissions generated from construction	Peak annual GHG emissions from construction would be well below the DAF's insignificance indicator. Construction would have **no significant impact** on resiliency.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.
Resiliency Impact-2	Impact from GHG emissions generated from operations	The total carbon dioxide equivalent for the operation of Starship-Super Heavy would be above the DAF's screening threshold; however, the Proposed Action would support reusable space launch capabilities that decrease the GHG emissions of space vehicles and fuel sources. Operations would have **no significant impact** on resiliency.	Ongoing and future activities at CCSFS should have **no significant impact.**

Resource Impact	Impact Description	Impact from Proposed Action SLC-37 at CCSFS	Impact from No Action Alternative
Resiliency Impact-3	Impact from weather-related risks on the project	Given the proximity to the Atlantic Coast, regional weather could cause an increased risk of flooding at the launch site from sea level rise. Weather-related risk measures would be implemented to protect the site from these impacts. Construction and operations would have **no significant impact** from weather-related risks.	Ongoing and future activities at CCSFS should have **no significant impact.**
Airspace Impact-1	Impact on airspace during construction	Construction would occur on CCSFS and KSC and would not affect airspace or require any changes to airspace management. Construction would have **no impact** on airspace.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.
Maritime Impact-1	Impact on maritime resources during construction	Construction would occur on the terrestrial portions of CCSFS and KSC and would not require changes to the maritime management. Launch complex components would be transported to CCSFS via U.S. flag coastwise-qualified vessels using established maritime shipping routes. Construction would have **no impact** on the Maritime Transportation System.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.
Airspace Impact-2	Impact on airspace during operations	The Proposed Action would result in temporary closures of airspace to ensure public safety. The FAA will analyze the effects on airspace no later than the receipt of pre-application materials for a vehicle operator license.	Ongoing and future activities at CCSFS should have **no significant impact**.
Maritime Impact-2	Impact on maritime during operations	SpaceX operations would not alter or close existing shipping lanes; however, Security zones, ship hazard areas, and regulated navigation areas would be established around SLC-37 based on each mission's parameters. The current management measures in place, the limited duration of any restrictions, and the ability of mariners to identify alternate routes based on Notice to Mariners would reduce the effects from these closures. Operations would have **no significant impact** on the Maritime Transportation System.	Ongoing and future activities at CCSFS should **have no significant impact**.
Infrastructure Impact-1	Impact on transportation infrastructure from construction	The number of vehicles on the local roadway system would temporarily increase during construction; however, the regional roadways would be able to support the increased traffic. Construction would have **no significant impact** on the surrounding community transportation infrastructure.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.

Resource Impact	Impact Description	Impact from Proposed Action SLC-37 at CCSFS	Impact from No Action Alternative
Infrastructure Impact-2	Impact on utilities from construction	Construction would not result in a disruption or exceedance of existing utility infrastructure. Construction would have **no significant impact** on utilities.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.
Infrastructure Impact-3	Impact on transportation infrastructure from operations	There would be increased traffic from daily worker commutes, periodic delivery of launch vehicle components, and visitor/public observers. This increased traffic is within the current capacity of the regional transportation infrastructure and should not result in a substantial degradation of service. Operations would have **no significant impact** on transportation infrastructure at CCSFS and KSC.	Ongoing and future activities at CCSFS should have **no significant impact**.
Infrastructure Impact-4	Impact on utilities from operations	Operations would not result in a substantial disruption to any utility or exceed existing capacity. Operations would have **no significant impact** on utilities.	Ongoing and future activities at CCSFS should have **no significant impact.**
Socioeconomic Impact-1	Impact on population and housing from construction	While specialized construction workers from outside the local area may be required, the migration of workers into the area would be minimal and temporary, resulting in no increased need for housing or other public services beyond what is currently available. Construction would have **no significant impact** on population or housing.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.
Socioeconomic Impact-2	Impact on employment and income from construction	Construction would stimulate the local economy through the employment of construction workers, the purchase of construction materials and other goods and services. Construction would have a temporary **beneficial impact** on employment and income in the local economy.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.
Socioeconomic Impact-3	Impact on regional industries from construction	Aside from the construction industry, no other regional industries would be impacted from construction. Construction would have **no impact** on the regional industries.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.

Resource Impact	Impact Description	Impact from Proposed Action SLC-37 at CCSFS	Impact from No Action Alternative
Socioeconomic Impact-4	Impact on population and housing from operations	It is assumed that any new personnel would already reside in the area. Operations would not change the demand for local housing. Operations would have **no significant impact** on population and housing.	Ongoing and future activities at CCSFS should have **no significant impact**.
Socioeconomic Impact-5	Impact on employment and income from operations	The additional personnel supporting Starship-Super Heavy operations would decrease unemployment and likely increase the median income in the area. Operations would have a **beneficial impact** on employment and income in the local economy.	Ongoing and future activities at CCSFS would have a **beneficial impact**.
Socioeconomic Impact-6	Impact on regional industries from operations	Operations would not substantially change the regional economy or business volume, cause relocation of regional businesses, or substantially change the community tax base. Operations would have **no significant impact** on regional industries.	Ongoing and future activities at CCSFS should have **no significant impact**.
Noise Impact-1	Impact from construction noise	Temporary construction noise and vibrations would remain primarily within the SLC-37 boundary where there are no sensitive points of interest. Construction would have **no significant impact** on noise.	SLC-37 would remain consistent with existing conditions and there would be **no impact**.
Noise Impact-2	Community annoyance from operations	Local communities could be exposed to relatively high-level noise and overpressure environments from the launch and landings of Starship and Super Heavy boosters. Operations would have **significant impact** on community annoyance**.**	Ongoing and future activities at CCSFS should have **no significant impact**.
Noise Impact-3	Impact on hearing from operations	Launches and landings would be below thresholds of concern for hearing damage in accordance with Air Force Instruction 48-127. Operations would have **no significant impact** on hearing.	Ongoing and future activities at CCSFS should have **no significant impact**.
Noise Impact-4	Structural damage from operations	Operations would have **no significant impact** from potential structural damage given the low potential for an effect.	Ongoing and future activities at CCSFS should have **no significant impact**.
Health and Safety Impact-1	Impact on workers during construction	Construction conducted on CCSFS and KSC would be performed in accordance with CCSFS and KSC safety requirements and Occupational Safety and Health Administration-prescribed standards. Construction would have **no significant impact** on onsite construction personnel.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.

Resource Impact	Impact Description	Impact from Proposed Action SLC-37 at CCSFS	Impact from No Action Alternative
Health and Safety Impact-2	Impact on the public during construction	All construction would be inside the CCSFS-controlled perimeter and at least 7.5 miles from the nearest developed community. Construction would have **no impact** on public safety.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.
Health and Safety Impact-3	Impact on children during construction	Children would be prohibited from accessing the construction site because of the security requirements at CCSFS. Construction would have **no impact** on children.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.
Health and Safety Impact-4	Impact on workers during operations	SLD 45 and SpaceX would adhere to all established safety procedures, regulations, and federal laws that relate to worker safety. Operations would have **no significant impact** on the health and safety of onsite personnel.	Ongoing and future activities at CCSFS should have **no significant impact**.
Health and Safety Impact-5	Impact on the public during operations	SLD 45 and Space would adhere to all established safety procedures, regulations, and federal law. Operations would have **no significant impact** on the health and safety of onsite personnel.	Ongoing and future activities at CCSFS should have **no significant impact**.
Health and Safety Impact-6	Impact on children during operations	Children would be prohibited from accessing the launch site because of the security requirements at CCSFS and would not be exposed to noise levels that could affect health and safety. Operations would have **no significant impact** on children	Ongoing and future activities at CCSFS should have **no significant impact**.
Health and Safety Impact-7	Impact on marine safety during construction and operations	Given established notification procedures, operations would not substantially increase risk to the marine community. Operations would have **no significant impact** on marine safety.	Ongoing and future activities at CCSFS should have **no significant impact.**
Cultural Resources Impact-1	Impact on aboveground cultural resources and historic buildings, structures, and districts during construction	Only one National Register of Historic Places-eligible building is within the construction area. SpaceX would avoid its removal and would use the building for administrative purposes. Construction would have **no significant impact** on aboveground National Register of Historic Places-listed or eligible historic properties or important aboveground cultural resources.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.

Resource Impact	Impact Description	Impact from Proposed Action SLC-37 at CCSFS	Impact from No Action Alternative
Cultural Resources Impact-2	Impact on NHLs during construction	No changes to the Cape Canaveral Air Force Station NHL District would occur during construction. Construction would **have no significant impact** on NHLs.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.
Cultural Resources Impact-3	Impact on archaeological resources and Native American cultural properties during construction	No known archaeological resources or Native American cultural properties are within the construction footprint. Construction would have **no significant impact** on archaeological resources or Native American cultural properties.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.
Cultural Resources Impact-4	Impact on aboveground cultural resources and historic buildings, structures, and districts during operations	Noise and sonic booms from launches and landings could affect aboveground historic properties within the Area of Potential Effects, including properties outside of CCSFS, although the potential is exceedingly low. Impacts on these properties are currently unknown. Monitoring would occur to determine potential effects, and adverse effects would be mitigated. Operations would have **no significant impact** on historic buildings, structures, and districts.	Ongoing and future activities at CCSFS should have **no significant impact**.
Cultural Resources Impact-5	Impact on NHLs during operations	Noise and vibration from operations would not be expected to affect the Cape Canaveral Air Force Station NHL District, which is primarily associated with launch infrastructure. Operations would have **no significant impact** on NHLs.	Ongoing and future activities at CCSFS should have **no significant impact**.
Cultural Resources Impact-6	Impact on archaeological resources and Native American cultural properties during operations	Operations would not include any ground disturbance. Noise and sonic booms from launches and landings could affect archaeological resources and Native American cultural properties within the Area of Potential Effects, including those outside of CCSFS, although the potential is exceedingly low. Impacts on these resources are currently unknown. Monitoring would occur to determine potential effects and adverse effects would be mitigated. Operations would have **no significant impact** on archaeological resources and Native American cultural properties.	Ongoing and future activities at CCSFS should have **no significant impact**.

Resource Impact	Impact Description	Impact from Proposed Action SLC-37 at CCSFS	Impact from No Action Alternative
Visual Resource Impact-1	Impact on visual resources from construction	The viewscape at SLC-37 would be compatible in appearance with CCSFS. Construction would have **no significant impact** on visual resources.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.
Visual Resource Impact-2	Impact on visual resources from operations	Light emissions could be perceived in the surrounding area but would not be expected to cause impacts on public enjoyment of visual resources or noticeably alter the current night sky conditions. Operations would have **no significant impact** on visual resources.	Ongoing and future activities at CCSFS should have **no significant impact**.
Biology Impact-1	Impact on common vegetation from construction	Impacts on vegetation from trampling and permanent removal of vegetation would occur during construction; however, construction would not result in a substantial loss in native vegetation or native plant community diversity. Construction would have **no significant impact** on vegetation.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.
Biology Impact-2	Impact on non-protected wildlife species from construction	The use of heavy equipment during construction would generate increased traffic, noise, vibration, and light that may cause mobile wildlife to temporarily leave the area. The effects would be limited to the duration of construction and species would be expected to resume normal behavior after construction is complete. Construction would have **no significant impact** on wildlife.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.
Biology Impact-3	Impact on protected species from construction	Construction would result in impacts and require the removal of habitat for federally listed species; however, with the implementation of mitigation measures, construction would not jeopardize the existence of any protected species or result in the destruction or adverse modification of critical habitat. Construction would have **no significant impact** on protected species.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.
Biology Impact-4	Impact on common vegetation from operations	Operations would not cause a substantial loss of vegetation community diversity and would **have no significant impact** on vegetation.	Ongoing and future activities at CCSFS should have **no significant impact.**

Resource Impact	Impact Description	Impact from Proposed Action SLC-37 at CCSFS	Impact from No Action Alternative
Biology Impact-5	Impact on common wildlife from operations	While individual wildlife organisms would experience impacts from operations, there would not be a substantial loss of wildlife species diversity on CCSFS or regionally. Operations would have **no significant impact** on wildlife.	Ongoing and future activities at CCSFS should have **no significant impact.**
Biology Impact-6	Impact on protected species from operations	Some federally protected species would be exposed to light, vehicle traffic, noise (including sonic boom overpressures), vibration, and heat during launch operations. With the implementation of the mitigation measures, as well as required monitoring, operations would not jeopardize the continued existence of any protected species or result in the destruction or adverse modification of critical habitat. Monitoring would occur to ensure operations have **no significant impact on** protected species.	Ongoing and future activities at CCSFS should **have no significant impact.**
Geology Impact-1	Impact on geology from construction	Construction would disturb previously undisturbed areas and would have **no impact** on geology.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.
Geology Impact-2	Impact on soil from construction	While increased erosion and sedimentation may be caused by site preparation and construction, these effects would be avoided or minimized by incorporating standard erosion-control measures. Construction would have **no significant impact** on soil.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.
Geology Impact-3	Impact on geology from operations	Once operational, Starship-Super Heavy would not be expected to cause any measurable change on geology within or adjacent to SLC-37. Operations would have **no impact** on geology.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.
Geology Impact-4	Impact on soil from operations	Once operational, Starship-Super Heavy would not be expected to have any measurable impact on soil within or adjacent to SLC-37. Operations would have **no significant impact** on soil.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.

Resource Impact	Impact Description	Impact from Proposed Action SLC-37 at CCSFS	Impact from No Action Alternative
Water Impact-1	Impact on groundwater from construction	Short-term removal or dewatering of groundwater could be required, but water levels would return to normal upon completion of construction, given natural recharge via precipitation. Construction would have **no significant impact** on groundwater.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.
Water Impact-2	Impact on surface waters from construction	Construction, including vegetation clearing, soil disturbance, and grading, could increase surface water runoff, but necessary permit will be obtained, and mitigation measures implemented. Construction would have **no significant impact** on surface waters.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.
Water Impact-3	Impact on wetlands from construction	Construction would impact wetlands. SpaceX would implement mitigation measures required by Clean Water Act 404 construction permits. Construction would have **no significant impact** on wetlands.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.
Water Impact-4	Impact on floodplains from construction	An increase in impervious areas could divert floodwater to other areas and increase flood risks; however, mitigation measures would be implemented. Construction would have **no significant impact** on floodplains.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.
Water Impact-5	Impact on groundwater from operations	Operations would not use groundwater for any purpose, and SpaceX would develop site-specific spill prevention plans in compliance with DAF policy. Operations would have **no significant impact** on groundwater.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.
Water Impact-6	Impact on surface waters from operations	Water that would be required for launch operations would be obtained through the City of Cocoa municipal water distribution system and stored in retention ponds within the launch complex. Any water released into the installation stormwater system would be treated and permitted prior to release. Operations would have **no significant impact** on surface waters.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.
Water Impact-7	Impact on wetlands from operations	There would be no direct impacts on wetlands from operations. Operations would have **no impact** on wetlands.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.

Resource Impact	Impact Description	Impact from Proposed Action SLC-37 at CCSFS	Impact from No Action Alternative
Water Impact-8	Impact on floodplains from operations	Operations would not result in additional changes to floodplain and all permanent structures within SLC-37 would be built to withstand a 100-year storm event. Operations would have **no impact** on floodplains.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.
Hazardous Materials and Solid Waste Impact-1	Impact from hazardous materials from construction	Construction would not result in a substantial increase in hazardous materials and construction would comply with all applicable laws and regulations. SpaceX would coordinate with SLD 45 ahead of construction so that construction would be conducted in compliance with the RCRA permit and LUCIP for SLC-37. Construction would have **no significant impact** from hazardous materials.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.
Hazardous Materials and Solid Waste Impact-2	Impact from solid waste from construction	Solid waste would be collected and disposed of offsite at local, permitted landfills with capacity. Construction would have **no significant impact** from solid waste.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.
Hazardous Materials and Solid Waste Impact-3	Impact from hazardous materials from operations	Operations would have **no significant impact** from hazardous materials with the implementation of proper management protocols. SpaceX would coordinate with SLD 45 on incorporation of proper engineering and management controls to ensure that operations comply with the RCRA permit and the LUCIP. Site conditions would continue to be monitored in accordance with an SLD 45-approved monitoring plan.	Ongoing and future activities at CCSFS should have **no significant impact.**
Hazardous Materials and Solid Waste Impact-4	Impact from solid waste from operations	Brevard County landfills have the capacity to accommodate solid waste generated during operations. The reusability of the Starship-Super Heavy launch vehicle would result in a beneficial impact due to the reduction in expendable launch missions. Operations would have **no significant impact** on solid waste.	Ongoing and future activities at CCSFS should have **no significant impact.**
Land Use Impact-1	Impact on land use from construction	Construction would be consistent with land use plans or policies and would have **no impact** on land use at CCSFS.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.

Resource Impact	Impact Description	Impact from Proposed Action SLC-37 at CCSFS	Impact from No Action Alternative
Land Use Impact-2	Impact on public recreation from construction	Construction would not affect publicly available recreation areas and would have **no impact** on public recreation.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.
Land Use Impact-3	Impact on range management from construction	Construction would follow established SLD 45 requirements governing vehicle movement and construction and have **no impact** on range management.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.
Land Use Impact-4	Impact on coastal resources from construction	Construction would be consistent with the Florida Coastal Management Program and Coastal Zone Management Act and have **no impact** on coastal resources.	SLC-37 would remain consistent with existing conditions and there would be **no additional impact**.
Land Use Impact-5	Impact on land use from operations	SLC-37 would be re-designated from a heavy lift to a super-heavy lift SLC. Operations would have **no significant impact** on land use at CCSFS.	SLC-37 would continue to be used as a launch complex. There would be **no significant impact** on land use.
Land Use Impact-6	Impact on public recreation from operations	Noise, sonic booms and temporary closures from launches and landings could affect public recreational activities; however, the effects would be temporary, and closures would be minimal. Operations would have **no significant impact** on public recreation.	Ongoing and future activities at CCSFS should have **no significant impact.**
Land Use Impact-7	Impact on range management from operations	SLD 45 would establish mission-specific Launch Safety Exclusionary Zones for every Starship-Super Heavy launch and landing event. Operations would have a **potential for significant impact** on range management if mitigations are not successful in deconflicting range usage to accommodate 76 annual Starship-Super Heavy launches.	Ongoing and future activities at CCSFS should have **no significant impact.**
Land Use Impact-8	Impact coastal resources from operations	Operations would be consistent with the Florida Coastal Management Program and Coastal Zone Management Act and have **no impact** on coastal resources.	Ongoing and future activities at CCSFS should have **no significant impact**.

Resource Impact	Impact Description	Impact from Proposed Action SLC-37 at CCSFS	Impact from No Action Alternative
Foreseeable Environmental Effects	All resources	The only identified potential significant combined effect is associated with human annoyance from noise. Given the increased launch activity on CCSFS and KSC, community annoyance may increase in the surrounding areas.	Not applicable.

GHG = greenhouse gas

LUCIP = Land Use Control Implementation Plan

NHL = National Historic Landmark

RCRA = Resource Conservation and Recovery Act

Table ES-2. Summary of Mitigation Measures

Resource	Proposed Mitigation Measures
Air Quality and Resiliency	▪ **Air Quality Mitigation-1**: SpaceX would incorporate mitigation and control measures, such as frequent use of water for dust-generating activities, to minimize fugitive particulate matter emissions. ▪ **Air Quality Mitigation-2**: SpaceX and the DAF will engage in an Adaptive Management strategy to proactively mitigate any potential adverse air quality impacts and better define potential air impacts as new and improved information becomes available. Adaptive Management strategies and measures will be developed in the comprehensive Mitigation Plan as a separate and independent document. ▪ **Resiliency Mitigation-1**: Weather-related resiliency measures, such as flood protection and hurricane resilient structures, would be implemented to increase the protection of the project area from weather-related risk impacts.
Airspace and Maritime Management	Through compliance with federal requirements, regulations, and laws, no additional mitigation measures have been identified at this time.
Infrastructure	▪ **Infrastructure Mitigation-1**: Traffic management mitigation measures such as phased construction, detours and signage, advance notifications of potential disruptions, alternate routes, and limiting the movement of oversize vehicle loads and deliveries to off-peak hours would be coordinated with SLD 45, as applicable. ▪ **Infrastructure Mitigation-2**: If roadway damage were directly correlated to SpaceX activities, SpaceX would be required to work with SLD 45 to remedy the damage. ▪ **Infrastructure Mitigation-3**: Construction mitigation measures such as utility identification, real-time locating, site-specific worker training, and a system for incident reporting would be implemented. SpaceX would coordinate with utility companies to schedule construction around any planned maintenance to minimize potential service disruptions. ▪ **Infrastructure Mitigation-4**: Launch activities would be coordinated with local authorities to allow for proper roadway planning during high-profile launches. ▪ **Infrastructure Mitigation-5:** Industrial wastewater would be retained in ponds within SLC-37 and reused to the extent possible. If discharging wastewater into the stormwater system became necessary, SpaceX would acquire an Industrial Wastewater Permit from FDEP and permission from St. Johns River Water Management District and then confirm the wastewater met the water quality criteria outlined in the required FDEP Industrial Wastewater Permit for onsite disposal of launch-related wastewater.
Socioeconomics	▪ **Socioeconomic Mitigation-1**: SLD 45 would aim to reduce scheduling conflicts between launch service providers and will develop mitigation strategies to reduce impacts from conflicts. ▪ **Socioeconomic Mitigation-2**: An official process for submitting claims to SLD 45 associated with Starship-Super Heavy activities from SLC-37 will be established prior to the launch vehicle arriving at CCSFS. Once in place, the CCSFS Public Affairs Office will notify the public and direct people to the necessary procedures, including the SpaceX insurance claims email (insurance@SpaceX.com).

Resource	Proposed Mitigation Measures
Noise	▪ **Noise Mitigation-1**: SpaceX would employ sound suppression systems, such as water deluge and flame diverters, to reduce noise from launch activities. ▪ **Noise Mitigation-2**: SpaceX would work with SLD 45 to notify the community of potential substantial noise and sonic booms events. ▪ **Noise Mitigation-3**: Structural damage claims would be investigated, and claimants compensated according to FAA regulations, the Commercial Space Launch Act, and DAF policy. An official process for submitting claims associated with Starship-Super Heavy operations at SLC-37 will be established prior to the launch vehicle arriving at CCSFS, including the SpaceX insurance claims email (insurance@SpaceX.com).
Health and Safety	▪ **Health and Safety Mitigation-1**: Launch notifications would continue to be provided to the Child Development Center from KSC via kennedyspacecenter@dcnotify.com. KSC-PLN-5000_SIMS_Rev_B includes mitigation measures such as sheltering indoors to leverage the attenuation of the facility.
Cultural Resources	▪ **Cultural Resources Mitigation-1**: SpaceX would retain the LCC (BR02790) at SLC-37. If damage were discovered, the SLD 45 Cultural Resources Manager would implement measures stipulated in the PA to protect the affected historic property(s) from further damage while consultation with the Florida SHPO and other Consulting Parties takes place regarding the nature of the effect along with potential avoidance or minimization measures. ▪ **Cultural Resources Mitigation-2**: In the event of unanticipated discoveries during construction, such as encountering artifacts or human remains, the SLD 45 Cultural Resources Manager would be notified and all project-related activities within one hundred (100) feet of the discovery would cease in order to avoid or minimize harm to the property. The response to unanticipated discoveries would be governed by the PA. ▪ **Cultural Resources Mitigation-3**: If monitoring results show that noise or sonic boom overpressures from launches and landings may adversely affect aboveground historic properties, archaeological resources, or Native American cultural properties within the APE, these effects would be evaluated and mitigated as stipulated in the PA.
Visual Resources	▪ **Visual Resources Mitigation-1**: External lighting would comply with Space Wing Instruction 32-7001, *Exterior Lighting Management*. SpaceX would develop and implement an LMP that would include measures to minimize the effects of nighttime lighting.
Biological Resources	▪ **Biology Mitigation-1**: All areas of temporary disturbance would be reseeded with a certified weed-free, native plant mix in accordance with the DAF Integrated Natural Resources Management Plan and recommendations from the USFWS. ▪ **Biology Mitigation-2:** SpaceX would adhere to guidelines for invasive species management in the DAF Integrated Natural Resources Plan and would implement the Invasive Plant Species Control Plan to eradicate noxious and invasive plant species as they appear on site.

Resource	Proposed Mitigation Measures
Biological Resources	• **Biology Mitigation-3**: For the southeastern beach mouse and Florida scrub-jay, temporarily disturbed habitat would be restored to its original condition within 1 year of the end of the temporary impacts. For permanently lost southeastern beach mouse and Florida scrub-jay habitat that is not included in the USFWS southeastern beach mouse translocation effort (refer to Figure 2-8 of the BCA), actual acreages would be calculated once design plans are finalized. Within 30 days of SLD 45's receipt of SpaceX's final design plans, which would inform the amount of southeastern beach mouse and Florida scrub-jay habitat expected to be impacted, SLD 45 would provide SpaceX with habitat restoration or offset costs. For each phase of construction, payment for the initial year of required habitat restoration or offset would be made by SpaceX into the Canaveral Conservation Fund within 90 days of impact to a specific habitat area. Any changes in this timeline would be coordinated with, and authorized by, SLD 45 and the USFWS. ▪ **Biology Mitigation-4:** If tricolored bats were found roosting in idle or abandoned structures scheduled to be demolished, the bats would be allowed to leave the structures before demolition begins. ▪ **Biology Mitigation-5:** Preconstruction surveys of construction areas would be completed for Florida scrub-jays. ▪ **Biology Mitigation-6:** To minimize the potential for impacts on eastern indigo snakes, USFWS standard protection measures would be implemented. ▪ **Biology Mitigation-**7: A pedestrian survey would be conducted to locate and flag/stake all gopher tortoise burrows and burrows would be avoided to the maximum degree possible. The affected gopher tortoise burrows would be excavated, and captured tortoises would be relocated by a qualified biologist to an FWC-approved recipient site off CCSFS in accordance with FWC permitting requirements. ▪ **Biology Mitigation-8:** Standard construction measures would be used to avoid runoff to nearby waterways. ▪ **Biology Mitigation-9:** Construction areas would be monitored for the presence of bird nests before beginning any earth-moving or demolition activities. If a nest with an egg was identified, SLD 45 biologists would be notified, and a determination would be made regarding whether work must be adjusted to avoid impacts on the nest. If a bald eagle nest were identified near SLC-37, the USFWS's National Bald Eagle Management Guidelines would be implemented. ▪ **Biology Mitigation-10:** The SLC-37 launch pad infrastructure would be designed to contain the entire heat plume within the SLC-37 fence line. ▪ **Biology Mitigation-11:** SpaceX would operate in a manner consistent with the requirements and goals of the Prescribed Burn Memorandum of Understanding (MOU), KCA-4205 Revision C (USSF, USFWS, and NASA 2025), unless superseded or revised, to the extent possible given constraints of sensitive payloads and mission operations. ▪ **Biology Mitigation-12:** SpaceX, in coordination with SLD 45 and the USFWS, would develop a monitoring plan to better understand operational impacts on the southeastern beach mouse and Florida scrub-jay.

Resource	Proposed Mitigation Measures
	▪ **Biology Mitigation-13:** No land-disturbing activities or construction would occur within the southeastern beach mouse habitat inside the fence line of SLC-37 prior to completion of the USFWS trapping and relocation effort for southeastern beach mice. The USSF would coordinate with the USFWS to facilitate the trapping and relocation of southeastern beach mice from the approximately 20 acres of southeastern beach mouse habitat within the fence line of SLC-37. This translocation effort will also minimize impacts to individuals expected to occur within this construction area. Relocated mice will be transferred by the USFWS to a recipient site located outside CCSFS but within the species' current and historical range to reintroduce or augment an existing population. A siltation fence along a portion of the SLC-37 perimeter would be installed and maintained as a barrier to reduce the likelihood of the southeastern beach mouse reentering the area during both the trapping and subsequent construction activities.
Geology	▪ **Geology Mitigation-1**: Standard erosion-control measures, such as erosion control blankets, silt fences, and check dams, would be deployed during construction.
Water Resources	▪ **Water Mitigation-1**: SpaceX would coordinate groundwater dewatering efforts with CCSFS, KSC, and the FDEP to prevent adverse effects on groundwater quality or flow. ▪ **Water Mitigation-2**: Compensatory mitigation would be developed during the Clean Water Act 404 permitting process to avoid significant impacts on wetlands. ▪ **Water Mitigation-3**: Stormwater systems would be designed to treat and attenuate volumes associated with the affected floodplains. ▪ **Water Mitigation-4:** SpaceX would develop site-specific spill prevention plans in compliance with DAF policy.
Hazardous Materials, Solid Waste, and Pollution Prevention	▪ **Hazardous Materials and Solid Waste Mitigation-1**: SpaceX would coordinate with the Installation Restoration Program office to deconflict any IRP investigation areas with new infrastructure and construction would not interfere with ongoing soil and groundwater monitoring and treatment efforts. ▪ **Hazardous Materials and Solid Waste Mitigation-2:** SpaceX would coordinate with SLD 45 ahead of construction activities so that activities are conducted in compliance with the RCRA permit and LUCIP for SLC-37. ▪ **Hazardous Materials and Solid Waste Mitigation-3**: If any previously undocumented contamination is discovered during construction, including PFAS contamination, work would cease and CCSFS environmental staff would be notified immediately. ▪ **Hazardous Materials and Solid Waste Mitigation-4**: During construction in the vicinity of known contaminated sites, training will be implemented to help workers identify contaminated media (soil and groundwater) for proper disposal or treatment. ▪ **Hazardous Materials and Solid Waste Mitigation-5:** SpaceX would develop a solid waste management plan, which would require construction contractors to recycle and/or reuse debris to the maximum extent practicable, thereby diverting the debris from landfills. ▪ **Hazardous Materials and Solid Waste Mitigation-6:** If an accidental spill or an anomaly were to occur, SpaceX would assemble an emergency response team responsible for responding to hazards, stop work, and notify CCSFS. ▪ **Hazardous Materials and Solid Waste Mitigation-7:** If fill dirt is required for the site, SpaceX would test the dirt to ensure that all fill dirt brought on site would be in accordance with any applicable DOD, federal, and state screening levels. ▪ **Hazardous Materials and Solid Waste Mitigation-8:** SpaceX would coordinate with SLD 45 on incorporation of proper engineering and management controls to ensure that operations comply with the RCRA permit and LUCIP, and site conditions would continue to be monitored in accordance with an SLD 45-approved monitoring plan.

Resource	Proposed Mitigation Measures
Land Use	▪ **Land Use Mitigation-1**: CCSFS will coordinate with Merritt Island National Wildlife Refuge and Canaveral National Seashore (USFWS and NPS, respectively) regarding scheduled launches and landing operations and potential restrictions. ▪ **Land Use Mitigation-2**: The new StarGate Web[2] system would be expected to reduce scheduling conflicts, minimize impacts on Range Management, and promote access to the Eastern Range for all users.

BCA = Biological and Conference Assessment

FWC = Fish and Wildlife Conservation Commission

FDEP = Florida Department of Environmental Protection

LMP = Lighting Management Plan

PFAS = per- and polyfluoroalkyl substances

[2] The StarGate web [cloud] system was designed to streamline scheduling and operational management across the full spectrum of spaceport activities, including daily range operations, pre-launch milestones, and launch execution. As part of the broader range enterprise system, it integrates planning, asset scheduling, and utilization tracking to enhance operational readiness and resource alignment. By enabling real-time coordination among mission stakeholders and improving visibility into asset usage, StarGate is expected to reduce scheduling conflicts, minimize impacts on Range Management, and promote access to the Eastern Range for all users.

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Contents

Summary **ES-1**

Purpose and Need for the Proposed Action ES-2

Interagency/Intergovernmental Coordination and Consultations, Government-to-Government Consultation, and Public Engagement ES-2

Description of the Proposed Action and Alternatives ES-3

Proposed Action: SLC-37 at CCSFS ES-3

Operations and Launch Vehicle ES-4

Launch Frequency ES-4

Launch, Landing, and Support Infrastructure ES-4

No Action Alternative ES-4

Summary of Impacts and Mitigations ES-5

Acronyms and Abbreviations ..... **ix**

1 Purpose and Need for the Proposed Action **1-1**

1.1 Introduction 1-1

1.2 Purpose of the Proposed Action 1-2

1.3 Need for the Proposed Action 1-3

1.4 Launch Sites Considered 1-3

1.5 Launch Site Selection Standards 1-4

1.5.1 Launch Sites Eliminated 1-5

1.6 Interagency/Intergovernmental Coordination and Consultations 1-7

1.6.1 Government-to-Government Consultation 1-7

1.6.2 Interagency Coordination 1-8

1.7 Public Engagement 1-8

1.7.1 Notice of Intent 1-8

1.7.2 Scoping 1-9

1.7.3 Public Draft 1-9

1.8 Permits, Approvals, and Agreements 1-10

2 Description of the Proposed Action and Alternatives **2-1**

2.1 Proposed Action: SLC-37 at CCSFS 2-1

2.2 No Action Alternative 2-2

2.3 Starship-Super Heavy Details 2-6

2.3.1 Starship-Super Heavy Launch Vehicle 2-6
2.3.2 Operations 2-6
2.3.3 Launch Frequency 2-13
2.3.4 Launch, Landing, and Support Infrastructure 2-13
3 Affected Environment and Environmental Consequences 3-1
3.1 Air Quality and Weather-related Resiliency 3-2
3.1.1 Affected Environment 3-2
3.1.2 Environmental Consequences 3-3
3.1.3 Summary of Mitigation Measures and Impacts 3-8
3.2 Airspace and Maritime Management 3-10
3.2.1 Affected Environment 3-10
3.2.2 Environmental Consequences 3-12
3.2.3 Summary of Mitigation Measures and Impacts 3-14
3.3 Infrastructure 3-15
3.3.1 Affected Environment 3-15
3.3.2 Environmental Consequences 3-18
3.3.3 Summary of Mitigation Measures and Impacts 3-24
3.4 Socioeconomics 3-26
3.4.1 Affected Environment 3-26
3.4.2 Environmental Consequences 3-28
3.4.3 Summary of Mitigation Measures and Impacts 3-33
3.5 Noise and Vibration 3-35
3.5.1 Affected Environment 3-35
3.5.2 Environmental Consequences 3-38
3.5.3 Summary of Mitigation Measures and Impacts 3-51
3.6 Health and Safety 3-52
3.6.1 Affected Environment 3-52
3.6.2 Environmental Consequences 3-53
3.6.3 Summary of Mitigation Measures and Impacts 3-56
3.7 Cultural Resources 3-57
3.7.1 Affected Environment 3-59
3.7.2 Environmental Consequences 3-60
3.7.3 Summary of Mitigation Measures and Impacts 3-62

3.8 Visual Resources 3-64
3.8.1 Affected Environment 3-64
3.8.2 Environmental Consequences 3-64
3.8.3 Summary of Mitigation Measures and Impacts 3-66
3.9 Biological Resources 3-67
3.9.1 Affected Environment 3-67
3.9.2 Environmental Consequences 3-73
3.9.3 Summary of Mitigation Measures and Impacts 3-84
3.10 Geology 3-88
3.10.1 Affected Environment 3-88
3.10.2 Environmental Consequences 3-88
3.10.3 Summary of Mitigation Measures and Impacts 3-89
3.11 Water Resources 3-91
3.11.1 Affected Environment 3-91
3.11.2 Environmental Consequences 3-93
3.11.3 Summary of Mitigation Measures and Impacts 3-95
3.12 Hazardous Materials, Hazardous Waste, and Solid Waste 3-97
3.12.1 Affected Environment 3-97
3.12.2 Environmental Consequences 3-100
3.12.3 Summary of Mitigation Measures and Impacts 3-102
3.13 Land Use 3-104
3.13.1 Affected Environment 3-104
3.13.2 Environmental Consequences 3-108
3.13.3 Summary of Mitigation Measures and Impacts 3-113
3.14 Foreseeable Environmental Effects 3-114
3.14.1 Reasonably Foreseeable Activities 3-114
3.14.2 Reasonably Foreseeable Combined Impacts on Individual Resources 3-120
4 Other Required Analyses 4-1
4.1 Relationship between Local Short-term Use of the Human Environment and the Maintenance and Enhancement of Long-term Productivity 4-1
4.2 Irreversible and Irretrievable Commitments of Resources 4-1
5 List of Preparers 5-1
6 References 6-1

Appendices

1A Tribal Letters
1B Draft EIS Public Review and Comment Period
3.1A Air Conformity Applicability Model (ACAM) Results
3.1B Barge Emissions Modeling
3.1C Raptor Engine Emissions Report
3.4A Fishing Revenue for South Atlantic Region and Brevard County
3.5A Noise Report
3.5B Structures and Major Buildings
3.7A Section 106 Correspondence
3.7B SLC-37 Historic Structures Survey Report
3.7C Programmatic Agreement
3.9A USFWS Biological and Conference Assessment
3.9B NMFS Biological Opinion
3.9C Essential Fish Habitat Assessment
3.9D USFWS Biological Opinion
3.9E Prescribed Burn Memorandum of Understanding
3.13A CZMA Consistency Determination

Tables

ES-1 Summary of Potential Impacts on Resource Areas ES-5
ES-2 Summary of Mitigation Measures ES-17
1-1 Candidate Launch Sites Compared to the Selection Standards 1-5
2-1 Detailed Starship-Super Heavy Operations 2-7
2-2 Annual Potential Launch, Landing, and Test Rates 2-13
2-3 Starship-Super Heavy Launch, Landing, and Support Infrastructure 2-14
3.1-1 National Ambient Air Quality Standards 3-2
3.1-2 Attainment Status for Brevard County, Florida and DAF Insignificance Indicators 3-3
3.1-3 Annual Construction Emissions Estimates for Criteria Pollutants for the Proposed Action 3-5
3.1-4 Annual Construction Emissions Estimates of GHGs for the Proposed Action 3-5
3.1-5 Proposed Action Operational and Commuting Estimated Emissions 3-7
3.1-6 Operational Steady State GHG Emissions for the Proposed Action 3-7
3.1-7 Summary of Impacts on Air Quality and Weather-related Resiliency 3-9
3.2-1 Summary of Impacts on Airspace and Maritime Management 3-14
3.3-1 Estimated Potable Water Use for Launch Operations 3-22
3.3-2 Summary of Impacts on Infrastructure 3-25
3.4-1 Summary of Socioeconomic Impacts 3-34
3.5-1 Points of Interest 3-35
3.5-2 Estimated Noise Duration for Operational Activities 3-42
3.5-3 Summary of Impacts from Noise and Vibration 3-51
3.6-1 Distances to Community Areas and Schools 3-53
3.6-2 Summary of Impacts on Health and Safety 3-56
3.7-1 Summary of Impacts on Cultural Resources 3-63
3.8-1 Summary of Impacts on Visual Resources 3-66
3.9-1 Terrestrial ESA-listed Species Occurring in the ROI 3-68
3.9-2 Aquatic Federally Listed Species Potentially Occurring in the ROI 3-71
3.9-3 Summary of Impacts on Biological Resources 3-85
3.9-4 Summary of USFWS ESA Section 7 Determinations for Potentially Effected Species 3-86
3.9-5 Summary of ESA Section 7 Determinations for Critical Habitat 3-87

3.10-1 Summary of Impacts on Geology Resources 3-90
3.11-1 Summary of Impacts on Water Resources 3-96
3.12-1 Summary of Impacts from Hazardous Materials and Solid Waste....3-103
3.13-1 Summary of Impacts on Land Use and Coastal Resources 3-113
3.14-1 No Action Alternative for Launch, Landing, and Static Fire Test Operations at KSC and CCSFS....3-114
3.14-2 Past Vehicle Launches at CCSFS and KSC....3-115
3.14-3 Planned Future and Potential Launch Actions at CCSFS and KSC 3-116
3.14-5 Past, Present, and Reasonably Foreseeable Future Actions....3-117
3.14-6 Summary of Combined Impacts 3-127
5-1 List of Preparers and Reviewers 5-1
5-2 Independent Government Evaluation 5-2

Figures

1-1 Potential Launch Site Locations....1-4
2-1 Lease Area Parcels for SLC-37....2-3
2-2 Proposed Action: SLC-37 at CCSFS Currently Proposed Site Plan 2-4
2-3 Proposed Action: SLC-37 at CCSFS....2-5
2-4 Starship-Super Heavy Launch Vehicle Design....2-6
2-5 Flight Sequence for a Starship-Super Heavy Launch....2-10
2-6 Starship and Starship-Super Heavy Azimuths....2-11
2-7 Starship Potential Oceanic Landing Areas for Expendable or Floating Platform Scenarios....2-12
2-8 Notionally Proposed Design for Integration Tower and Launch Mount 2-16
3.2-1 Example of Maritime Restricted Areas for the 2024 Europa Clipper Mission....3-12
3.3-1 Transportation Systems at CCSFS and KSC and Surrounding Area 3-17
3.3-2 Roadway Improvements 3-20
3.4-1 Example of Launch and Expendable Landing NOTMARs and Vessel Counts within South Atlantic Exclusive Economic Zone 3-31
3.4-2 Locations of Popular Fishing Spots Near CCSFS....3-32
3.5-1 Noise Points of Interest....3-37
3.5-2 Current Baseline DNL 3-40
3.5-3 Current Baseline CDNL (only 60 dBC shown)....3-41

3.5-4 DNL Noise Contours for Starship-Super Heavy Launch....3-46
3.5-5 Sonic Boom Overpressure Contours for Super Heavy Landing....3-47
3.5-6 CDNL Contours for Super Heavy Landing....3-48
3.5-7 Noise Contours for Starship-Super Heavy Launch Maximum A-weighted (L_{Amax})....3-49
3.5-8 Noise Contours for Starship-Super Heavy Launch Maximum Unweighted Sound Levels (L_{max})....3-50
3.7-1 Area of Potential Effects....3-58
3.11-1 Wetlands in ROI....3-92
3.12-1 Environmental Restoration Sites in ROI....3-99
3.13-1 Public Recreation Areas in ROI....3-107
3.13-2 Notional Access Restriction Areas....3-112
3.14-1 Cumulative DNL....3-123
3.14-2 Cumulative CDNL....3-124

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Acronyms and Abbreviations

Acronym	Definition
µg/m^3	microgram(s) per cubic meter
ACAM	Air Conformity Applicability Model
AFMAN	Air Force Manual
AHA	aircraft hazard area
APE	Area of Potential Effects
ASU	air separation unit
BA	biological assessment
BCA	Biological and Conference Assessment
BDA	blast danger area
BGEPA	Bald and Golden Eagle Protection Act
CAA	Clean Air Act
CANA	Canaveral National Seashore
CCSFS	Cape Canaveral Space Force Station
CDNL	C-weighted day-night average sound level
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CSOSA	Commercial Space Operations Support Agreement
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DAF	U.S. Department of the Air Force
dB	decibel(s)
dBA	A-weighted decibel level
dBC	C-weighted decibel level
DNL	day-night average sound level
DOD	Department of Defense

Acronym	Definition
DOT	Department of Transportation
EA	environmental assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	environmental impact statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ERP	Environmental Resource Permit
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FCA	Flight Caution Area
FDEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
FEMA	Federal Emergency Management Agency
FHA	Flight Hazard Area
FMSF	Florida Master Site File
FONPA	Finding of No Practicable Alternative
FR	*Federal Register*
FRA	Fiscal Responsibility Act of 2023
FWC	Fish and Wildlife Conservation Commission
GHG	greenhouse gas
HIF	Horizontal Integration Facility
ICRMP	Integrated Cultural Resources Management Plan
in/sec	inch(es) per second
INRMP	Integrated Natural Resources Management Plan
IRP	Installation Restoration Program
KSC	Kennedy Space Center
L_{Amax}	maximum A-weighted sound level
lb.	pound(s)
LBP	lead-based paint
LC	launch complex

Acronym	Definition
L_{max}	maximum unweighted sound level
LMP	Lighting Management Plan
LN_2	liquid nitrogen
LOA	Letter of Authorization
LOX	liquid oxygen
LUC	land use control
LUCIP	Land Use Control Implementation Plan
MBTA	Migratory Bird Treaty Act
MINWR	Merritt Island National Wildlife Refuge
MMPA	Marine Mammal Protection Act
MN	meganewton(s)
MOU	Memorandum of Understanding
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MT	metric ton(s)
mtpy	metric ton(s) per year
NAAQS	National Ambient Air Quality Standards
NAS	National Aerospace System
NASA	National Aeronautics and Space Administration
NEI	National Emissions Inventory
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NHL	National Historic Landmark
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NOI	Notice of Intent
NOTAM	Notice to Airmen
NOTMAR	Notice to Mariners
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service

Acronym	Definition
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
O_3	ozone
OSHA	Occupational Safety and Health Administration
PA	programmatic agreement
Pb	lead
PCB	polychlorinated biphenyl
PFAS	per- and polyfluoroalkyl substances
PM_{10}	particulate matter less than 10 micrometers in aerodynamic diameter
$PM_{2.5}$	particulate matter less than 2.5 micrometers in aerodynamic diameter
POI	point of interest
ppm	part(s) per million, by volume
PPV	peak particle velocity
psf	pound(s) per square foot
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
ROI	region of influence
SCCC	Spaceport Command and Control Center
SHPO	State Historic Preservation Officer
SLC	Space Launch Complex
SLD	Space Launch Delta
SO_2	sulfur dioxide
SpaceX	Space Exploration Technologies Corporation
SSCM	Space Systems Command Manual
SWI	Space Wing Instruction
SWMU	solid waste management unit
tpy	ton(s) per year
U.S.	United States
U.S.C.	*United States Code*
UFC	Unified Facilities Criteria
ULA	United Launch Alliance

Acronym	Definition
USACE	U.S. Army Corps of Engineers
USCB	U.S. Census Bureau
USCG	U.S. Coast Guard
USFWS	U.S. Fish and Wildlife Service
USSF	United States Space Force
VOC	volatile organic compound
VSFB	Vandenberg Space Force Base

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1 Purpose and Need for the Proposed Action

1.1 Introduction

The Department of the Air Force (DAF) prepared this Environmental Impact Statement (EIS) to inform and support the decision on whether to authorize the redevelopment of Space Launch Complex (SLC)-37. This EIS will evaluate the potential environmental effects associated with (1) the redevelopment of SLC-37 to support Starship-Super Heavy operations, including launches and landings at Cape Canaveral Space Force Station (CCSFS), and (2) the Federal Aviation Administration's (FAA's) issuance or modification of a vehicle operator license to Space Exploration Technologies Corporation (SpaceX) for Starship-Super Heavy operations at CCSFS and approval of related airspace closures. SpaceX would conduct up to 76 launches and 152 landings annually (76 per stage) at SLC-37.

This EIS assesses the potential environmental, social, economic, historic, and cultural impacts of the Proposed Action and alternatives. This EIS was prepared in compliance with the National Environmental Policy Act (NEPA), (*United States Code* [U.S.C.] Title 42, Sections 4321 et seq.), as amended; Department of Defense National Environmental Policy Act Implementing Procedures, dated June 30, 2025; the Initial Department of the Air Force (DAF) Policy for Implementation of the National Environmental Policy Act, dated July 2025; and Federal Aviation Administration (FAA) National Environmental Policy Act Implementing Procedures, dated June 30, 2025.

The Proposed Action includes the potential execution of a real property agreement between the United States Space Force (USSF) and SpaceX at CCSFS, the issuance of a vehicle operator license for Starship-Super Heavy operations by the FAA, and the approval of related airspace closures by the FAA. In addition to a real property agreement, Space Launch Delta 45 (SLD 45) would need to approve the program on the Eastern Range, including modifications to the program. These modifications encompass changes to planning, construction, operations, and vehicle configurations as outlined in the program's jointly tailored Space Systems Command Manual (SSCM) 91-710, relevant Statement of Support, and Commercial Space Operations Support Agreement (CSOSA) and CSOSA Annex between the User and Eastern Range. The real property agreement, license, and approvals would support the proposed Starship-Super Heavy construction and operations at CCSFS, with a focus on Starship-Super Heavy missions supporting the DAF, the Department of Defense (DOD), and other national security requirements and objectives. Operating Starship-Super Heavy at CCSFS would ensure mission-essential functions for the DOD, enable USSF to meet current and future mission requirements, and support civilian launch capabilities needed to meet projected rapid increase in launch requirements.

The DAF, as the parent organization of USSF, is the lead federal agency and is responsible for the scope and content of this EIS. The FAA, National Aeronautics and Space Administration (NASA), U.S. Coast Guard (USCG), U.S. Fish and Wildlife Service (USFWS), and National Park Service (NPS) are cooperating agencies.

The FAA has regulatory responsibilities for the Proposed Action under the Commercial Space Launch Act (51 U.S.C. Sections 50901 et seq.) for licensing SpaceX Starship-Super Heavy non-DOD operations at CCSFS and approval of related airspace closures. The FAA would issue a vehicle operator license to SpaceX for Starship-Super Heavy commercial operations at CCSFS, along with potential renewals and modifications to the license within the scope of operations analyzed in this EIS. In addition, the FAA must approve related airspace closures for launch and landing operations. After completion and acceptance of the NEPA process, the FAA may issue

its own Record of Decision (ROD) to support issuing a vehicle operator license to SpaceX and approving related airspace closures. The FAA will draw its own conclusions from the analysis presented in this EIS and assume responsibility for its environmental decisions and any related mitigation measures. For the FAA to use this analysis to support its determination, the EIS must meet the requirements of FAA Order 1050.1F, *FAA National Environmental Policy Act Implementing Procedures*, which contains the FAA's policies and procedures for compliance with NEPA. Because it is expected to take months to prepare the site for operational capabilities, and the details of airspace closures to support Starship-Super Heavy operations are unknown at this time, the DAF will assess the supplemental airspace analysis conducted by the FAA upon its completion and finalize a revised ROD prior to Starship-Super Heavy launches or landings occurring. Successfully completing the environmental review process does not guarantee that the FAA would issue SpaceX's launch and reentry license or approve related airspace closures.

NASA is serving as a cooperating agency based on special expertise with respect to potential environmental impacts from space launches and the operation of a launch site. NASA also has special expertise and interest in the operation of reusable suborbital and orbital launch vehicles through its programs, which are intended to foster the development of the commercial reusable suborbital and orbital space transportation industry.

The USCG is serving as a cooperating agency based on its role in maritime safety and regulatory authority over waters subject to jurisdiction of the United States (U.S.) pursuant to the Ports and Waterways Safety Act, 46 U.S.C. Section 700. The USCG also has regulatory authority of U.S.- and foreign-flagged vessels as outlined in 46 CFR and has a requirement to review and advise SLD 45 on all launch and reentry site evaluation risk assessments with a focus on vessel navigation safety.

The USFWS is serving as a cooperating agency based on its land management responsibilities for Merritt Island National Wildlife Refuge (MINWR), which surrounds CCSFS to the west and north and includes the undeveloped portions of Kennedy Space Center (KSC).

The NPS is serving as a cooperating agency based on its management of the Canaveral National Seashore (CANA), which is located to the north of KSC and consists of the barrier islands along the Atlantic Ocean.

1.2 Purpose of the Proposed Action

The purpose of the Proposed Action is to advance U.S. space capabilities by providing launch and landing infrastructure in furtherance of U.S. policy to ensure capabilities to launch and insert national security payloads into space (10 U.S.C. Section 2273, "Policy regarding assured access to space: national security payloads"). The DAF requires super-heavy lift capability to help meet its statutory and regulatory mandates. The Proposed Action would serve to maximize the use, effectiveness, and efficiency of DOD launch infrastructure because such a vehicle offers unique capabilities and potential cost savings currently unachievable by smaller launch vehicles. Additionally, it would diversify the launch program portfolio at CCSFS so the DAF can exploit new technologies and capabilities to increase access to, and defend freedom of, movement in space. The Proposed Action would increase the space launch mission capability of the DOD, NASA, and other federal and commercial customers and enhance the resilience and capacity of the nation's space launch infrastructure, while promoting a robust and competitive national space industry.

1.3 Need for the Proposed Action

The need for the Action is to ensure increasingly assured access to space without substantially compromising current launch capabilities and fulfill (in part) the U.S. Congress's grant of authority to the Secretary of Defense, pursuant to 10 U.S.C. Section 2276(a), "Commercial space launch cooperation," and 10 U.S.C. Section 2273(b) permitting the Secretary of Defense to take action to:

- Maximize the use of the capacity of the space transportation infrastructure of the DOD by the private sector in the U.S.
- Maximize the effectiveness and efficiency of the space transportation infrastructure of the DOD.
- Reduce the cost of services provided by the DOD related to space transportation infrastructure at launch support facilities and space recovery support facilities.
- Encourage commercial space activities by enabling investment by covered entities[3] in the space transportation infrastructure of the DOD.
- Foster cooperation between the DOD and covered entities.
- Provide resources and policy guidance to sustain the availability of at least two space launch vehicles (or families of space launch vehicles) capable of delivering into space any payload designated by the Secretary of Defense or the Director of National Intelligence as a national security payload.

1.4 Launch Sites Considered

The following established launch sites were considered for siting the new Starship-Super Heavy operations (Figure 1-1):

- **CCSFS**: SLD 45 operates CCSFS, which covers approximately 16,000 acres on the east coast of Florida in Brevard County.
- **KSC**: NASA operates KSC, which covers approximately 142,000 acres in Brevard and Volusia counties on the east coast of Florida on the Canaveral Peninsula. The southern boundary of KSC abuts CCSFS.
- **Vandenberg Space Force Base (VSFB)**: SLD 30 operates VSFB, which is located on the west coast of California. The Base covers approximately 100,000 acres in western Santa Barbara County and extends approximately 42 miles along California's central coast.
- **Starbase**: SpaceX operates Starbase, which is in Boca Chica, Texas, adjacent to the Gulf of America in Cameron County. Starbase is approximately 2 miles north of the U.S.-Mexico border and is close to the cities of Brownsville and South Padre Island.

[3] The term "covered entity" means a non-federal entity that is organized under the laws of the U.S. or of any jurisdiction within the U.S. and is engaged in commercial space activities.

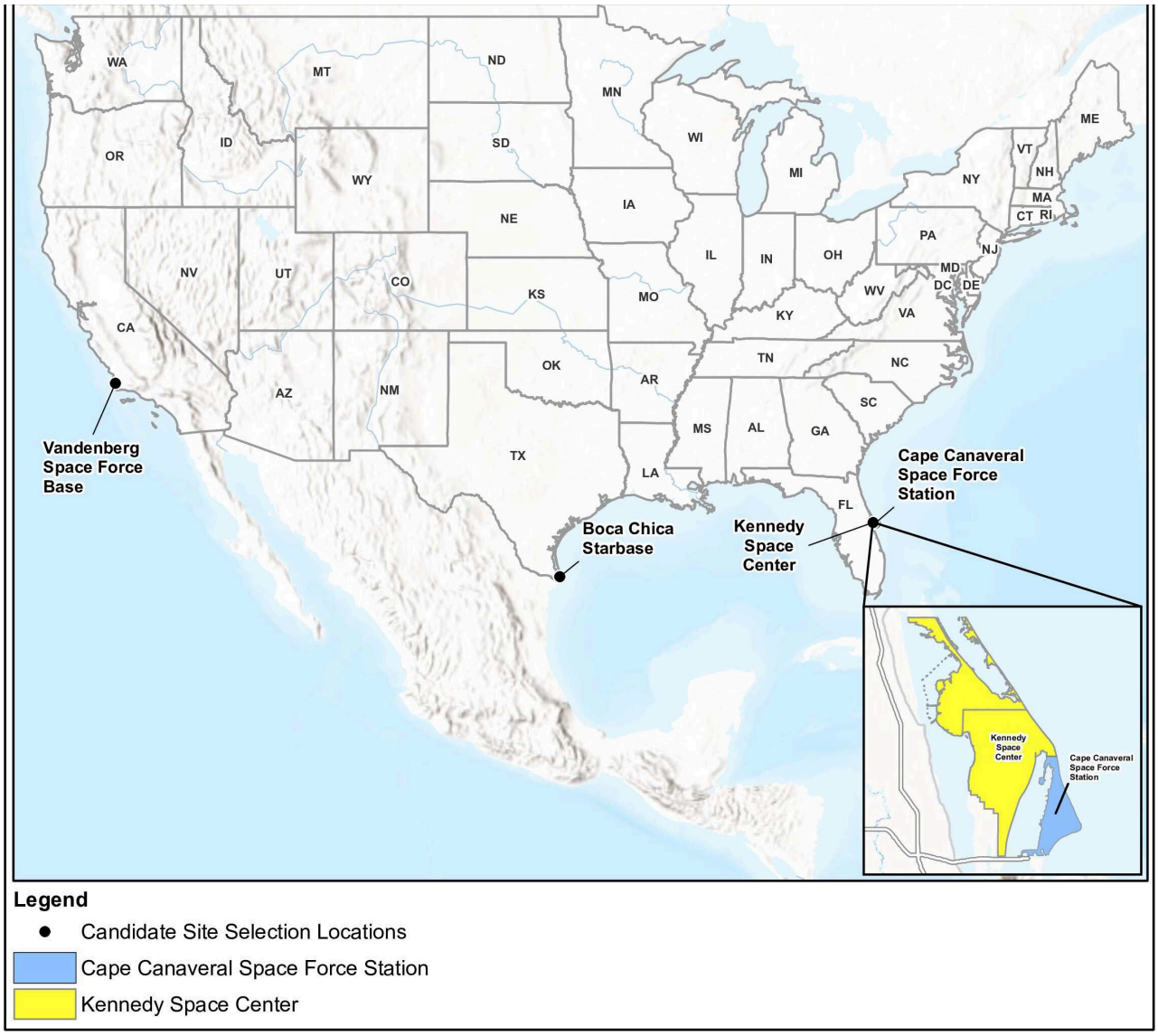

Figure 1-1. Potential Launch Site Locations

1.5 Launch Site Selection Standards

The following candidate launch complexes at CCSFS, KSC, VSB, and Starbase were determined to meet the purpose and need of the Action and were considered for inclusion in this EIS:

1. SLC-37 at CCSFS, Florida
2. SLC-50 at CCSFS, Florida (undeveloped)
3. SLC-40 at CCSFS, Florida
4. Launch Complex (LC)-39A at KSC, Florida
5. LC-49 at KSC, Florida (undeveloped)
6. SLC-4 at VSFB, California
7. SLC-6 at VSFB, California
8. SpaceX Starbase, Texas
9. Other Undeveloped East Coast Locations

These candidate Starship-Super Heavy launch sites were evaluated using the following selection standards:

A. Located on or adjacent to a USSF installation with appropriate launch support infrastructure to provide direct access for USSF and secure payload processing facilities.

B. Located in an area where Launch Exclusionary Safety Zones (i.e., blast danger areas [BDAs], flight caution areas [FCAs], flight hazard areas [FHAs], and special clear areas), airfield operation clear zone, accident potential zone, explosive safety quantity distance arcs, and antiterrorism/force protection standards would not conflict with established public land uses or residential areas.

C. Can accommodate up to 76 Starship-Super Heavy launches annually with minimal limitations to operations at existing launch complexes.

D. Supports missions requiring an eastward launch from the U.S., with no changes to existing designations for airspace or land use.

E. Maximize effectiveness and efficiency of space transportation infrastructure and limit environmental disturbance by utilizing a site currently developed for use as a launch complex.

Table 1-1 compares each of the candidate launch sites to the selection standards. Some of the identified launch sites presented technical and logistical challenges.

Table 1-1. Candidate Launch Sites Compared to the Selection Standards

Candidate Launch Site	Selection Standard A – Proximate to USSF Installation	Selection Standard B – Compatible Land Use	Selection Standard C – Supports up to 76 Launches Annually	Selection Standard D – Supports an Eastward Trajectory	Selection Standard E – Existing SLC
SLC-37 at CCSFS	Meets	Meets	Potentially meet	Meets	Meets
SLC-50 at CCSFS	Meets	Meets	Potentially meets	Meets	Does not meet
SLC-40 at CCSFS	Meets	Meets	Does not meet	Meets	Meets
LC-39A at KSC	Meets	Meets	Does not meet	Meets	Meets
LC-49 at KSC	Meets	Does not meet	Does not meet	Meets	Does not meet
SLC-4 at VSFB	Meets	Meets	Does not meet	Does not meet	Meets
SLC-6 at VSFB	Meets	Meets	Does not meet	Does not meet	Meets
SpaceX Starbase (Boca Chica)	Does not meet	Meets	Potentially meets	Meets	Meets
Other Undeveloped East Coast Locations	Does not meet	Does not meet	Potentially meets	Meets	Does not meet

1.5.1 Launch Sites Eliminated

The following launch sites have been eliminated from further analysis in this EIS. The rationale for their elimination is provided in the following sections.

1.5.1.1 SLC-40 at CCSFS

SLC-40 is a SpaceX-leased launch site in the northern portion of CCSFS, north of proposed SLC-50. SpaceX has the authorization to launch 70 Falcon vehicles per year from SLC-40. SLC-40 was eliminated as an alternative because it is currently the only CCSFS launch complex supporting Falcon operations. Part of the need for the Proposed Action "is to ensure increasingly assured access to space without substantially compromising current launch capabilities." Eliminating Falcon launch capabilities from CCSFS would not meet the purpose of and need for this Proposed Action and SLC-40 does not meet Selection Standard C. Therefore, it was eliminated from further consideration.

1.5.1.2 SLC-50 at CCSFS

SLC-50 is an undeveloped plot on CCSFS located between SLC-40 and SLC-37. In the *Range of the Future Cape Canaveral Space Force Station District Plans* (USSF 2022a), USSF identifies the need for a new medium- or heavy-lift launch site in this area; however, SLC-50 is currently greenspace and does not contain any launch infrastructure. While SLC-50 was under consideration during the early scoping phases of the EIS process, it was ultimately eliminated from detailed study after site archaeological surveys were completed and showed it was an area with high potential for archaeological sites and endangered species. The development of SLC-50, which is currently a greenspace, is less ideal than the redevelopment of an existing SLC because leveraging existing infrastructure would increase efficiency and reduce environmental impacts and SLC-50 does not meet Selection Criteria E. Therefore, it was eliminated from further consideration.

1.5.1.3 LC-39A at KSC

LC-39A is a SpaceX-leased launch site in the northern portion of NASA's KSC that supports Falcon 9 and Falcon Heavy launches. SpaceX is developing a site within the perimeter of LC-39A for Starship-Super Heavy launch operations and intends to conduct up to 44 Starship-Super Heavy launches and up to 88 landings (44 per stage) per year from LC-39A, pending issuance of a vehicle operator license. In 2019, NASA completed an Environmental Assessment (EA) to evaluate the potential environmental impacts resulting from construction and operations associated with using LC-39A for the Starship-Super Heavy launch vehicle. The FAA is preparing an EIS to evaluate the potential environmental impacts of issuing a commercial launch vehicle operator license to SpaceX for the Starship-Super Heavy launch vehicle at LC-39A.

Launch capacity for Starship-Super Heavy at LC-39A is limited at this time because SpaceX must continue to support regular launches of Falcon 9 and Falcon Heavy from this pad in addition to the proposed Starship-Super Heavy operations at LC-39A. LC-39A is one of three domestic pads (the others are SLC-40 and SLC-41) from which American astronauts can launch into space, which makes relocation of the Falcon program from this site technically and economically infeasible. The Falcon pad at LC-39A is also used for launching cargo to the International Space Station for NASA and payloads for the DOD and SpaceX commercial customers. This site does not meet Selection Standard C because its current launch uses would be substantially compromised. Additionally, LC-39A is not under the DAF's control and, therefore, does not meet the USSF's specific needs incorporated into the DAF's launch pad allocation strategy. Therefore, it was eliminated from further consideration.

1.5.1.4 LC-49 at KSC

Proposed LC-49 is identified as a potential vertical launch site LC-49 in the 2016 KSC Master Plan (NASA 2016); however, it is in the northern portion of KSC in proximity to publicly accessible areas of MINWR and CANA's Playalinda Beach, and the land is currently part of MINWR and managed by USFWS. (NPS 2024b). The site would create non-compatible public land uses because of the required Launch Exclusionary Safety Zones. This launch site does not meet Selection Standard B. Therefore, it was eliminated from further consideration.

1.5.1.5 SLC-4 at VSFB

SLC-4 is a launch site on VSFB allocated to SpaceX. This location does not support the eastward trajectories that would comprise most Starship-Super Heavy launches. This launch site does not meet Selection Standard D. Therefore, it was eliminated from further consideration.

1.5.1.6 SLC-6 at VSFB

SLC-6 is a launch site on VSFB allocated to SpaceX. Similar to SLC-4, this location does not support the eastward launch trajectories that would comprise the majority of Starship-Super Heavy launches. This launch site does not meet Selection Standard D. Therefore, it was eliminated from further consideration.

1.5.1.7 Starbase at Boca Chica

SpaceX developed a Starship-Super Heavy launch facility at Starbase in Boca Chica, Texas, for research and development and to support future Starship-Super Heavy missions (FAA 2022). SpaceX is authorized to conduct a limited number of Starship-Super Heavy orbital and suborbital launches and landings per year. Starbase is not on or near a USSF installation. This launch site does not meet Selection Standard A. Therefore, it was eliminated from further consideration.

1.5.1.8 Other Undeveloped East Coast Locations

The DAF and SpaceX conducted a high-level site screening to identify and compare potential locations for development of a new launch site on the East Coast of the U.S. to support Starship-Super Heavy operations before submitting its application to USSF for access to CCSFS. Few undeveloped areas on the East Coast of the U.S. can support a launch site with the required operational clear area for Starship-Super Heavy operations, and none are within, or adjacent to, a USSF installation. These locations do not meet Selection Standard A, B, or E. Therefore, they were eliminated from further consideration.

1.6 Interagency/Intergovernmental Coordination and Consultations

The following sections detail the efforts to date regarding coordination with Native American tribes, and coordination with outside agencies (i.e., government agencies that are not the lead federal agency or cooperating agencies).

1.6.1 Government-to-Government Consultation

Executive Order (EO) 13175, "Consultation and Coordination with Indian Tribal Governments," directs federal agencies to coordinate and consult with Native American tribal governments with interests that might be directly and substantially affected by activities on federally administered lands. Consistent with EO 13175, DOD Instruction 4710.02, *Interactions with*

Federally Recognized Tribes, and DAFI90-2002, *Air Force Interaction with Federally Recognized Tribes*, USSF sent letters on February 21, 2024, for early comment to the following Native American tribal governments that may be impacted by, or have an interest in, the Action: the Seminole Nation of Oklahoma, Miccosukee Tribe of Indians of Florida, and the Seminole Tribe of Florida. Copies of the tribal letters are provided in Appendix 1A.

1.6.2 Interagency Coordination

During the development of this EIS, the DAF coordinated with various local, state, and federal agencies regarding the Action and the DAF will continue to coordinate with these agencies as required. Involvement activities to date include scoping, ad hoc agency meetings, and distribution and review of the Draft EIS. The DAF sent scoping letters and draft resource consultation materials to agencies, organizations, and tribal governments. Agency representatives provided comments that helped the DAF focus the EIS analysis on the environmental resources of concern. The DAF conducted the required consultations under the National Historic Preservation Act (NHPA) (refer to Appendices 3.7A, 3.7B, and 3.7C for Section 106 documentation) and the Endangered Species Act (ESA) (refer to Appendices 3.9A, 3.9B, 3.9C, and 3.9D for Section 7 documentation).

1.7 Public Engagement

A variety of public involvement activities, tools, and techniques were used to engage the public and agencies during the EIS process, including:

- Project website (https://www.SpaceForceStarshipEIS.com), which includes information on the project schedule, public meeting details, project alternatives, information documents, and an online comment form
- In-person public meetings/hearings during the scoping public comment period and the Draft EIS public comment period
- Virtual public meetings/hearings during comment periods
- Public hearing video presentation during the Draft EIS public comment period
- Stakeholder emails announcing meetings/hearings and general project information
- Newspaper advertisements soliciting public input and announcing document availability and public meetings/hearings

1.7.1 Notice of Intent

The DAF published the Notice of Intent (NOI) to prepare an EIS in the *Federal Register* on February 21, 2024. Notices were also published in local and regional newspapers to inform the public and government agencies of the EIS and announce the scoping comment period and scoping meetings. The newspaper notices were provided in English and Spanish.

Pursuant to EO 11990, “Protection of Wetlands” (1977), EO 11988, “Floodplain Management” (1977), and DAF Instruction 32-7064, *Integrated Natural Resources Management*, USSF requested public comments in advance of publishing the EIS to determine if there were any public concerns regarding the Action’s potential to impact floodplains and wetlands, or suggested alternatives to location in floodplains or wetlands. The NOI also informed the public of this requirement.

1.7.2 Scoping

Scoping provides an opportunity for the public, government agencies, tribal governments, and interested parties to learn about a proposed project and provide input. The scoping period began on February 21, 2024. In-person, open-house scoping meetings were held from 4:00 p.m. to 7:00 p.m. Eastern Standard Time on March 6, 7, and 8, 2024, at the following locations, respectively:

- Catherine Schweinsberg Rood Central (Cocoa) Library, 308 Forrest Avenue, Cocoa, FL 32922
- Titusville Civic Center, 4220 S. Hopkins Avenue, Titusville, FL 32780
- The Radisson Resort at The Port, 8701 Astronaut Boulevard, Cape Canaveral, FL 32920

A Spanish interpreter was available at each meeting, and the display boards were available in English and Spanish. Two hundred people (188 general public and 12 media representatives) attended the public scoping meetings, including 58 in Cocoa, 59 in Titusville, and 84 in Cape Canaveral. A virtual scoping meeting was held on Tuesday, March 12, 2024, at 6:00 p.m. Eastern Standard Time. Attendees accessed the Zoom meeting from a link provided on the project website (https://www.SpaceForceStarshipEIS.com). Approximately 41 people attended the virtual scoping meeting.

Written comments were accepted at the meetings and by email or postal mail during the scoping comment period from February 15 to March 22, 2024. An electronic comment form was also available on the project website throughout the scoping comment period. The opportunity to provide oral comments was provided during the meetings, though no one requested that option.

A total of 159 comments from 136 unique commenters were received during the scoping comment period. The DAF considered nine comments after the closing of the official scoping comment period on March 22, 2024. All scoping comments received were considered in the Draft and Final EIS.

1.7.3 Public Draft

The Draft EIS was made available to the public for a 45-day review and comment period from June 13 to July 28, 2025. A Notice of Availability (NOA) was published in the *Federal Register* and local newspapers on June 13, 2025. The NOA announced the 45-day comment period and the public hearing dates. Letters were sent to stakeholders on June 12, 2025. The Draft EIS was made available on the project website and hard copies were made available at local libraries.

In-person, open-house public hearings were held from 4:00 p.m. to 7:00 p.m. Eastern Standard Time on July 8, 9, and 10, 2025, at the following locations, respectively:

- American Police Hall of Fame and Museum, 6350 Horizon Drive, Titusville, FL 32780
- Radisson Resort at The Port, 8701 Astronaut Boulevard, Cape Canaveral, FL 32920
- Dr. Joe Lee Smith Recreation Center, 415 Stone Street, Cocoa, FL 32922

A virtual public hearing was held on Tuesday, July 15, 2025, at 6 p.m. Eastern Standard Time. Attendees accessed the Teams link provided on the project website (https://www.SpaceForceStarshipEIS.com).

There were 269 comments received during the comment period. A detailed summary of the public hearings, including the comments received and the DAF's responses, can be found in Appendix 1B.

An NOA for the Final EIS and ROD will be published in the *Federal Register*. The Final EIS will also be posted on the project website and hard copies of the Final EIS will be made available at the local libraries.

1.8 Permits, Approvals, and Agreements

This section provides a summary of the regulatory requirements that may need to be met, along with the permits and approvals that may need to be obtained, before implementing the Proposed Action. This list is not all inclusive and there is the potential for additional required permits, approvals, and agreements.

- **FAA Licensing Requirements.** Under 14 CFR Part 450, SpaceX would be required to obtain an FAA vehicle operator license for the Starship-Super Heavy launch vehicle at CCSFS. A vehicle operator license may authorize launch, reentry, or both. Launch operations at CCSFS affecting airspace must comply with the FAA's licensing requirements. SpaceX has entered into a Letter of Agreement with appropriate air traffic control centers to accommodate flight parameters of Starship-Super Heavy. SpaceX may also enter into a Letter of Intent with appropriate USCG Districts in order to safely operate the Starship-Super Heavy launch vehicle over the open ocean.
- **U.S. Department of Transportation (DOT) Act 4(f) Consideration.** Under 49 U.S.C. Section 303, before approving a project that uses Section 4(f) property, the FAA must determine that there is no feasible and prudent alternative that avoids the Section 4(f) properties and that the project includes all possible planning to minimize harm to the Section 4(f) properties, or the FAA may make a finding that the project has a de minimis impact on the Section 4(f) property. Section 4(f) pertains to impacts on subject properties from direct contact and public accessibility, as well as impacts from noise and/or airspace restrictions associated with the Proposed Action. FAA will coordinate with SpaceX to conduct a future, separate Section 4(f) analysis.
- **NHPA Section 106 Consultation.** Section 106 of the NHPA requires federal agencies to consider the effect of federal undertakings on historic properties, including archaeological and tribal cultural resources. As part of the NHPA Section 106 process, the DAF is consulting with the State Historic Preservation Officer (SHPO), NPS, NASA, FAA, and other interested parties, including federally recognized tribes to help determine the potential effects of the Proposed Action.
- **ESA Section 7 Consultation, Marine Mammal Protection Act (MMPA) and Magnuson-Stevens Fishery Conservation and Management Act (MSA).** Section 7 of the ESA requires all federal agencies to ensure that any action authorized, funded, or carried out is not likely to jeopardize the continued existence of any listed species or result in adverse impacts on designated critical habitats. The MMPA protects marine mammals, including whales, dolphins, porpoises, manatees, and other marine species. Under the MMPA, it is unlawful to pursue, hunt, take, capture, wound, or kill a marine mammal by any means, unless otherwise authorized. The MSA requires the identification of the potential effects of, and conservation recommendations for, actions that may adversely affect essential fish habitat (EFH). In compliance with these laws, the DAF is consulting with the USFWS and the National Marine Fisheries Service (NMFS) for this Proposed Action.

- **Coastal Zone Management Act (CZMA) Consistency Determination.** The CZMA establishes a policy to preserve, protect, develop, restore, and enhance the resources of the nation's coastal zones. However, CCSFS is not part of the coastal zone, because it is federal property. CZMA requires federal agency activities to be consistent with enforceable policies of a state's approved coastal management program, to the maximum extent practicable, when those activities may affect the coastal zone. In addition, the CZMA requires the federal agency to submit a consistency determination for all federal agency activities affecting any coastal use or resource. The DAF submitted a consistency determination to the Florida Department of Environmental Protection (FDEP) (Appendix 3.13A).
- **Clean Air Act (CAA) Title V Operation Permit.** Under Title V of the CAA, air emissions from the Action may require SpaceX to obtain a Title V Air Operating Permit issued by FDEP, if necessary. CCSFS operates under an Air General Permit, which covers stationary internal combustion engines and generators. Stationary sources operate under exemption thresholds established by FDEP (Chapter 63-210 *Florida Administrative Code*).
- **Clean Water Act (CWA) Section 404 and 401 and National Pollutant Discharge Elimination System (NPDES) Permit.** Section 404 of the CWA regulates the discharge of dredged or fill material into waters of the U.S., including wetlands. Obtaining a Section 404 permit from the U.S. Army Corps of Engineers may be required for the Action. Section 401 requires a water quality certification by the FDEP and may be required for the Action. NPDES addresses water pollution by regulating point sources that discharge pollutants into the waters of the U.S. Obtaining an NPDES permit may be required for the Action.
- **Floodplain Management Considerations.** EO 11988, "Floodplain Management," and EO 11990, "Protection of Wetlands," direct federal agencies to avoid or minimize adverse impacts on floodplains and wetlands, respectively. If an agency determines that no practicable alternative to impacts in the floodplain or to wetlands is feasible, the agency must prepare and circulate a notice to explain how avoidance was not practicable and describe minimization measures. If necessary, the DAF will prepare a Finding of No Practicable Alternative for inclusion in the ROD.

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2 Description of the Proposed Action and Alternatives

Based on the comparison of candidate launch sites (Section 1.4), SLC-37 at CCSFS (Proposed Action) and the No Action Alternative are carried forward for analysis.

2.1 Proposed Action: SLC-37 at CCSFS

SLC-37 is one of the largest launch sites at CCSFS, and previously supported United Launch Alliance's (ULA's) Delta IV Heavy launch vehicle. In the *Range of the Future Cape Canaveral Space Force Station District Plan* (USSF 2022a), USSF identified a need to reallocate SLC-37 to a future launch service provider after the completion of the remaining scheduled Delta IV Heavy launches. The final Delta IV Heavy launched on April 9, 2024. After the launch portion of SLC-37 was vacant, USSF approved a demolition plan to remove some of the unusable Delta IV Heavy infrastructure to prepare the site for future use consistent with the 2022 District Plan. Additionally, the USSF coordinated with the USFWS on a translocation effort by the USFWS to trap and relocate southeastern beach mouse individuals from the southeastern beach mouse habitat area inside the SLC-37 fence line. While the goal of this effort is to support the recovery of the southeastern beach mouse, this translocation effort will minimize impacts to individuals expected to occur within the proposed construction area within the SLC-37 fence line. Relocated mice will be transferred to a recipient site located outside CCSFS but within the species' current and historical range to reintroduce or augment an existing population. This USFWS effort will preclude the need for habitat restoration or offset for the loss of southeastern beach mouse habitat within the SLC-37 fence line and is expected to be accomplished prior to the initiation of ground-disturbing activities or construction associated with the Proposed Action within the southeastern beach mouse habitat inside the SLC-37 fence line. SLC-37 meets the purpose and need, and the identified selection standards (Section 1.5); therefore, this alternative was carried forward for further analysis in this EIS.

SpaceX would redevelop SLC-37 at CCSFS to support Starship-Super Heavy launch and landing operations. The estimated total construction footprint for the Proposed Action, including modifications to SLC-37 and the surrounding area and upgrades to transportation and utilities, is approximately 230 acres.

Subsequent to the DAF's decision and issuance of a ROD, the DAF would execute a lease agreement with SpaceX for the use of SLC-37. The lease would include six parcels – Parcel A through E (Figure 2-1). The Horizontal Integration Facility (HIF) parcel, currently occupied by ULA, is not part of the lease. As part of the Proposed Action, the DAF plans to amend the lease with SpaceX to add the HIF parcel upon the expiration of ULA's lease of the HIF parcel. All earth-moving activities would occur within the "construction area" as displayed on Figures 2-1 and 2-2.

The DAF's action includes acceptance of the Starship-Super Heavy launch vehicle onto the Eastern Range. The DAF-required actions from the launch service provider are documented in the Program Support Guide and include the following:

- Perform a robust and acceptable flight worthiness certification process.
- Provide SLD 45/Commander with a sufficient level of confidence that launch vehicle performance presents an acceptable risk to public safety and launch base infrastructure and security. This level of confidence for commercial launches can be achieved through approval/disapproval of User's flight worthiness processes and any changes to those processes.
- Provide SLD 45/Commander with User's flight worthiness certification during SLD 45 Launch Readiness Review.

SpaceX's Starship-Super Heavy would not be approved to launch on the Eastern Range until all the safety requirements are met. The DAF recognizes that, despite extensive precautions, launch or landing operations may occasionally deviate from expected outcomes, known as anomalies. In such rare instances, the DAF and SpaceX would be prepared to activate established emergency response protocols. Refer to Section 3.6 for more details regarding health and safety. Figure 2-2 represents SpaceX's currently proposed site plan for SLC-37. The site plan is subject to change as SpaceX refines the design for construction and approvals are obtained from the DAF. The final site plan would adhere to the construction area presented in this EIS. Modifications to building location and design are not anticipated to affect the findings of this EIS; however, any substantial deviations from the construction area may require additional NEPA analysis.

Various road improvements at CCSFS and KSC would be necessary to facilitate Starship-Super Heavy launch vehicle transport (Figure 2-3). SpaceX would widen Phillips Parkway to approximately 34 feet from SLC-37 to Pad A Bypass Road on KSC for approximately 7 miles, primarily within the existing maintained roadway 60-foot corridor. Old A1A would be improved and widened approximately 34 feet for approximately 1 mile between SLC-37 to Phillips Parkway, and a maintained 60-foot corridor would be established for Old A1A. SpaceX would add two turn radiuses to accommodate the efficient movement of the launch vehicle components. One turn radius would be located at the northeast corner of Phillips Parkway and Patrol Road, and the second turn radius would be located at the northwest corner of Patrol Road and Beach Road.

2.2 No Action Alternative

The No Action Alternative (the affected environment carried into the future) serves as a baseline against which the impacts of the action alternatives are compared in this EIS.

Under the No Action Alternative, SLC-37 would not be redeveloped for Starship-Super Heavy; the DAF would not enter into any real property agreements with SpaceX for the property, and the FAA would not issue a launch license to SpaceX for Starship-Super Heavy operations at this location. CCSFS and KSC would remain active launch facilities, and future launch activities would likely increase in the future. The No Action Alternative includes all projects currently authorized for implementation with signed NEPA decision documents, as provided for in Section 3.14.1.

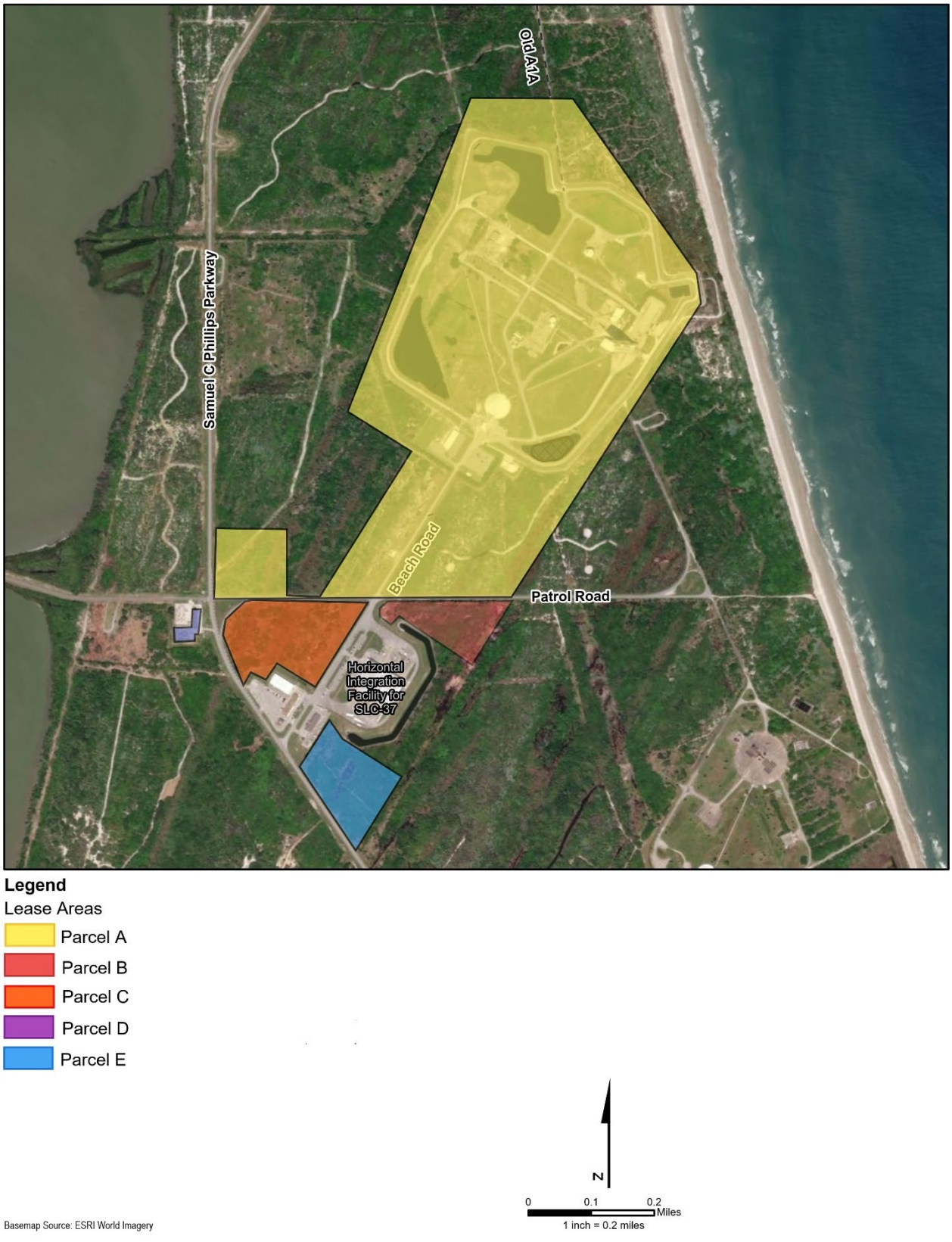


Figure 2-1. Lease Area Parcels for SLC-37

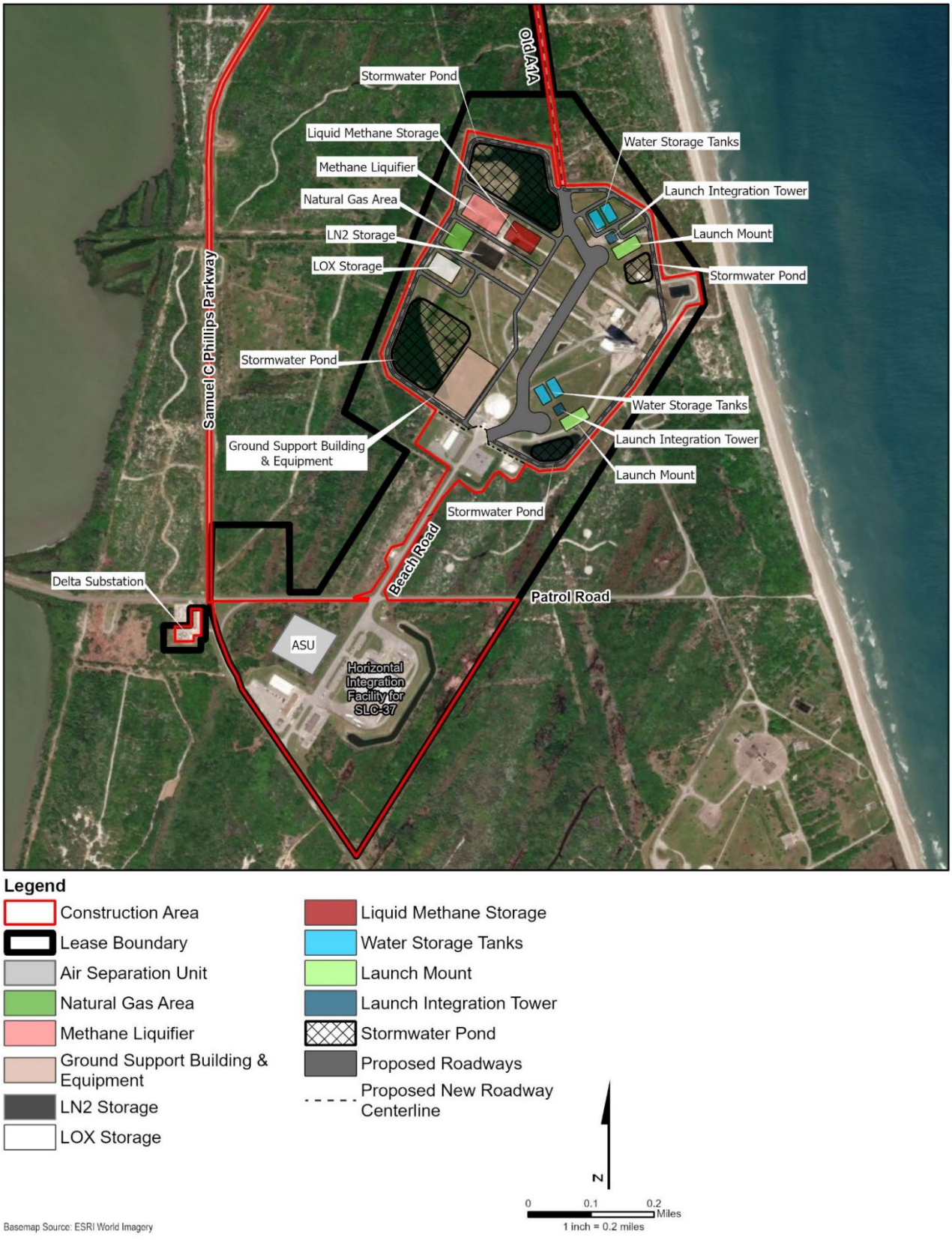


Figure 2-2. Proposed Action: SLC-37 at CCSFS Currently Proposed Site Plan

Figure 2-3. Proposed Action: SLC-37 at CCSFS

2.3 Starship-Super Heavy Details

The following sections detail the Starship-Super Heavy launch vehicle, as well as operation and facility requirements for the Starship-Super Heavy.

2.3.1 Starship-Super Heavy Launch Vehicle

The Starship-Super Heavy launch vehicle includes two stages (Figure 2-4): (1) Super Heavy, which is the first stage (or booster), and (2) Starship, which is the second stage. As designed, both stages are reusable. The fully integrated launch vehicle is up to 493 feet tall depending on configuration and 30 feet in diameter. Super Heavy includes 35 Raptor engines and Starship includes 9 Raptor engines; each engine is powered by liquid oxygen (LOX) and liquid methane (CH_4). Super Heavy holds up to 4,100 metric tons (MT) of propellant and Starship up to 2,650 MT of propellant. As built, Super Heavy has a maximum liftoff thrust of up to 103 meganewtons (MN); Starship has a maximum liftoff thrust of approximately 28 MN. Launch propellants and commodities include liquid nitrogen (LN_2), water, gaseous oxygen, gaseous CH_4, gaseous nitrogen, helium, hydraulic fluid, LOX, and liquid CH_4.

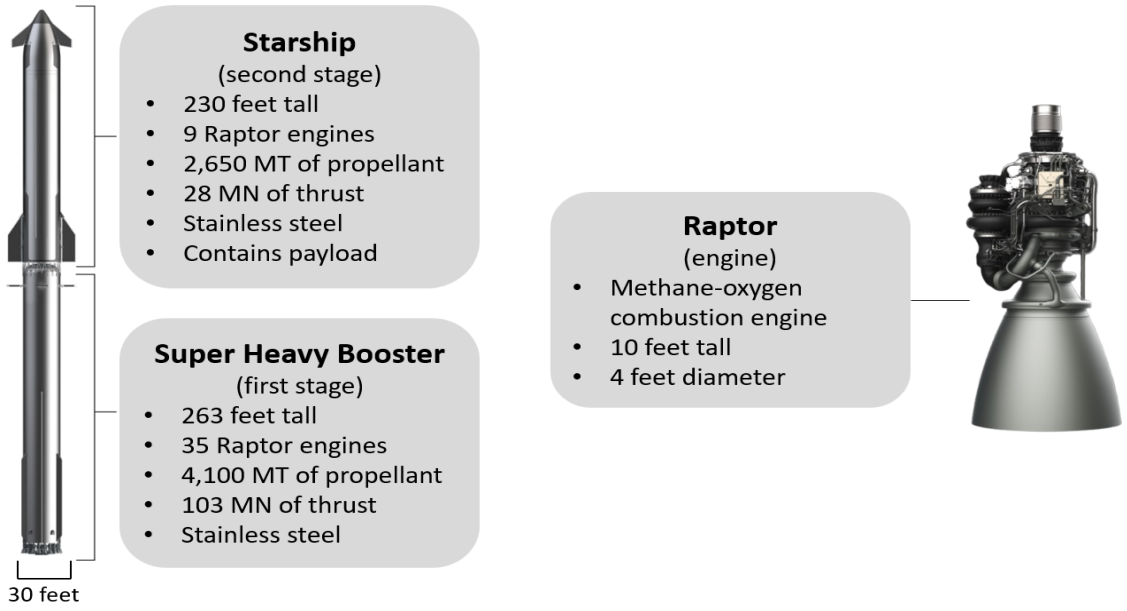


Figure 2-4. Starship-Super Heavy Launch Vehicle Design

2.3.2 Operations

Starship-Super Heavy operations would include the transport of the launch vehicle's components to the launch pad, pre-launch operations (including static-fire testing), launches, and landings. The first Starship-Super Heavy launch from SLC-37 would be planned to occur in 2026. Up to 450 additional full-time employees or contractors would be needed to support launch activities 24 hours per day, 7 days per week, throughout the year. A detailed list of the Starship-Super Heavy operations at CCSFS is provided in Table 2-1. Figure 2-5 depicts a typical sequence for a Starship-Super Heavy launch and landing.

Table 2-1. Detailed Starship-Super Heavy Operations

Activity	Description
Transportation of Launch Vehicle Components	Starship, Super Heavy, and components would arrive from SpaceX's Starbase in Texas. The components would be transported horizontally via a barge from the Port of Brownsville, Texas to CCSFS, Port Canaveral, Hanger AF Wharf, or KSC wharfs, and then delivered to the launch site via over-the-road transport. The transport of vehicle components from Texas to Florida would be episodic and would use established marine shipping and roadway corridors, which already experience similarly sized traffic. SpaceX's goal is for Starship-Super Heavy to require minimal refurbishment (including fabrication, assembly, delivery, and integration) to achieve rapid reusability of the launch vehicle. To achieve this, SpaceX plans to perform vehicle integration (process of assembling components of the launch vehicle) and refurbishment, if needed, at the launch site. Nonetheless, SpaceX may use its additional existing SpaceX facilities at CCSFS or KSC for refurbishment, if necessary.
Pre-launch Operations	Pre-launch operations would include ground-testing, tank testing, spin tests, mission rehearsals (wet and dry dress rehearsals), and static-fire tests[a]. These tests are needed to verify that all vehicle and ground systems are functioning properly and in accordance with documented procedures prior to launch. Except for static-fire testing, no propellant release or ignition would occur. All propellant transfers would maximize recapture methods. Tank tests confirm the launch vehicle fuel tank's reliability. The tanks are pressurized to confirm their structural integrity with appropriate factors of safety. These proof pressure tests are designed not to release any propellant to the environment. All propellant is recycled back into the ground system tanks after the test is completed. Tank tests do not involve mixing explosive commodities; thus, they are not expected to explode or spread debris. Spin tests are conducted to test engine components. During a spin test, the vehicle engines are chilled, and pumps are spun to operating speed but are stopped prior to engine ignition. Static-fire testing verifies engine control and performance. During a static-fire test, the launch vehicle engines are ignited for a short duration and then shut down. SpaceX would perform a Starship static-fire test before integrating Starship with Super Heavy. SpaceX would also perform a Super Heavy static-fire test, either by itself or with Starship integrated. It is conservatively assumed for this analysis that there would be one static-fire test per stage per launch operation, lasting up to 15 seconds in duration. However, as the Starship-Super Heavy launch vehicle matures, SpaceX would reduce the cadence of static-fire tests to not require one per launch. After the wet dress rehearsal and static-fire test, SpaceX would transfer the propellant back into the commodity tanks.
Launch	During launch, the ignition of the Starship-Super Heavy Raptor engines would generate a heat plume that would appear clear and consist of water vapor, CO_2, carbon monoxide, hydrogen, CH_4, NO_x, and oxygen. The maximum heat plume would occur during engine ignition and would travel away from the launch pad, and last for approximately 20 seconds before dissipating. Various designs, such as a diverter and deluge water, would be used to limit the extent of the heat plume so it remains within the launch complex fence line. The Starship-Super Heavy launch would generate a sonic boom over the ocean.

Activity	Description
Super Heavy Landing (Return to Launch Site)	After the Super Heavy booster separates from Starship, it would perform a controlled descent using grid fins, engines, and atmospheric resistance to slow down and guide it for a precise return to the tower at the launch site (SLC-37) to be caught with the tower's arms. Once near the landing location, Super Heavy would ignite its engines to conduct a controlled landing. The heat plume would be smaller than that for launch. Super Heavy could land vertically at the catch tower and would enter a safe state. The Super Heavy landing would generate a sonic boom over land. Following a Super Heavy landing, LOX and liquid CH_4 (approximately 26 MT) would remain in the Super Heavy booster. The remaining LOX would be vented to the atmosphere and all the remaining liquid CH_4 would be released into the atmosphere or safely combusted.
Super Heavy Landing (Floating Platform Scenario)	After the Super Heavy booster separates from Starship, it would land on a floating platform (i.e., "droneship") in the Atlantic Ocean (Figure 2-6). Super Heavy would be delivered by barge and roadways to CCSFS for refurbishment. If a landing were to occur within the territorial seas of a nation other than the U.S., appropriate coordination through the State Department would occur. The Super Heavy landing would generate a sonic boom overpressure over the ocean. Following a Super Heavy landing, LOX and liquid CH_4 (approximately 26 MT) would remain in the Super Heavy booster. The remaining LOX would be vented to the atmosphere and all the remaining liquid CH_4 would be released into the atmosphere or combusted.
Super Heavy Landing (Expendable Scenario)	While SpaceX intends for Super Heavy to be fully reusable following most operational flights, expending (that is, not recovering) vehicles may be required. After the Super Heavy booster separates from Starship, the Super Heavy booster could be expended, by a controlled or uncontrolled descent in a target area in the Atlantic Ocean at least 1 to 5 nautical miles away from the coast, between 50 miles north and 50 miles south of SLC-37 (Figure 2-6) or greater than 5 nautical miles in the Atlantic Ocean area on Figure 2-7. Every effort would be made to avoid collisions with marine vessels, including coordination with USCG, as feasible. An expended Super Heavy would break up on impact with the ocean's surface and would be expected to sink. An expended mission may generate a sonic boom overpressure over the ocean.
Starship Landing (Launch Pad or Floating Platform Scenario)	The Starship nominal landing configuration (Figure 2-6) would closely resemble the Super Heavy landing and could occur either at the launch site (SLC-37) or on a floating platform in the open ocean including parts of the Gulf of America, Atlantic Ocean, Pacific Ocean, and Indian Ocean (Figure 2-7). The Starship landing would generate a sonic boom overpressure over land or the ocean. Starship would have approximately 5 MT of liquid CH_4 onboard following a flight. Any LOX remaining in the vehicle would be vented to the atmosphere and liquid CH_4 would be released or safely combusted.

Activity	Description
Starship Landing (Expendable Scenario)	If necessary, Starship could be expended by controlled or uncontrolled descent in the open ocean including parts of the Gulf of America, Atlantic Ocean, Pacific Ocean, and Indian Ocean. The landing areas would be no closer than 5 nautical miles away from the coast, except between 50 miles north and 50 miles south of SLC-37, where landing activities could occur at least 1 to 5 nautical miles from the coast (Figure 2-7). SpaceX has a requirement to surveil the splashdown area before committing to launch and would stand down if the area could not be confirmed clear of vessel traffic. In a controlled descent, after ascent engine cutoff, Starship would vent residual main tank propellant during the in-space coast phase of the launch at or above 74.5 miles above ground level. Following the in-space coast phase, Starship would conduct a deorbit burn to begin its controlled descent. Upon a hard ocean impact, structural failure could allow the remaining LOX and CH_4 to mix, resulting in an explosive event. Alternatively, a soft water landing could occur and Starship could tip over and explode or have a soft water landing, tip over and sink or be scuttled[b]. In an unanticipated uncontrolled descent, Starship would break up during atmospheric entry. Most of the launch vehicle debris would sink because it is made of steel. Lighter items not made of steel, such as composite overwrapped pressure vessels, may float but would be expected to become waterlogged and sink. If there were reports of large debris, SpaceX would coordinate with marine debris specialists to survey the situation and sink or recover, as necessary, any large floating debris. SpaceX would coordinate with all land and water regulatory authorities including the USCG and the State Department prior to recovering debris. Every effort would be made to avoid collisions with marine vessels, including coordination with USCG, as feasible.
Launch Trajectories	The launch trajectories for the Starship-Super Heavy program need to accommodate eastward trajectories, which allow the spacecraft to benefit from the Earth's natural rotation. Specific flight trajectories vary based on mission and depend on desired payload orbit Starship-Super Heavy launch azimuths would range from 40° to 115°, from a reference of due north at 0° and due east at 90° (Figure 2-6).
Landing Trajectories	The Super Heavy booster would perform a flip maneuver midflight and return to the launch pad or a nearby platform (Figure 2-5). Starship could land at SLC-37 or on a platform in the open ocean, including parts of the Gulf of America, Atlantic Ocean, Pacific Ocean, and Indian Ocean (Figure 2-7). Following an in-space coast phase, Starship would conduct a deorbit maneuver and return to Earth from the west to the east over central Florida (Figure 2-6).
Payloads	Starship-Super Heavy program payloads would be similar to, but larger than, current and planned payloads launched on Falcon 9 and Falcon Heavy. Payloads and their associated materials/fuels/volumes are mission dependent but would be in keeping with the current commercial and government payloads analyzed in the Launch of *NASA Routine Payloads on Expendable Launch Vehicles Environmental Assessment* (NASA 2011a). Environmental review requirements for unique payloads not covered under existing NEPA documents would be assessed on a case-by-case basis to determine if supplemental or mission-specific NEPA documentation is required.

[a] A dry dress rehearsal simulates launch day conditions, where a full launch countdown is conducted but the vehicle is not fueled. A wet dress rehearsal is similar to a dry dress rehearsal, except the vehicle is fueled. This test allows the launch team to practice timelines and procedures used for launch and identify potential issues.

[b] A scuttle is a procedure to intentionally sink a launch vehicle by opening the hatches or creating holes to allow water to flood the vehicle, causing it to sink.

CO_2 = carbon dioxide

NO_x = nitrogen oxides

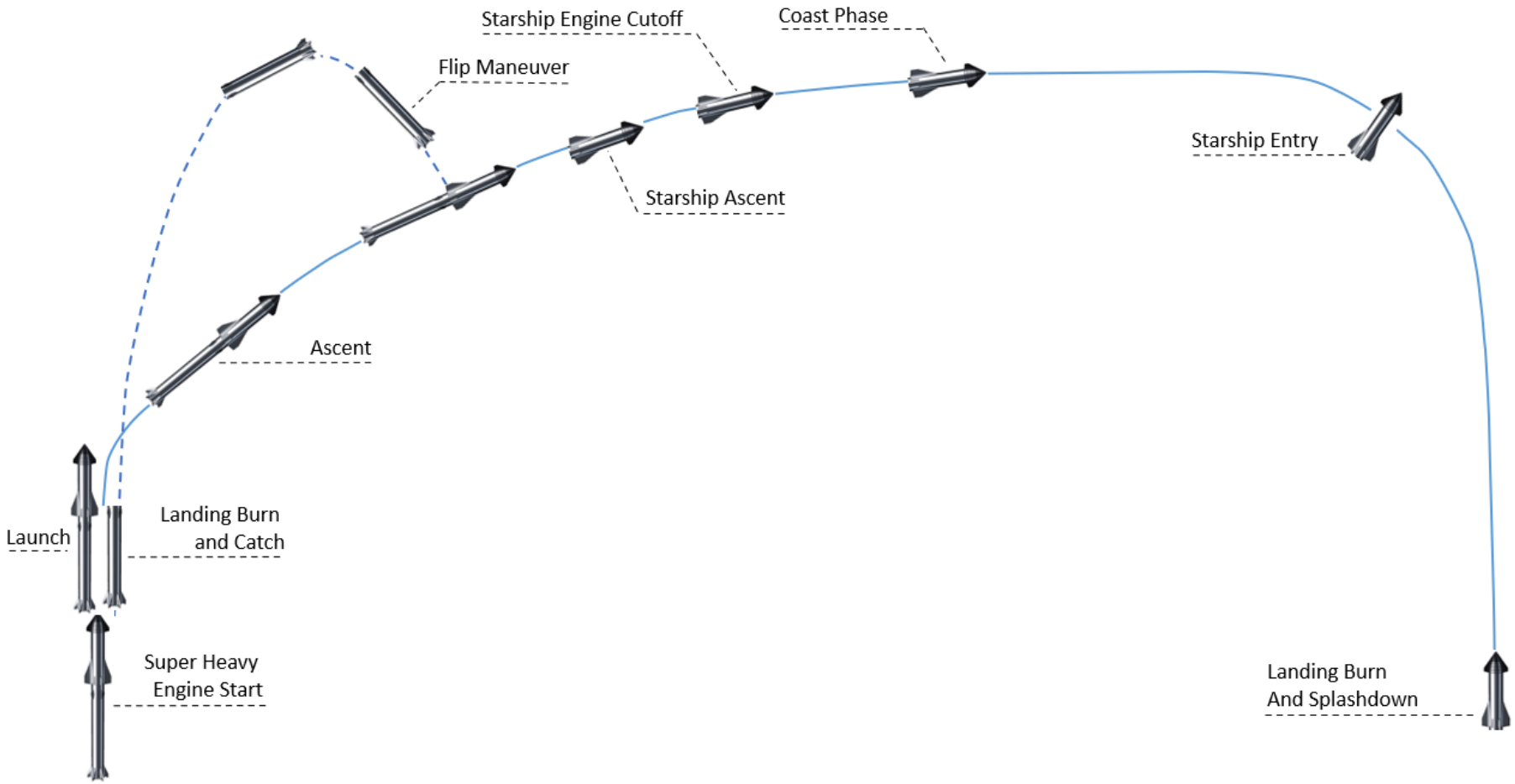


Figure 2-5. Flight Sequence for a Starship-Super Heavy Launch

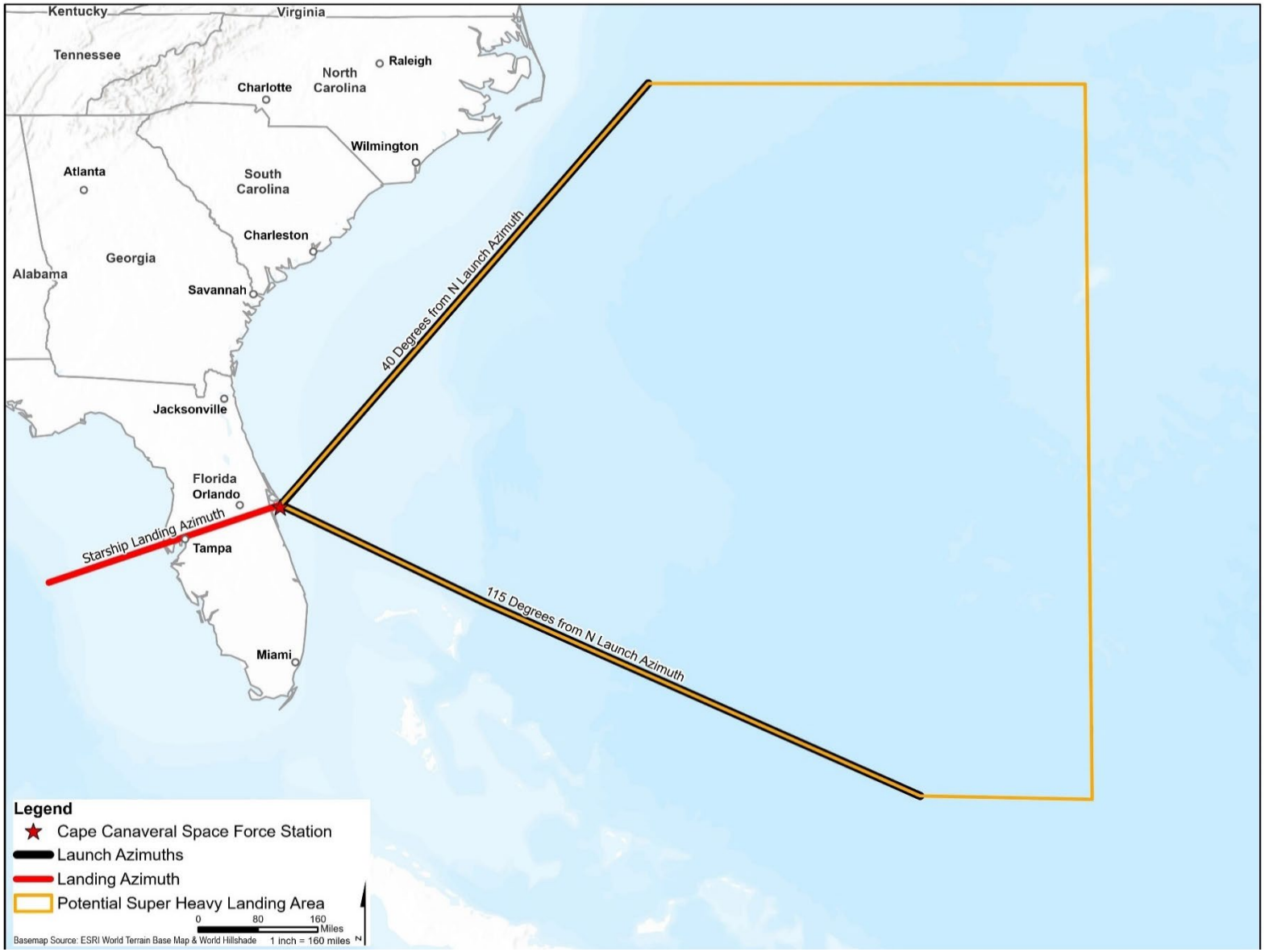


Figure 2-6. Starship and Starship-Super Heavy Azimuths

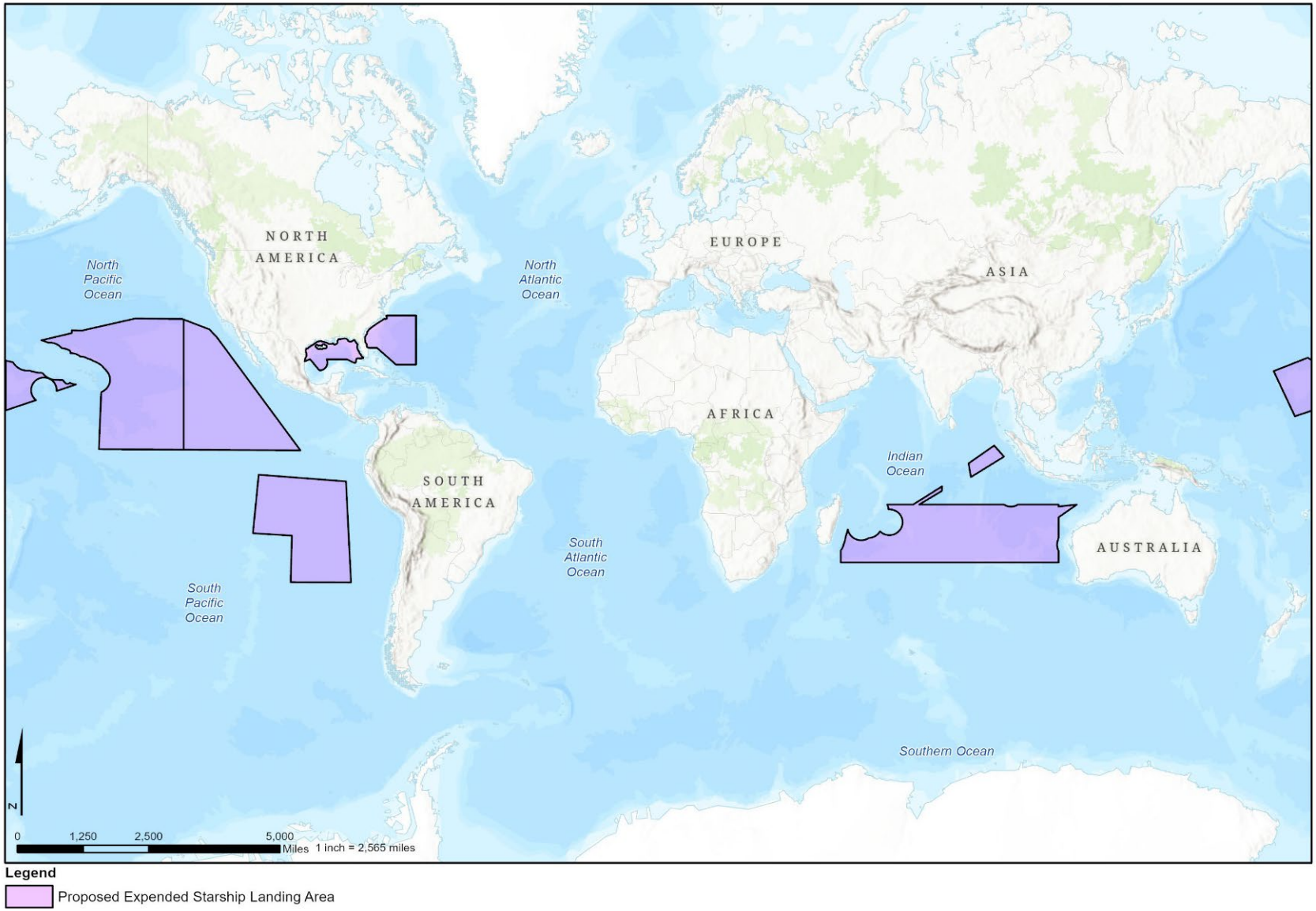


Figure 2-7. Starship Potential Oceanic Landing Areas for Expendable or Floating Platform Scenarios

2.3.3 Launch Frequency

SpaceX estimates being able to have up to 76 launches and 152 landings (76 per stage) of Starship-Super Heavy per year from the new launch site. Table 2-2 outlines the maximum annual activities for pre-launch (e.g., static-fire tests), launches (including scrubs), and landings for both Starship and Super Heavy booster. Launches or landings exceeding these numbers would be outside the scope of this EIS. It is assumed that half of the launches would occur during the day and the other half during the night. For each of these launches, pre-launch activities (i.e., static-fire tests) would be conducted for both Super Heavy and Starship.

It is assumed that up to 20% of the annual launches would be scrubbed (meaning cancelled or delayed for a later date). SpaceX would err on the side of caution when launching Starship-Super Heavy, and when conditions are not appropriate, either due to weather conditions or technical issues, a launch would be scrubbed. Scrubs can occur up to the moment of liftoff, but the large majority would occur prior to ignition. The Super Heavy booster landings would occur within a few minutes of launch, while the Starship landings would occur upon the completion of the Starship missions, which could last hours or years. Most of the landings would return to the launch site (SLC-37); however, several landings per year could be expendable or occur on a floating platform.

Restricted access[4] and closure areas[5] would be established and enforced for each activity. This environmental analysis and launch pad allocation does not guarantee 76 launches per year, and fewer launches could occur per year. SLD 45 would closely coordinate and schedule all launch activities at CCSFS in accordance with its policies and regulations. Launches would begin after construction is complete, which would take approximately 1 year, and then would increase as the launch approval process allows.

Table 2-2. Annual Potential Launch, Landing, and Test Rates

Activity	Quantity
Launches	76
Scrubs (up to 20% of launches)	16
Super Heavy Landings (shortly after launch)	76
Starship Landings (after completion of mission)	76
Maximum Total Launch and Landing Activities	**244**
Starship Static-fire Tests	76
Super Heavy Static-fire Tests	76
Maximum Total Test Activities	**152**
Maximum Total Activities	**396**

2.3.4 Launch, Landing, and Support Infrastructure

A detailed description of the launch, landing, and support infrastructure that would be constructed at the allocated launch site is provided in Table 2-3.

[4] Restricted access areas refer to limitations to workers operating within CCSFS

[5] Closure areas refer to limitations to individuals in public areas, including maritime areas

Table 2-3. Starship-Super Heavy Launch, Landing, and Support Infrastructure

Structure	Description
Roadway Improvements	To facilitate vehicle transport, SpaceX would widen Phillips Parkway to approximately 34 feet of pavement from SLC-37 to Pad A Bypass Road on KSC for approximately 7 miles, primarily within the existing 60-foot roadway corridor. Approximately 4 miles of Phillips Parkway widening would occur on CCSFS and approximately 3 miles on KSC. Old A1A would be improved and widened to approximately 34 feet for approximately 1 mile between SLC-37 to Phillips Parkway (Figure 2-3). SpaceX would add two turn radiuses. One turn radius would be located at the northeast corner of Phillips Parkway and Patrol Road, and the second turn radius would be located at the northwest corner of Patrol Road and Beach Road.
Launch Mounts	Two launch mounts, approximately 38 feet tall and 38 feet wide, would be used as the foundation for stacking the two stages of the Starship-Super Heavy launch vehicle (Figure 2-8). The launch mounts would be placed on two concrete launch pads approximately 400 feet long by 400 feet wide.
Launch Integration Towers	Two integration towers, each approximately 600 feet tall, 40 feet wide, and 40 feet long, would be used to vertically integrate the Starship-Super Heavy vehicle on the launch mount (Figure 2-8). The integration towers would be located on the launch pads.
Launch Flame Trenches, Deluges, and Diverters	A launch diverter or flame trench structure would be placed directly underneath the launch mount to divert the heat plume away from the ground. Flame trenches and diverters would reduce the acoustic and thermal energy to the launch vehicle, payload, and ground systems during launch and landing. Water would be required for these systems. The water would discharge via a water-cooled diverter and/or deluge. Water would be retained in ponds within the launch site boundary. Whenever possible, the wastewater would be reused for the next launch. Various engineering designs would be used to limit the heat plume temperature dispersion, including deluge, lofted diverter, or berms. The specific design of the diverter has not been developed yet; however, it is possible for the diverters to be bifurcated or directional. These design features would be developed to keep the heat plume within the fence line.
Landing Pads	Two concrete landing pads, approximately 225 feet in diameter, could be constructed on site, if space allows within the SLC-37. Two catch towers, similar to the integration towers, would be placed on the landing pads.
Propellant Generation – Natural Gas Area	A natural gas pretreatment system would remove impurities such as mercury, sulfur, water, CO_2, and hydrocarbons heavier than CH_4 from the pipeline-quality natural gas to produce a stream of higher purity gaseous CH_4. Surplus natural gas would be used for process work or power generation. The natural gas pretreatment system would include a small amine treating unit for CO_2 removal; a heavies scrub column[a] that would be up to 100 feet tall and 10 feet in diameter; and multiple smaller vessels approximately 6 feet in diameter and up to 30 feet tall. The system would be in the launch complex.
Propellant Generation – Methane Liquefier	A CH_4 liquefier would supercool pretreated natural gas into a liquid state for storage and transportation. Together, the natural gas pretreatment and liquefier would comprise several structures, each up to 65 feet tall. The CH_4 liquefier could be up to 3 acres. The CH_4 liquefier would be cooled by a typical evaporative cooling tower requiring up to approximately 132 gallons per minute of water and producing up to approximately 13 gallons per minute of wastewater (approximately 5.3 million gallons annually) that would be treated onsite via evaporation or retention ponds or hauled off site by trucks. The system would be in the launch complex and would comply with all regulatory requirements

Structure	Description
Propellant Generation – ASU	An ASU would be constructed to generate the LN_2 and LOX required for launch operations. An ASU dehumidifies, liquefies, and separates ambient air into oxygen and nitrogen. In addition to the primary oxygen and nitrogen liquid products, the ASU would produce a waste nitrogen stream composed of rejected atmospheric gases, principally nitrogen, oxygen, and argon that would be vented to the atmosphere. The ASU would comprise a primary cold box structure up to 180 feet tall and a smaller supporting infrastructure up to 60 feet tall. The ASU would be cooled by a typical evaporative cooling tower requiring up to approximately 660 gallons per minute of water and producing up to approximately 66 gallons per minute of wastewater (12.4 million gallons annually) that would be treated onsite via evaporation and retention ponds or hauled off site by trucks.
Propellant Commodity Storage	Onsite propellant storage would be sized to support up to 2.3 launches at any given time; however, the storage could be incrementally expanded to meet increased propellant demands. Increases to storage would be assessed for potential environmental effect and additional NEPA analysis would be conducted, as necessary. Commodity tanks would hold LOX, LN_2, water, helium, gaseous nitrogen, gaseous CH_4, and liquid CH_4. The approximate sizes of the commodity tanks include 16,500 tons for LOX, 6,500 tons for LN_2, and 5,000 tons for liquid CH_4. The location of the tanks would comply with LOX and liquid natural gas location siting regulations (NFPA 251 and NFPA 59A).
Lighting	Nighttime launch activities require bright spotlighting for short durations to illuminate the launch vehicle at the launch site. Lighting is needed to ensure the protection and safety of SpaceX personnel and hardware. In addition to potential nighttime tests, launches, and landings, SpaceX would need to perform ground-support operations 24 hours a day, 7 days a week, throughout the year; however, these routine operations would not require engine ignition or bright spotlighting.
Utilities – Power	An electrical substation of up to 130 kilovolts is proposed for the launch site; Florida Power and Light would provide up to 250 megawatts of power via the existing Delta substation. If it is determined that the existing available power is insufficient to serve SpaceX's needs, power needs would be supplemented using Tesla Mega packs[b]. No additional power upgrades are proposed.
Utilities – Fiber	New fiber connectivity lines would be routed underground within the right-of-way along Phillips Parkway.
Utilities – Water	The launch site would use existing water and sewer systems, and use or relocate lines, where practicable.
Utilities – Natural Gas	Natural gas would be brought to the launch site through a multi-user pipeline that serves all launch service providers and government agencies at the installations. The natural gas pipeline would extend from the existing natural gas mainline on KSC. The main natural gas pipeline enters the western boundary of KSC along NASA Parkway. Florida City Gas is in the process of extending the pipeline underground at KSC and CCSFS to provide additional service; however, the extension of the pipeline is not part of this EIS. SpaceX would connect to the existing natural gas pipeline; however, this would not be required for launch.
Utilities – Nitrogen and Helium	Nitrogen and helium utilities would connect to the existing systems on CCSFS. All utilities would tie into a proposed utilities yard at the launch site.
Staging, Storage, and Support Infrastructure	Infrastructure would include tie-down foundations for short-term storage and a crane staging area. SpaceX would also construct an approximately 23,000-square-foot, 30-foot-tall ground support equipment fabrication building; an approximately 40,000-square-foot ground support equipment outdoor storage space; and an approximately 20,000-square-foot, 20-foot-tall office building with approximately 100 permanent parking spaces.

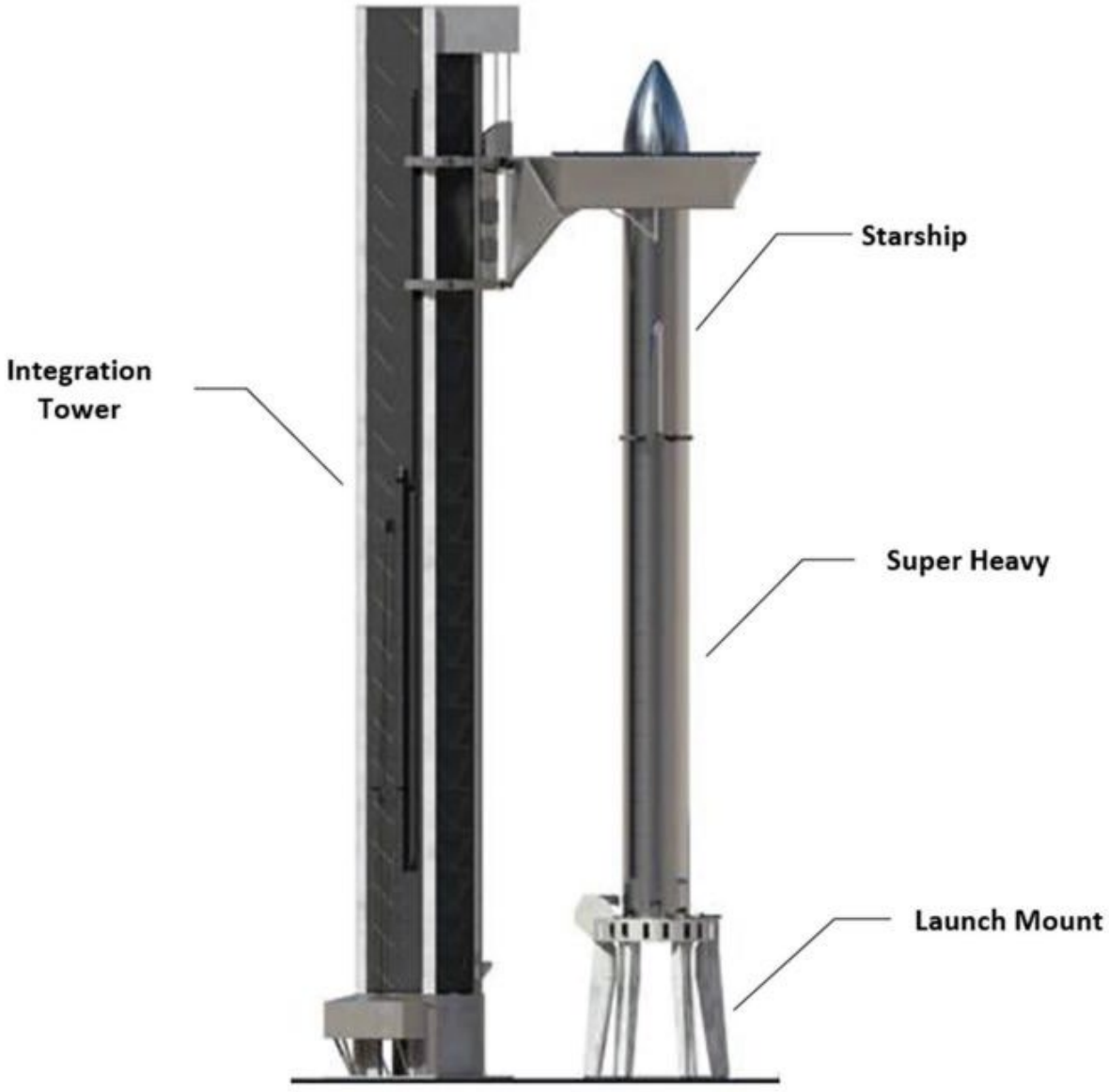
Structure	Description
Water Infrastructure	Water storage and stormwater ponds would be built on site. The water storage would be used to provide potable water for deluge, which includes water needed for launch, landing, and static-fire tests. SpaceX would retain deluge water for reuse in properly sized retention ponds.

[a] A scrub column is used to remove heavy components from natural gas used for propellant generation.

[b] Tesla Megapack is a large-scale rechargeable lithium-ion battery stationary energy storage product, intended for use at battery storage power stations.

ASU = Air Separation Unit

NFPA = National Fire Protection Association



Note: This image is subject to change.

Figure 2-8. Notionally Proposed Design for Integration Tower and Launch Mount

3 Affected Environment and Environmental Consequences

The following sections provide resource-focused analyses of the affected environment and the potential environmental consequences from the Proposed Action. Pursuant to NEPA the effects of the Proposed Action were evaluated based on context and intensity. Context relates to the current environmental conditions within the region of influence (ROI) and is described in the "Affected Environment" sections for each resource. Intensity is detailed in the "Environmental Consequence" sections for each resource, which includes a definition for a significant impact.

The impact intensity designations align with guidelines provided in FAA Order 1050.1F, DAF policies, and expert opinion. An intensity designation is assigned to every identified impact, and the impacts are numbered to allow comparisons across alternatives. In addition, mitigation measures that would offset adverse impacts from the Proposed Action are identified in the "Environmental Consequences" sections. Mitigation measures for each resource are numbered to track potential commitments that could be documented in the ROD.

Due to the nature and maturity of the Starship-Super Heavy program, new information may become available, or the effectiveness of mitigation measures may be different than expected. Therefore, the DAF will employ an adaptive management strategy to monitor and evaluate results of earlier predictions and develop and implement adaptations to eliminate or reduce effects. For example, air quality will use this approach due to the potential significant impacts identified to air quality along with the continued refinement of operational and emissions data.

Preferred Alternative

EISs are required to identify a preferred alternative. The Proposed Action at SLC-37 is the preferred alternative. SpaceX's Starship-Super Heavy operations at SLC-37 fulfill the Purpose and Need (Sections 1.2 and 1.3) and the launch site selection standards (Section 1.5). A detailed explanation of the potential environmental impacts associated with construction and operations is provided in the following sections.

3.1 Air Quality and Weather-related Resiliency

The ROI for air quality is Brevard County, Florida. Global, U.S., and state greenhouse gas (GHG) emissions and regional resiliency are also evaluated to provide additional perspective on the Proposed Action's potential impact on weather-related risks.

3.1.1 Affected Environment

The affected environment for air quality and weather-related resiliency is discussed in the following sections.

3.1.1.1 Ambient Air Quality Standards

Air quality in each region is measured by the concentrations of pollutants in the air. The air quality in a region is a result of not only the types and quantities of atmospheric pollutants and pollutant sources in an area, but also surface topography, the size of the topological "air basin," and the prevailing meteorological conditions.

Under the CAA, the U.S. Environmental Protection Agency (EPA) has developed National Ambient Air Quality Standards (NAAQS) for criteria pollutants that have been determined to affect human health and the environment. NAAQS are the maximum allowable concentrations for criteria pollutants (Table 3.1-1).

Table 3.1-1. National Ambient Air Quality Standards

Criteria Pollutant	Federal Standard (Averaging Period)	Form
CO	35 ppm (1 hour)	Not to be exceeded more than once per year
CO	9 ppm (8 hour)	Not to be exceeded more than once per year
NO_2	0.100 ppm (1 hour)	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
NO_2	0.053 ppm (1 year)	Annual mean
O_3	0.070 ppm (8 hour)	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
$PM_{2.5}$	9 µg/m^3 (1 year)	annual mean, averaged over 3 years
$PM_{2.5}$	15 µg/m^3 (1 year, secondary standard)	annual mean, averaged over 3 years
$PM_{2.5}$	35 µg/m^3 (24 hour)	98th percentile, averaged over 3 years
PM_{10}	150 µg/m^3 (24 hour)	Not to be exceeded more than once per year on average over 3 years
SO_2	0.075 ppm (1 hour)	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
SO_2	0.10 ppm (1 year, secondary standard)	Annual mean, averaged over 3 years
Pb	0.15 µg/m^3 (rolling 3-month average)	Not to be exceeded

Source: EPA 2024a
µg/m^3 = microgram(s) per cubic meter
CO = carbon monoxide
NO_2 = nitrogen dioxide
O_3 = ozone
Pb = lead
PM_{10} = particulate matter less than 10 micrometers in aerodynamic diameter
$PM_{2.5}$ = particulate matter less than 2.5 micrometers in aerodynamic diameter
ppm = part(s) per million, by volume
SO_2 = sulfur dioxide

EPA classifies the air quality in an area according to whether the concentrations of criteria pollutants in ambient air exceed the NAAQS. EPA designates areas within each area as "attainment," "nonattainment," "maintenance," or "unclassified" for each of the six criteria pollutants:

- Attainment means that the air quality within an area is better than the NAAQS.
- Nonattainment indicates that criteria pollutant levels exceed NAAQS.
- Maintenance indicates that an area was previously designated nonattainment but is now attainment.
- Unclassified means there is not enough information to appropriately classify an area, so the area is regulated as attainment.

CCSFS is within Brevard County, Florida, which is designated as attainment/unclassified for all criteria pollutants.

3.1.1.2 Greenhouse Gas Emissions

GHGs are gaseous emissions that absorb energy in the atmosphere. These emissions occur from natural processes and human activities. The most common GHGs emitted from natural processes and human activities include CO_2, CH_4, and nitrous oxide. GHGs are primarily produced by burning fossil fuels and through industrial and biological processes. GHGs are quantified using the Air Force's Air Conformity Applicability Model (ACAM).

3.1.1.3 Weather-related Resiliency

Temperatures in Florida have risen more than 2 degrees Fahrenheit since the beginning of the twentieth century (NOAA 2022). Annual total rainfall in Florida has varied widely from year to year since 1895. The data does not show an obvious trend of increasing rainfall in the state over time; however, the state has experienced a near- or above-average number of 4-inch extreme precipitation events since 1995 (NOAA 2022). An increase in extreme precipitation events would increase inland flooding and exacerbate coastal flooding along with sea level rise. According to the Brevard County Emergency Management, sea level has risen 9 inches along the Atlantic Coast over the last century. Worst-case scenario projections anticipate sea level rise to increase 2 feet in the next century, and this is the most probable scenario for the next 50 years (Brevard County 2016; EDR 2023).

3.1.2 Environmental Consequences

The DAF defines indicators for each criteria pollutant according to current air quality conditions. Table 3.1-2 summarizes the DAF indicators for areas in attainment. Brevard County is in attainment. The DAF indicators are meant to identify clearly insignificant impacts or potentially significant impacts that must be addressed with a further and more advanced assessment. The DAF's insignificant indicators do not identify significant impacts; they only identify clearly insignificant impacts (AFCEC 2023a).

Table 3.1-2. Attainment Status for Brevard County, Florida and DAF Insignificance Indicators

Criteria Pollutant	Brevard County Attainment Status	DAF Insignificance Indicators
CO	Attainment/ Unclassified	250 tpy
Pb	Attainment/ Unclassified	25 tpy
NO_2	Attainment/ Unclassified	250 tpy (also refer to limits for O_3 and $PM_{2.5}$)

Criteria Pollutant	Brevard County Attainment Status	DAF Insignificance Indicators
PM_{10}	Attainment/ Unclassified	250 tpy
$PM_{2.5}$	Attainment/ Unclassified	250 tpy
O_3	Attainment/ Unclassified	250 tpy (of NO_X or VOC) [a]
SO_2	Attainment/ Unclassified	250 tpy

Notes:
Refer to 40 CFR 51.166(b)(1)(i)(b).
[a] Extensive regulations govern air emissions of so-called "ozone precursors," including NO_x and VOCs.
tpy = ton(s) per year
VOC = volatile organic compound

If the air emissions from the Proposed Action would exceed the DAF's Air Quality insignificance indicator, then further analysis would be required to determine if the emissions are "significant" (i.e., causes or contributes to an area's violation of any NAAQS). Similarly, as stated in FAA Order 1050.1F, the FAA's significance threshold for air quality is whether "the action would cause pollutant concentrations to exceed one or more of NAAQS, as established by the Environmental Protection Agency under CAA, for any of the time periods analyzed, or to increase the frequency or severity of any such existing violations."

The DAF identifies 75,000 tpy or 68,039 metric tons per year (mtpy) of carbon dioxide equivalent (CO_2e)[6] as an insignificance indicator screening threshold (AFCEC 2023b), meaning actions with a net change of emissions above this threshold require further consideration. FAA Order 1050.1F indicates that the FAA has not established a significance threshold for GHG emissions.

3.1.2.1 Proposed Action: SLC-37 at CCSFS

This section details the potential effects on air quality and weather-related resiliency from construction and operations under the Proposed Action.

3.1.2.1.1 Construction

The following sections describe the potential construction impacts on air quality and GHG emissions.

3.1.2.1.1.1 Air Quality

Construction would generate air pollutant emissions from the use of construction equipment, vehicle trips, and ground-disturbing activities. SpaceX would require contractors to incorporate mitigation measures and control measures, such as frequent use of water for dust-generating activities, to minimize fugitive particulate matter emissions **(Air Quality Mitigation-1)**. Annual construction emissions for criteria pollutants were estimated using the DAF's ACAM Version 5.0.23a, as shown in Table 3.1-3. The analysis included the following emission sources:

- Ground-disturbing activities
- Construction of new facilities and infrastructure

[6] GHG emissions are reported as CO_2 equivalent (CO_2e), which are commonly expressed in units of metric tons

- Use of construction equipment, including:
  - Generators
  - Rollers
  - Dozers
  - Scrapers
  - Tractors/Loaders/Backhoes
  - Cement/Mortar Mixers
  - Pavers
  - Paving Equipment
  - Cranes
  - Forklifts
  - Welders
  - Heavy- and light-duty trucks
- Construction workers commuting

Table 3.1-3. Annual Construction Emissions Estimates for Criteria Pollutants for the Proposed Action

Year	VOC (tpy)	CO (tpy)	NO_x (tpy)	Pb (tpy)	SO_2 (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)
2026[a]	2.07	12.8	12.4	0	0.027	71.2	0.470
Total	**2.07**	**12.8**	**12.4**	**0**	**0.027**	**71.2**	**0.470**
Insignificant Indicator[b] (tpy)	250	250	250	25	250	250	250
Threshold Exceeded	No	No	No	No	No	No	No

[a] 2026 is the peak year for criteria pollutant emissions.

[b] AFCEC 2023b

All criteria pollutants would be below the DAF indicators; refer to Appendix 3.1A for full ACAM results**.** Construction would have **no significant impact** on air quality **(Air Quality Impact-1)**.

3.1.2.1.1.2 GHG Emissions

Annual GHG emissions would be 2,502 mtpy CO_2e for construction in 2026 (Table 3.1-4), which would be well below the insignificance indicator for GHG emissions, which is 68,039 mtpy (AFCEC 2023b).

Table 3.1-4. Annual Construction Emissions Estimates of GHGs for the Proposed Action

Year	CO_2 (mtpy)	CH_4 (mtpy)	Nitrous Oxide (mtpy)	CO_2e (mtpy)
2026	2,484	0.0937	0.0559	2,502

Construction would have **no significant impact** on weather-related resiliency **(Resiliency Impact-1)**.

3.1.2.1.2 Operations

The following sections describe the potential operations impacts on air quality and GHG emissions.

3.1.2.1.2.1 Air Quality

Operations would generate criteria pollutant emissions from the following sources:

- Operations, including Starship-Super Heavy testing, launch, and landing
- Onsite fuel generation (ASU and CH_4 liquefier)
- Worker commute
- Transportation of vehicle components, including by ocean (barge) and on land (truck)
- Marine vessel and aircraft rerouting

Very low levels of air emissions would result from the air separation processes (European Industrial Gases Association 2017). Potential operational emissions from the CH_4 liquefier were estimated by comparing the Proposed Action's liquefier against the liquefier evaluated in a Papua New Guinea Liquefied Natural Gas Project EIS (Esso Highlands Limited 2009). The EIS estimated that operational air emissions would primarily be insignificant amounts of NO_X, PM_{10}, and SO_2. Given that the production capacity of the Proposed Action liquefier would be a fraction of the capacity of the reference liquefier, it is assumed that operational air emissions from the liquefier would be minimal.

Neither the CH_4 Liquefier nor the ASU plants have been designed. Emissions from the plants would be dependent on final designs and operational characteristics. Each facility will undergo permitting through the FDEP, ensuring compliance with all applicable federal and state air quality regulations. This permitting process would include a detailed emissions evaluation to determine any applicable permit requirements and ensure operations would not contribute to an exceedance of the NAAQS.

Barge transport of vehicle components would require an average of six roundtrips per year for 5 years from the Port of Brownsville, Texas, to Cape Canaveral, Florida (Appendix 3.1B). The exact number of trips could fluctuate from year to year. Barge activity would be more frequent in 2027 and then decrease over the 5-year period. The potential air emissions associated with Starship and Super Heavy floating platform landings is included in Appendix 3.1B.

The emissions for all NAAQS criteria pollutants, except for NO_x, would be well below the DAF insignificant indicators (Table 3.1-5). Brevard County is in full attainment for NO_x and ozone (O_3, with NO_x as a precursor), but the projected net annual operational and commuting emissions for the Proposed Action would be approximately 570 tpy of NO_x, which would exceed the insignificant threshold (250 tpy) by 320 tpy. Since the projected net annual emissions would exceed the DAF insignificance indicator (threshold) for NO_x, the significance of the Action's impact on air quality is still unknown (potentially significant); therefore, further analysis to determine whether the emissions are "significant" is required. As mentioned, since Brevard County is currently in attainment for NO_x and O_3 and the coastal climatic conditions are favorable for dispersion of pollutants, it would be unlikely that the Action would have an adverse impact on air quality. However, adaptive management, as a method of further analysis, will be employed to monitor air quality and proactively mitigate adverse impacts associated with the Action before they occur.

Since the projected emissions would exceed the DAF insignificance indicator (threshold) for NO_x, the action is considered to have a **potentially significant impact** on air quality **(Air Quality Impact-2)**. This potential impact will be addressed through adaptive management **(Air Quality Mitigation-2)**.

Table 3.1-5. Proposed Action Operational and Commuting Estimated Emissions

Emission Type	VOC (tpy)	CO (tpy)	NO_X (tpy)	Pb (tpy)	SO_2 (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)
Vehicle Operations[a]	0.834	11.0	0.361	0	0.008	0.064	0.021
Launch Operations[b]	0	16.8	569	0	0	0	0
Barge Transport Operations[c]	0.040	0.11	0.51	0	0.03	0.04	0.04
Total Operational Emissions	**0.87**	**27.91**	**569.87**	**0**	**0.04**	**0.10**	**0.06**
Insignificant Indicator[d] (tpy)	250	250	250	25	250	250	250
Threshold Exceeded	No	No	Yes	No	No	No	No

[a] Appendix 3.1A

[b] Appendix 3.1C

[c] Appendix 3.1B

[d] AFCEC 2023b

3.1.2.1.2.2 GHG Emissions

The total CO_2e for launch operations would be 379,717 mtpy (Table 3.1-6). Although the estimated emissions would be above the DAF's screening threshold of 68,039 mtpy for GHG emissions, when compared to the global emissions over the same time period, the emissions are minimal. Still, the Proposed Action's emissions exceeding the screening threshold implies further analysis is needed. Consequently, a relative comparison analysis was conducted by weighing the annual net change in GHG emissions proportionally against the state of Florida (where action will primarily occur) and U.S. annual emission value.

Florida's annual GHG emissions in CO_2e is 258,255,572 mtpy and the U.S. annual GHG emissions in CO_2e is 6,251,695,230 mtpy. The relative comparison of the Proposed Action's net change in GHG emissions versus the State is 0.15% and U.S. is 0.0060% projected GHG emissions for the same time period.

The Proposed Action would support reusable space launch capabilities, thereby reducing GHG emissions, creating resilient facilities, and improving logistics and sustainability. Operations would have **no significant impact** on weather-related resiliency **(Resiliency Impact-2)**.

Table 3.1-6. Operational Steady State GHG Emissions for the Proposed Action

Activity	CO_2e (mtpy)
Operational Commuting	908
Launch Operations	377,086
Barge Transport Operations	1,723
Total	**379,717**

3.1.2.1.3 Weather-related Resiliency

Given the site's proximity to the Atlantic Coast, the regional weather may affect the Proposed Action, through flooding from storm surge as sea levels rise. Florida is susceptible to increases in heavy rainstorms, hurricanes, and flooding (Runkle et al. 2022). Coastal erosion is expected to continue from saltwater intrusion and widespread flooding. Weather-related resiliency measures, such as flood protection and hurricane resilient structures, would be implemented to increase the protection of the project area from weather impacts **(Resiliency Mitigation-1)**. Construction and operations would have **no significant impact** from the weather **(Resiliency Impact-3)**.

3.1.2.2 No Action Alternative

Under the No Action Alternative, SLC-37 would not be redeveloped for Starship-Super Heavy; the DAF would not enter into any real property agreements with SpaceX for the property, and the FAA would not issue a launch license to SpaceX for Starship-Super Heavy operations at this location. CCSFS and KSC would remain active launch facilities, and future launch activities would likely increase in the future. The No Action Alternative includes all projects currently authorized for implementation with signed NEPA decision documents. Under the No Action Alternative, the cadence of operations at CCSFS and KSC would likely increase, which would increase NAAQS and GHG emissions within the region; however, this is dependent on the number of launches, types of vehicles, and size of development projects, which is not fully known at this time. The potential for emissions and pollutants to affect air quality would continue as evaluated in existing NEPA documents and permits. There would be **no significant impact** on air quality from the No Action Alternative.

3.1.3 Summary of Mitigation Measures and Impacts

This section provides a summary of the mitigation measures and impacts for air quality and weather-related resiliency.

3.1.3.1 Summary of Mitigation Measures

The following is a list of the mitigation measures that would be implemented.

- **Air Quality Mitigation-1**: SpaceX would incorporate mitigation and control measures, such as frequent use of water for dust-generating activities, to minimize fugitive particulate matter emissions.
- **Air Quality Mitigation-2**: SpaceX and the DAF will engage in an Adaptive Management strategy to proactively mitigate any potential adverse air quality impacts and better define potential air impacts as new and improved information becomes available. Specific discussions on adaptive management strategies and measures will be developed in the comprehensive Mitigation Plan as a separate and independent document.
- **Resiliency Mitigation-1**: Weather-related resiliency measures, such as flood protection and hurricane resilient structures, would be implemented to increase the protection of the project area from weather impacts.

3.1.3.2 Summary of Impacts

Table 3.1-7 provides a summary of the impacts on air quality and weather-related resiliency, as described in this section.

Table 3.1-7. Summary of Impacts on Air Quality and Weather-related Resiliency

Impacts	Proposed Action SLC-37	No Action Alternative
Air Quality Impact-1: Impact from criteria pollutants generated from construction	No significant impact with mitigation and control measures	No additional impact
Air Quality Impact-2: Impact from criteria pollutants generated from operations	Projected emissions would exceed the DAF insignificance indicator for NO_x; therefore, the action is considered to have a **potentially significant impact** on air quality. This potential impact will be addressed through adaptive management	No significant impact
Resiliency Impact-1: Impact from GHG emissions generated from construction	No significant impact	No additional impact
Resiliency Impact-2: Impact from GHG emissions generated from operations	No significant impact	No significant impact
Resiliency Impact-3: Impact from weather on the project	No significant impact	No significant impact

3.2 Airspace and Maritime Management

This section describes airspace and maritime management. The airspace ROI includes the airspace where the Starship-Super Heavy launch and landings would occur. The maritime ROI includes waterways where restrictions from Starship-Super Heavy launch and landings would occur.

3.2.1 Affected Environment

The affected environment for airspace and maritime management is discussed in the following sections.

3.2.1.1 Airspace

Airspace is defined as the navigable area at or above the minimum altitudes of flight, including the area needed to ensure safety in the takeoff and landing of aircraft. Navigable airspace is a limited national resource, and the U.S. Congress has charged the FAA with administering this airspace in the public interest to ensure it is safe for aircraft and used efficiently (FAA 2024).

Airspace controlled by the FAA may be restricted through the activation of airspace closures. A Notice to Airmen (NOTAM) provides notice of unanticipated or temporary closures within the National Airspace System (NAS) (FAA Order 7930.2T, *Notice to Airmen (NOTAM)*). The FAA issues a NOTAM at least 72 hours prior to a launch, landing, or test activity to notify pilots and other interested parties of temporary airspace conditions. A NOTAM provides notice of temporary future closures to components of, or hazards in, the NAS. NOTAMs are similarly used by Air Navigation Service Providers to provide notice of temporary airspace closures in foreign airspace. Advance notice via NOTAMs and the identification of Aircraft Hazard Areas (AHAs)[7] assist pilots in scheduling around any temporary disruption of flight activities in the area of operation. For launch and landing, the restricted area typically begins at the time of launch and ends when the mission has been completed, terminated, or cancelled. Airspace closures are immediately released once the mission has successfully cleared the area and no longer poses a risk to the public.

To comply with the FAA's licensing requirements, launch service providers at CCSFS must follow the procedures in the Letter of Authorization (LOA) between SLD 45 and the FAA. The LOA outlines the procedures and responsibilities applicable to operations, including notification of launch activity; communication procedures before, during, and after launch; plans for contingencies and emergencies; NOTAM issuance; and any other measures necessary to safeguard public health and safety. The LOA defines responsibilities and procedures applicable to operations that require the use of restricted areas, warning areas, air traffic-controlled assigned airspace, or altitude reservations within affected airspace.

[7] 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. They include regions of land, sea, and air potentially exposed to hazardous debris generated during normal flight events and all reasonably foreseeable failure modes.

3.2.1.2 Maritime

The ROI includes the maritime transportation activities in the vicinity of the launch complex (Figure 2-6), as well as the landing areas (Figure 2-7).

The USCG collaborates with other federal agencies, local governments, and industry stakeholders to maintain safe and navigable waterways within the jurisdiction of the U.S. Through the Marine Transportation System Management Program, the USCG assesses and mitigates risks to safe navigation (USCG 2023) and issues Notices to Mariners (NOTMARs). In accordance with 33 CFR Part 72, the USCG issues two types of NOTMARs to inform the maritime community of temporary changes in conditions or hazards in navigable waterways. The Local Notice to Mariners is published at least weekly but can be available to the public within 1 day of notifying the USCG. The Marine Broadcast Notice to Mariners is issued as needed. A NOTMAR notifies mariners of temporary hazards within a defined area, providing the dates and times of the operations and the coordinates of the hazardous operations area. The USCG takes steps to reduce the duration of a NOTMAR as a mission unfolds. Security zones and ship hazard areas are established around launch complexes for each mission and regulated navigation areas are established as needed for high-profile missions. Figure 3.2-1 provides an example of the configurations of these areas for a high-profile launch from KSC, although the actual configurations for Starship-Super Heavy operations may differ. The following list provides an explanation for each designation:

- **Security zone** – This zone does not change based on the mission and it is in effect beginning 2 hours before the scheduled launch or landing window. The security zone is closed to all vessels and persons, except those vessels and persons authorized by the USCG.
- **Ship hazard area** – This area is established based on mission requirements. The activation of the ship hazard area does not restrict vessels from entering the area, and the area is not typically actively patrolled by the USCG. However, an increase in vessel traffic in the ship hazard area and/or a vessel close to the trajectory may pose a substantial risk that could cause the launch to be delayed or cancelled. If there are any vessels in the immediate ship trajectory 15 minutes before launch or landing, SLD 45 personnel may need to clear the area, or the launch service provider would scrub the launch.
- **Regulated navigation area** – This area is contained within a ship hazard area and is established only for high-profile missions with substantial hazard risks. A regulated navigation area is closed to all vessels and persons for 45 minutes during launch operations.

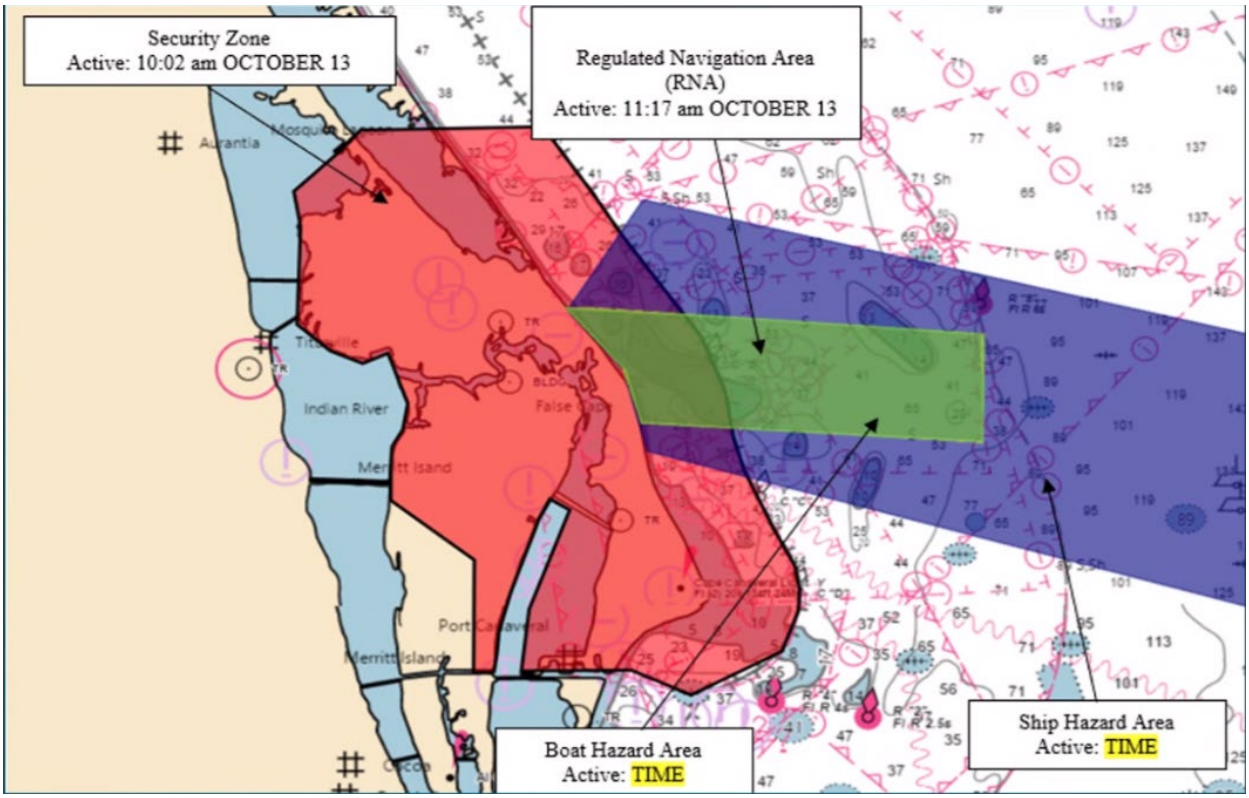


Figure 3.2-1. Example of Maritime Restricted Areas for the 2024 Europa Clipper Mission[8]

The National Geospatial-Intelligence Agency publishes notices for landings in international waters. The advanced notice is intended to assist mariners in scheduling around any temporary disruption of shipping activities in landing areas.

3.2.2 Environmental Consequences

This section describes the potential impacts on airspace and maritime management within the ROI.

The parameters used to determine impacts included:

- Major restrictions on air or maritime commerce opportunities.
- Substantial limitations to users' ability to access waterways or airspace.

3.2.2.1 Proposed Action: SLC-37 at CCSFS

This section details the potential effects on airspace and maritime management from construction and operations under the Proposed Action.

3.2.2.1.1 Construction

The following sections describe the potential construction impacts on airspace and maritime management.

[8] The Europa Clipper Mission is provided as example to explain potential restricted areas, it was not flown from SLC-37; consequently the resulting polygons for Starship would not exactly reflect what is shown here.

3.2.2.1.1.1 Airspace

Construction would occur on CCSFS and KSC and it would not affect airspace or require any changes to airspace management. Construction would have **no impact** on airspace **(Airspace Impact-1)**.

3.2.2.1.1.2 Maritime

Construction would occur on the terrestrial portions of CCSFS and KSC and it would not require any changes to maritime management. Launch complex components would be transported to CCSFS via U.S.-flag coastwise-qualified vessels using established maritime shipping routes. Construction would have **no impact** on the Maritime Transportation System **(Maritime Impact-1)**.

3.2.2.1.2 Operations

The following sections describe the potential operations impacts on airspace and maritime management.

3.2.2.1.2.1 Airspace

The Proposed Action would result in temporary closures of airspace to ensure public safety. The FAA is responsible for creating these temporary closures in accordance with FAA Order JO 7400.2R, *Procedures for Handling Airspace Matters*. SpaceX would submit a Flight Safety Data Package to the FAA in advance of the launch or reentry. The package would include the launch/reentry trajectory and associated AHAs.

The FAA will provide supplemental analysis of airspace impacts. Because it is expected to take months to prepare the site for operational capabilities, and the details of airspace closures to support Starship-Super Heavy operations are unknown at this time, the DAF will assess the supplemental airspace analysis conducted by the FAA upon its completion and finalize a revised ROD prior to Starship-Super Heavy launches or landings occurring **(Airspace Impact-2)**.

3.2.2.1.2.2 Maritime

SpaceX operations would not alter or close existing shipping lanes and the transport of vehicle components from Boca Chica, Texas, to CCSFS would be episodic and involve U.S.-flag coastwise-qualified vessels and established shipping routes. No unique maritime effects would result from transporting Starship-Super Heavy launch vehicle components.

SpaceX would enter into an agreement with the USCG to operate the launch vehicle over the maritime resources managed by the USCG. The agreement would describe the responsibilities and procedures for both SpaceX and the USCG, including the issuance of NOTMARs and the establishment of maritime hazard areas for operations. SpaceX would coordinate with the National Geospatial-Intelligence Agency to publish NOTMARs and establish ship hazard areas in international areas, as required.

Security zones, ship hazard areas, and regulated navigation areas would be established around SLC-37 based on each mission's parameters. The following list provides a conservative estimate of the duration of annual closures for each restricted area type as it assumes all launch and landing operations would occur at SLC-37:

- **Security zone:** This zone is typically restricted for 2 hours before and during launch. Assuming a maximum of 244 launch and landing events (including scrubs), there could be up to 488 hours of security zone closures per year.
- **Ship hazard area:** Ships in the immediate vicinity of the trajectory of the launch vehicle could be asked to clear the area. A closure would occur only in the direct vicinity of the launch trajectory and not in the entire ship hazard area. Assuming 244 launch and landing events

(including scrubs), this would equate to approximately 61 hours of closures within ship hazard areas per year.

- **Regulated navigation area**: This area is closed to all vessels for 45 minutes during launch operations and is required only for high-profile missions. The number of high-profile missions to be performed in the future is unknown; however, historically, there have been 10 to 12 per year, which would equate to up to 9 hours of closures within regulated navigation areas per year.

Operations would have **no significant impact** on the Maritime Transportation System **(Maritime Impact-2)**, given there are management measures in place (i.e., NOTMARS, security zones, ship hazard areas, and so forth), a limited duration of any restrictions, and the ability of mariners to identify alternate routes based on NOTMARs.

3.2.2.2 No Action Alternative

Under the No Action Alternative, the DAF would not enter into a real property agreement with SpaceX, SpaceX would not redevelop SLC-37 for Starship-Super Heavy operations, and the FAA would not issue a vehicle operator launch license for Starship-Super Heavy operations at SLC-37. SLC-37 would remain consistent with existing conditions. The potential for temporary airspace closures and alterations to maritime activities to affect airspace and maritime management would continue as evaluated in existing NEPA documents. Existing notification requirements would continue to be implemented. There would be **no significant impact** on airspace and maritime from the No Action Alternative.

3.2.3 Summary of Mitigation Measures and Impacts

This section provides a summary of the mitigation measures and impacts for airspace and maritime management.

3.2.3.1 Summary of Mitigation Measures

Through compliance with federal requirements, regulations, and law, no additional mitigation measures are necessary at this time.

3.2.3.2 Summary of Impacts

Table 3.2-1 provides a summary of the impacts on airspace and maritime resources, as described in this section.

Table 3.2-1. Summary of Impacts on Airspace and Maritime Management

Impacts	Proposed Action SLC-37	No Action Alternative
Airspace Impact-1: Impact on airspace during construction	No impact	No additional impact
Maritime Impact-1: Impact on maritime during construction	No impact	No additional impact
Airspace Impact-2: Impact on airspace during operations	Dependent on FAA analysis no later than the receipt of pre-application materials for a vehicle operator license.	No significant impact
Maritime Impact-2: Impact on maritime during operations	No significant impact	No significant impact

3.3 Infrastructure

This section describes existing and planned infrastructure at CCSFS, including roadways and utilities. Utilities comprise potable (drinking water) and non-potable water, wastewater, electrical power, commodities, and communication systems that provide essential services to CCSFS and the surrounding community. The ROI for infrastructure consists of transportation networks that provide access to and within CCSFS and KSC, as well as the utility systems at CCSFS.

3.3.1 Affected Environment

The affected environment for infrastructure is discussed in the following sections.

3.3.1.1 Roadways

Figure 3.3-1 shows the transportation systems on CCSFS and KSC and in the surrounding areas. CCSFS has 81 miles of paved roads connecting launch support facilities to a centralized industrial area (USSF 2022a). SLC-37 is accessed from Phillips Parkway, which is the primary roadway on CCSFS. It is a north-south four-lane divided highway in some areas and a two-lane arterial in other areas. Roadway use at CCSFS is increasing because of new commercial development and increased launches. Currently, vehicles traveling on Phillips Parkway must pull onto unpaved shoulders to allow spacecraft and large loads to pass. The SLD 45 periodically performs traffic studies to determine the capacity of its roadways. The current level of service is considered acceptable for Phillips Parkway and growth can occur without degrading roadway conditions (CCSFS 2025).

All CCSFS and KSC roads and supporting structures, such as culverts, bridges, and pavement, were constructed to meet Florida Department of Transportation (FDOT) heavy vehicle load standards. Most of the road pavement is in good or fair condition. There are numerous ongoing roadway improvement projects at CCSFS and KSC.

CCSFS can be accessed via three vehicle-controlled entry points. All commercial vehicles must access CCSFS through the South Gate; the other two entry points allow access to and from KSC.

SLD 45 maintains a robust and mature ground transportation program that proactively manages, schedules, and deconflicts hardware, construction, and other vehicular ground movements. Programmatic metrics and routine programmatic reviews indicate capacity for movements has yet to be reached. Based upon review of the SLD 45's CCSFS Transportation Policy, current metrics and routine assessments indicate that the transportation network is operating within its intended capacity. However, should future phases of the program—ranging from construction through launch—result in increased activity, the DAF recognizes the importance of periodically reassessing the program's impact. This ensures that any rise in traffic or vehicle movements is proactively managed to avoid placing undue strain on the broader transportation network and infrastructure.

3.3.1.2 Utilities

Utilities on CCSFS comprise potable and non-potable water, wastewater, electrical power, commodities, and communication systems. Most utilities at CCSFS run along Phillips Parkway and ICBM Road. SLC-37 is an operational launch complex with most utility connections already in place.

3.3.1.2.1 Potable and Non-potable Water

The City of Cocoa's municipal water distribution system provides and treats potable and non-potable water at CCSFS via a connection at the South Gate. Various storage systems and secondary pump systems supply water throughout CCSFS. Non-potable water use at CCSFS includes fire protection and hydrant flushing (USAF 2017).

The City of Cocoa has an agreement with CCSFS for water and wastewater services. The U.S. Government is the City's largest wholesale water customer, with a combined annual average daily flow of 5 million gallons per day at CCSFS, KSC, and Patrick Space Force Base (Space Florida 2017). The 2020–2030 City of Cocoa Comprehensive Plan sets objectives so that an adequate supply of water and storage capacity will be available to accommodate future average daily and typical peak day demands generated by an increase in the number of launch customers (City of Cocoa 2020) and should be able to accommodate over 9 million gallons per day (Rutland pers. comm. 2025).

3.3.1.2.2 Sanitary and Wastewater

Domestic and industrial wastewater from CCSFS and KSC is treated at the CCSFS Regional Wastewater Treatment Facility. The facility treats wastewater from various sources before releasing it back into the environment. The facility has the capacity to treat approximately 0.8 million gallons per day. As of 2020, approximately 0.436 million gallons per day, which is 55% of the facility's capacity, were used (Black and Veatch 2023). As of 2023, no new sources of non-nutritive discharge are accepted at the CCSFS Regional Wastewater Treatment Facility.

3.3.1.2.3 Electrical Power

Florida Power and Light provides high-voltage (115-kilovolt) electrical power to substations at CCSFS. Electrical transmission lines enter CCSFS at the southwest boundary and cross the Banana River Lagoon to the substations. The feeds can provide 59 megavolt-amperes to CCSFS, which exceed current requirements (USSF 2023). CCSFS maintains the local electrical distribution system, which provides 13.2 kilovolts to the launch complexes (USAF 2017). Electrical power is available at SLC-37.

3.3.1.2.4 Commodities

Florida City Gas owns and operates natural gas at CCSFS. An 8-inch-diameter gas main branches from KSC to CCSFS and supplies natural gas to the CCSFS industrial area and areas to the south. Liquefied gases are delivered by tanker trucks or via buried pipelines and standalone pipeline facilities used within specific SLCs. Liquified natural gas is delivered to CCSFS by truck. Gaseous nitrogen and gaseous helium are delivered to SLC-37 via buried pipelines with metering stations.

3.3.1.2.5 Communications

Communication systems supporting telephone and data transmission services are provided throughout CCSFS and include systems for conventional telephone service, launch/test data, countdown and timing, weather, range safety, paging and operational intercommunication; radio-frequency communications; wideband fiber-optics; operational television, video transmission and recording; and video teleconferencing (Space Florida 2017). Underground communications infrastructure at CCSFS consists of direct buried cable or unprotected cable in conduit or within collapsed concrete duct banks. The details of the locations of communication infrastructure at SLC-37 are unknown at this time.

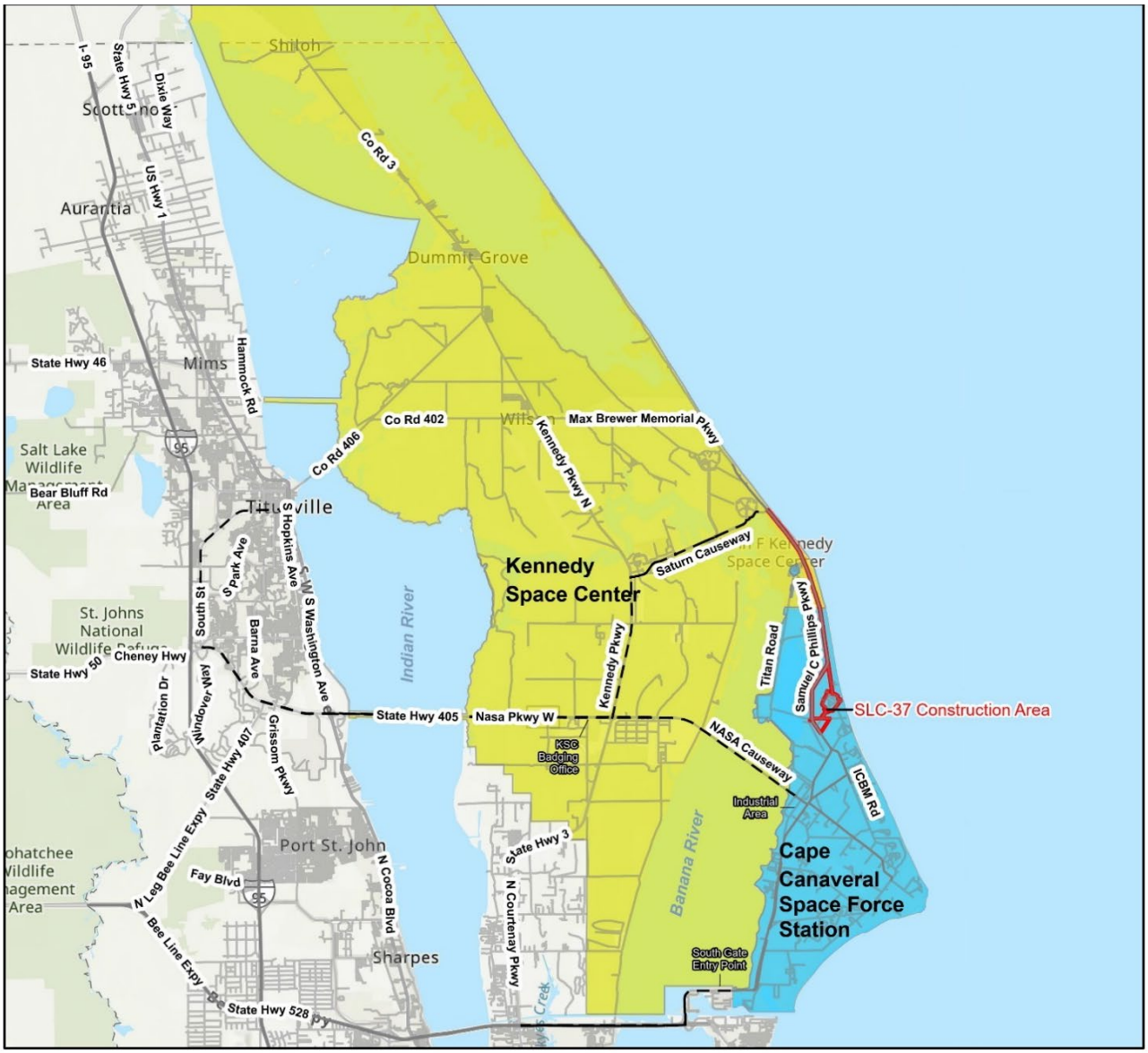


Figure 3.3-1. Transportation Systems at CCSFS and KSC and Surrounding Area

3.3.2 Environmental Consequences

This section describes the potential impacts on transportation and utilities within the ROI.

The following parameters were used to analyze traffic:

- New traffic patterns resulting in severe disruptions to local traffic.
- Potential for severely degraded level of service from increased vehicle trips on the roadway network.
- Road damage that could render a road unusable.

The following parameters were used to analyze utilities:

- Substantial disruption to utilities.
- Exceedances in the existing capacity of the utilities or infrastructure.

3.3.2.1 Proposed Action: SLC-37 at CCSFS

This section details the potential effects on infrastructure from construction and operations under the Proposed Action. This analysis represents the current understanding of the utility requirements. If significant additional utility upgrades are necessary, additional analysis may be performed.

3.3.2.1.1 Construction

The following sections describe the potential construction impacts on infrastructure.

3.3.2.1.1.1 Transportation

To facilitate the transport of Starship-Super Heavy vehicle components to the launch site, SpaceX would widen Phillips Parkway to 34 feet for approximately 7 miles from SLC-37 to Pad A Bypass Road on KSC; of this, approximately 4 miles would be on CCSFS, and 3 miles would be on KSC. Philips Parkway is approximately 25 feet wide, so the road widening would add approximately 9 feet. Additional roadway improvements would include widening a 1-mile section of Old A1A that connects SLC-37 to Phillips Parkway, adding two turn radiuses along Patrol Road, and adding roads within the launch complex (Figure 3.3-2). While the level of service for Phillips Parkway is considered acceptable and assessments indicate that the roadway can sustain a substantial increase in traffic (CCSFS 2025), these roadway improvements would help alleviate delays on Phillips Parkway and improve the level of service.

The temporary road closures and detours along Phillips Parkway during construction could result in short-term disruptions and increased pressure on other CCSFS and KSC roads. Because Old A1A is not an active road, no disruption would occur from construction on that road. Temporary road closures during construction would occur on CCSFS during the delivery of tower segments and associated parts and tanks (approximately 40 items per tower). Temporary disruptions would be minimized by implementing measures such as phased construction, detours and signage, advance notifications, and limiting the movement of construction-related vehicles and deliveries to off-peak hours, as applicable **(Infrastructure Mitigation-1)**.

Construction would require an average of 175 construction workers, with a peak of 300 construction workers, over the estimated 12-month construction period. These workers would temporarily contribute up to 300 additional vehicles traveling on the roadway system to and from locations within CCSFS. Throughout the duration of construction, an average of 20 delivery vehicles and an average of 10 rental and service vehicles would access the site each day.

Additionally, approximately 30 haul trucks and 40 concrete trucks would access the site daily for 12 months. Construction vehicles and materials would lead to increased pressure on the South Gate and commercial vehicle inspection stations. However, this increase in traffic is within the capacity of regional roadways.

Construction traffic would be temporary in nature and not result in a severe disruption of local traffic or a degradation of service beyond current conditions. Furthermore, regional roadways are maintained and the occasional movement of large construction equipment to SLC-37 should not lead to substantial road damage on CCSFS or the surrounding community. If damage were directly correlated to SpaceX activities, SpaceX would be required to work with SLD 45 to remedy the damage **(Infrastructure Mitigation-2)**. Construction would have **no significant impact** on transportation infrastructure at CCSFS and KSC **(Infrastructure Impact-1)**.

Figure 3.3-2. Roadway Improvements

3.3.2.1.1.2 Utilities

SpaceX would modify existing utility infrastructure at SLC-37 to support Starship-Super Heavy operations. During construction, temporary utilities would be provided, including up to 60 portable toilets and generators to supply electrical power to the onsite construction trailers. Construction mitigation measures such as utility identification, real-time locating, site-specific worker training, and a system for incident reporting would be implemented. SpaceX would coordinate with SLD 45 and SpaceX would obtain any required permits for potable water and wastewater infrastructure. To minimize disruptions to utility infrastructure during construction, SpaceX would implement construction standards such as utility identification, real-time locating, site-specific worker training, and a system for incident reporting. **(Infrastructure Mitigation-3)**. Construction would not result in a disruption or exceedance of existing utility infrastructure. Construction would have **no significant impact** on utilities **(Infrastructure Impact-2)**.

3.3.2.1.2 Operations

The following sections describe the potential operational impacts on infrastructure.

3.3.2.1.2.1 Transportation

Starship, Super Heavy, and launch vehicle components would be transported to SLC-37 from the SpaceX Starbase in Boca Chica, Texas. The components would be transported by sea via barge from the Port of Brownsville, Texas, to Port Canaveral, through the Banana River to dock at either the AF Wharf at CCSFS or the Turn Basin at KSC. Established shipping lanes would be used to transport all components. Once on CCSFS or KSC, the launch vehicle components would be transported via existing designated haul routes on CCSFS and KSC to SLC-37. Post launch and landing, SpaceX would perform vehicle integration and refurbishment, to the degree practicable, at the launch site.

Oversize load trucks would be used for vehicle transport; these vehicles would adhere to applicable FDOT weight limits. Temporary road closures could be required for some oversize transports. SpaceX would work with SLD 45 to minimize temporary disruptions to other tenants, including other commercial launch service providers, by implementing measures such as phased construction, detours and signage, advance notifications, and limiting the movement of construction-related vehicles and deliveries to off-peak hours, as applicable. **(Infrastructure Mitigation-1)**. The widening of Phillips Parkway would help optimize the transportation network within CCSFS and KSC by reducing overall traffic delays.

Increased traffic would result from daily worker commutes and the periodic delivery of components for operations. SpaceX would require 450 additional full-time personnel to support Starship-Super Heavy operations. These individuals would work shifts to cover 24-hour operations, as necessary, and approximately 200 workers would be onsite at the same time. In addition, there is a possibility of increased localized traffic in the vicinity of CCSFS from visitors and public observers related to launch activity. Launch activities would be coordinated with local authorities to allow for proper roadway planning during high profile launches **(Infrastructure Mitigation-4)**. The current average daily trips on Phillips Parkway are approximately 600 trips a day where the level of service capacity for the roadway is 4,600 trips a day; therefore, increased traffic from regular operations at SLC-37 is within the current capacity of the regional roadways and should not result in a substantial degradation of service (CCSFS 2025).

Regional roadways are regularly maintained and the occasional movement of oversized equipment to SLC-37 should not lead to substantial road damage on CCSFS or in the surrounding community. If damage were directly correlated to SpaceX activities, SpaceX would be required to work with SLD 45 to remedy the damage **(Infrastructure Mitigation-2)**.

Operations would **have no significant impact** on transportation infrastructure at CCSFS and KSC **(Infrastructure Impact-3)**.

3.3.2.1.2.2 Utilities

SpaceX intends to be self-sufficient in providing commodities at the space launch complex. However, connectivity to shared resources would be maintained as a contingency for instances when organic resources are unavailable. The DAF has established processes to prioritize, deconflict, and address usage, shortfalls, and outages as needed. The baseline plan relies on SpaceX-provided commodities, with intermittent access to shared resources on an excess-capacity basis.

Water

Table 3.3-1 provides estimates of the amount of potable water used for each launch activity. Starship-Super Heavy operations would require potable water for deluge, which includes water needed for launch, landing, and static fires. Deluge water would be stored in retention ponds within SLC-37 for reuse during future operations **(Infrastructure Mitigation-5)**. However, it is conservatively assumed that the full 1,146,000 gallons of water would be required for each launch, which is within the City of Cocoa's permitted water availability (Rutland, pers. comm. 2025).

In addition to needing water for a deluge system, a CH_4 liquefier would require up to 132 gallons per minute of water and produce up to 13 gallons per minute of wastewater (approximately 5.3 million gallons annually) and an ASU would require approximately 660 gallons per minute of water and produce up to approximately 66 gallons per minute of wastewater (12.4 million gallons annually). The City of Cocoa will be able to support this amount of water and is factoring this into future planning efforts in the service area.

Table 3.3-1. Estimated Potable Water Use for Launch Operations

Operational Activity	Estimated Potable Water Use (gallons per launch)
Static fire – Starship	304,000
Static fire – Super Heavy Booster	304,000
Integrated launch – Starship-Super Heavy	402,000
Landing – Starship	68,000
Landing – Super Heavy Booster	68,000
Total per launch (up to 76 times per year)	1,146,000
Maximum Total Annual Deluge	87,096,000
Annual CH_4 Liquefier	5,300,000
Annual ASU	12,400,000
Maximum Total Annual Requirements	104,796,000

SpaceX would retain wastewater for reuse in properly sized retention ponds in accordance with the SLD 45 Memorandum Eliminating Non-Nutrient Discharges to the CCSFS water treatment facilities (November 3, 2023); Unified Facilities Criteria (UFC) 3-210-10, *Low Impact Development*; and the Energy Independence and Security Act (42 U.S.C. Sections 17001 et seq.).

The lining of the retention ponds would prevent the percolation of contaminants. SpaceX would maintain and monitor the retention ponds. The wastewater would be treated onsite via evaporation, condensation, or hauled offsite by trucks. If discharging water into the stormwater system became necessary, SpaceX would acquire an Industrial Wastewater Permit from FDEP and permission from St. Johns River Water Management District and then confirm the wastewater met the water quality criteria outlined in the required FDEP Industrial Wastewater Permit for onsite disposal of launch-related wastewater **(Infrastructure Mitigation-5)**.

The Proposed Action includes temporary clears of SLD 45 personnel, which may include personnel at the CCSFS Regional Wastewater Treatment Facility. While these clears are temporary and of short duration, a clear could result in impacts on the CCSFS Regional Wastewater Treatment Facility, which is currently operated 24 hours per day, 7 days per week, 365 days per year. Any future modifications to the common-use infrastructure, such as the CCSFS Regional Wastewater Treatment Facility, to accommodate launch operations on CCSFS would require additional coordination to ensure compliance with applicable environmental and infrastructure planning requirements.

Potable water to support personnel would be provided to SLC-37 using existing water lines that connect to the existing potable water main. The 450 permanent employees would generate sanitary wastewater; it is estimated that 200 personnel would be at SLC-37 at any given time and would generate approximately 15 gallons per day per person. Existing sewer lines would be used, where practicable, and sanitary waste would be treated at the Regional Wastewater Treatment Plant on CCSFS.

Electrical Power

SpaceX would use the existing Delta Substation at CCSFS and construct an electrical substation of up to 130 kilovolts at the launch site to support SpaceX's electrical demands. Florida Power and Light could provide up to 250 megawatts of power via the existing Delta Substation. Connections to the CCSFS electrical system would be constructed, as necessary. SpaceX's estimated annual average power usage of 60 megawatts would be less than the available capacity. If necessary, SpaceX would supplement the substations with megapacks, which are large-scale rechargeable lithium-ion battery stationary energy storage devices.

Commodities

The existing fuel commodity systems would be used to obtain the fuel necessary for operations. Commodity tanks would hold LOX, LN_2, water, helium, gaseous nitrogen, gaseous CH_4, and liquid CH_4. The approximate sizes of the commodity tanks are 16,500 tons for LOX, 6,500 tons for LN_2, and 5,000 tons for liquid CH_4. The location of the tanks would comply with LOX and LN_2 location siting regulations (NFPA 251 and NFPA 59A).

SpaceX would also construct the following propellant generation systems at SLC-37:

- Natural gas pretreatment system to remove impurities from the pipeline-quality natural gas and produce gaseous CH_4. Surplus natural gas would be used for processing work or power generation.
- CH_4 liquefier to supercool pretreated natural gas to a liquid state for storage and transportation.
- ASU to generate the LN_2 and LOX required for launch operations.

Communications

New fiber connectivity lines would be routed underground within the existing right-of-way along Phillips Parkway to provide communications connectivity to the launch site.

Utilities Conclusion

Operations would not result in a substantial disruption to any utility or exceed existing capacity. Operations would have **no significant impact** on utilities **(Infrastructure Impact-4)**.

3.3.2.2 No Action Alternative

Under the No Action Alternative, the DAF would not enter into a real property agreement with SpaceX, SpaceX would not redevelop SLC-37 for Starship-Super Heavy operations, and the FAA would not issue a vehicle operator launch license for Starship-Super Heavy operations at SLC-37. SLC-37 would remain consistent with existing conditions and remain active. The potential for traffic and utility usage would continue as evaluated in existing NEPA documents, which would include improvements to infrastructure at CCSFS and KSC. There would be **no significant impact** on infrastructure from the No Action Alternative.

3.3.3 Summary of Mitigation Measures and Impacts

This section provides a summary of the mitigation measures and impacts for infrastructure.

3.3.3.1 Summary of Mitigation Measures

The following mitigation measures would be implemented as necessary:

- **Infrastructure Mitigation-1**: SpaceX would work with SLD 45 to minimize temporary disruptions to other tenants, including other launch service providers, by implementing measures such as phased construction, detours and signage, advance notifications, and limiting the movement of construction-related vehicles and deliveries to off-peak hours, as applicable.
- **Infrastructure Mitigation-2**: If roadway damage were directly correlated to SpaceX activities at CCSFS, SpaceX would work with SLD 45 to remedy the damage.
- **Infrastructure Mitigation-3**: To minimize disruptions to utility infrastructure during construction, SpaceX would implement construction standards such as utility identification, real-time locating, site-specific worker training, and a system for incident reporting.
- **Infrastructure Mitigation-4**: Launch activities would be coordinated with local authorities to allow for proper roadway planning during high-profile launches.
- **Infrastructure Mitigation-5:** Industrial wastewater would be retained in ponds within SLC-37 and reused to the extent possible. If discharging wastewater into the stormwater system became necessary, SpaceX would acquire an Industrial Wastewater Permit from FDEP and permission from St. Johns River Water Management District and then confirm the wastewater met the water quality criteria outlined in the required FDEP Industrial Wastewater Permit for onsite disposal of launch-related wastewater.

3.3.3.2 Summary of Impacts

Table 3.3-2 provides a summary of impacts on infrastructure, as described in this section.

Table 3.3-2. Summary of Impacts on Infrastructure

Impacts	Proposed Action SLC-37	No Action Alternative
Infrastructure Impact-1: Impact on transportation infrastructure from construction	No significant impact	No additional impact
Infrastructure Impact-2: Impact on utilities from construction	No significant impact	No additional impact
Infrastructure Impact-3: Impact on transportation infrastructure from operations	No significant impact	No significant impact
Infrastructure Impact-4: Impact on utilities from operations	No significant impact	No significant impact

3.4 Socioeconomics

This section assesses potential effects associated with socioeconomics. The socioeconomic ROI is Brevard County, as well as the commercial and recreational fishing waters of the South Atlantic Region off the coasts of Florida, Georgia, South Carolina, and North Carolina.

3.4.1 Affected Environment

The affected environment for socioeconomics is discussed in the following sections.

3.4.1.1 Socioeconomics

Socioeconomics is the study of the relationship between social and economic factors. It includes factors such as population characteristics, housing availability, employment opportunities and regional industries. The following sections outline the current socioeconomic conditions within the ROI based on U.S. Census Bureau (USCB) data and other sources.

3.4.1.1.1 Population and Housing

As of 2022, Brevard County and the State of Florida had populations of approximately 631,000 and 22,000,000, respectively (USCB 2022). Between 2010 and 2020, Brevard County's population grew by 11.6% and the State of Florida's population grew by 14.6% (Florida Legislature 2024). In 2020, the total number of housing units in Brevard County was 288,794; approximately 11% (31,768 units) are vacant (Florida Legislature 2024). Refer to Section 3.5, Noise, for a detailed description of noise impacts on population and housing.

3.4.1.1.2 Employment and Income

Between 2018 and 2022, Brevard County's median household income was $71,308 and Florida's was $67,917 (USCB 2022). The 2023 unemployment rate in Brevard County was 3.0%, which is similar to Florida's unemployment rate of 2.9% (Florida Legislature 2024).

3.4.1.1.3 Regional Industries

3.4.1.1.3.1 Aerospace and Defense Industry

The aerospace and defense industries are major contributors to Florida's economy, and Florida ranks in the top five U.S. States for aerospace employment (Space Florida 2023). Brevard County, Florida, is a recognized hub for the U.S. Space Industry and is often referred to as the "Space Coast." As of 2023, Florida's aerospace industry generated approximately $1.1 billion in revenue annually (Space Florida 2023), and as of 2021, accounted for 114,993 jobs (Florida DEO 2021). Most of the employees are based out of Brevard County, making CCSFS and KSC Brevard County's major employers, with a combined workforce of military, civil service, other governmental, and contract employees.

The aerospace industry is expected to continue to grow, and the commercial space industry is rapidly evolving in Brevard County (USSF 2022a). In addition to SpaceX, a new generation of launch service providers are interested in operating from CCSFS, including Blue Origin, ULA, Relativity Space, Stoke Space, and others (USSF 2022a). Typically, USSF enters into a lease agreement allowing the launch service provider access to a launch site for a specified duration. CCSFS aims to maximize opportunities for launch service providers and minimize impacts from overlapping operations (SLD 45 2023).

3.4.1.1.3.2 Commercial Fishing Industry

Commercial fishing refers to the selling of catch for profit. The economic components of commercial fisheries include the quantity of fish and shellfish that are caught and brought to shore by commercial fishing operations, also referred to as landings.

In 2022, revenue from fish caught in the South Atlantic Region totaled $173.8 million from 94.6 million pounds of fish and created 158,711 jobs (NMFS 2022). The South Atlantic Region commercial fisheries harvest a variety of species, including blue crab, clams, flounder, grouper, king mackerel, oysters, shrimp, snapper, swordfish, and tuna. Northern white shrimp and blue crab were the species with the highest landing revenues, accounting for about 40%, or $64.0 million, of total landings revenue in the South Atlantic Region.

In 2024, revenue from fish caught in Brevard County totaled $10.7 million from 4.5 million pounds of fish. In the same year, Port Canaveral revenue totaled $6.6 million from 2.8 million pounds of fish (NOAA 2025). In the last 10 years, the total number of pounds of fish and revenue has fluctuated over time, with 2019 being the peak revenue at $13 million and 10.6 million pounds of fish (NOAA 2025). These fluctuations may be caused by habitat loss and degradation, severe weather (such as hurricanes), nutrient pollution (i.e., runoff from fertilizers and other agricultural or industrial activities), overfishing, or other operations at Port Canaveral that may decrease total amount of fishing time. There are many fishing spots near Port Canaveral, including Chris Benson reef, which is approximately 15 miles northeast of SLC-37. The commercial fishing revenue by species for both South Atlantic Region and Brevard County are included in Appendix 3.4A.

3.4.1.1.3.3 Recreational Fishing Industry

In 2022, the South Atlantic Region recreational fishing industry generated $3.7 billion in sales and supported 27,000 jobs. A vast majority of the revenue comes from boat sales, with a small fraction generated from for-hire charters (NMFS 2021). There are approximately 80 charter-for-hire boats at Port Canaveral (USSF 2024b).

3.4.1.1.3.4 Cruise Industry

The cruise industry is Port Canaveral's primary economic contributor. In 2023, Port Canaveral supported 42,666 jobs providing $2.1 billion in total wages from those jobs, and $189.5 million in total state and local tax revenue. The cruise industry accounts for 66% of the total economic contribution, with the remaining economic contribution coming from cargo (20%), real estate (5%), government organizations (5%), and recreation (1%) (Canaveral Port Authority 2023).

3.4.1.1.3.5 Local Tourism

Tourists in the region are split into two distinct groups with different sets of activities and behaviors. One group includes visitors participating in outdoor recreation at MINWR, CANA, and the local beaches, and the other group includes visitors viewing space launches and landings. Annual visitation to MINWR is 2.1 million, while annual visitation to CANA is also 2.1 million, of which Playalinda Beach accounts for 1.16 million visitors (USFWS 2024). The number of people who come to watch a launch is difficult to estimate; however, for unique and groundbreaking missions, it has been estimated that upwards of 100,000 people may come to watch a single launch (Florida Today 2022). In 2023, visitors to CANA spent $84.2 million while visiting the national park. These expenditures supported 1,080 jobs, $40.7 million in labor income, $69.2 million in value added, and $120 million in economic output in local gateway economies (Flyr and Koontz 2024).

3.4.2 Environmental Consequences

This section describes the potential impacts on socioeconomics within the ROI.

The following parameters were used to analyze socioeconomics:

- Substantial change to the local or regional economy or employment.
- Change in demand for local housing.
- Disruptions or divisions the physical arrangement of an established community.
- Extensive relocations of community businesses that would cause economic hardship.
- Substantial changes in the community tax base.

3.4.2.1 Proposed Action: SLC-37 at CCSFS

This section details the potential effects on socioeconomics from construction and operations under the Proposed Action.

3.4.2.1.1 Construction

The following sections describe the potential construction impacts on socioeconomics.

3.4.2.1.1.1 Population and Housing

Construction would require an average of 175 construction workers and a peak of 300 construction workers over the estimated 12-month construction period. In 2022, 19,526 people in Brevard County were employed in the construction industry (USCB 2022). While specialized construction workers from outside the local area could be required, the migration of workers into the area would be minimal and temporary, resulting in no increased need for housing or other public services beyond what is currently available. Construction would have **no significant impact** on population or housing **(Socioeconomic Impact-1)**.

3.4.2.1.1.2 Employment and Income

Construction would stimulate the local economy through the employment of construction workers and the purchase of construction materials and other goods and services. Additionally, the purchase of local construction materials would result in a short-term benefit to the county's tax base in terms of additional sales tax revenues. Construction would have a temporary **beneficial impact** on employment and income in the local economy **(Socioeconomic Impact-2)**.

3.4.2.1.1.3 Regional Industries

Construction would take place entirely within CCSFS. Aside from a potential benefit to the construction industry, no other regional industries would be impacted from construction. Construction would have **no impact** on the regional industries **(Socioeconomic Impact-3)**.

3.4.2.1.2 Operations

The following sections describe the potential operational impacts on socioeconomics.

3.4.2.1.2.1 Population and Housing

SpaceX would require 450 additional full-time personnel to support Starship-Super Heavy operations. These individuals would work shifts to cover 24-hour operations, as necessary, and would not all be onsite at the same time. This increase in personnel at CCSFS would be small compared with the population of Brevard County and the State of Florida. It is assumed that most of the new personnel would already reside in the area, as the aerospace industry is well-established in the region and local universities specialize in aerospace education.

With an estimated 31,700 vacant housing units in Brevard County, no new housing or public services would be needed in the local area to support the additional employees. Operations would not change the demand for local housing.

Residential communities, such as the City of Cape Canaveral, Titusville, and Cocoa Beach, would be exposed to increased noise from Starship-Super Heavy operations; however, the potential for property damage would be exceeding low (refer to Section 3.5). A direct correlation between increased noise exposure and decreased property values cannot be made because there are many factors associated with changes in property values, including market conditions and local economic activities.

Operations would have **no significant impact** on population and housing **(Socioeconomic Impact-4)**.

3.4.2.1.2.2 Employment and Income

Aerospace industry jobs pay on average 20% more than all other industries (Florida DEO 2021). The additional 450 full-time personnel supporting Starship-Super Heavy operations would decrease unemployment and likely increase the median income in the area. Operations would have a **beneficial impact** on employment and income in the local economy **(Socioeconomic Impact-5)**.

3.4.2.1.2.3 Regional Industries

Aerospace Industry

The introduction of 450 additional aerospace employees would contribute to the growing commercial space industry within Brevard County. However, in addition to SpaceX's operations, other launch service providers are projected to perform over 110 launches annually from CCSFS. The addition of Starship-Super Heavy's estimated up to 76 launches, 152 landings (76 per stage), associated static-fire tests, and potential scrubs could result in planning constraints for other range user operations. These Starship-Super Heavy operation estimates represent the maximum number of annual activities; the actual number of annual activities could be less based on the commercial needs for Starship-Super Heavy and SLD 45 range management decisions. The SLD 45 commander holds ultimate authority to determine launch numbers and resolve conflicts. SLD 45 uses a tiered priority system to allocate launch windows, prioritizing national security missions, NASA civil launches, and high-value commercial missions. Starship-Super Heavy's up to 76 launches and landings would be scheduled in accordance with these priorities, with flexibility for static fires and landings. Most launches require two to four hours of exclusive Range access, while static-fire tests can be interleaved. SLD 45 scheduling process/software assigns non-overlapping slots, ensuring a Starship-Super Heavy operation at SLC-37 would not conflict with other launch service providers operations. SLD 45 deconflicts operations by staggering activities across pads with occasional concurrent operations. For example, a Starship-Super Heavy launch at SLC-37 could occur simultaneously with payload processing at SLC-40. A detailed explanation of closure procedures is provided in Section 3.13, Land Use. SLD 45 would aim to reduce scheduling conflicts between launch service providers and would develop mitigation strategies to reduce conflicts **(Socioeconomic Mitigation-1)**.

Commercial Fishing Industry

A portion of the South Atlantic Region, including areas near Port Canaveral in Brevard County, would be temporarily restricted to vessel movement during the maximum 244 Starship-Super Heavy launch and landing operations and potential scrubs per year. Refer to Section 3.2.1.2 for a detailed explanation of the restriction areas. An estimated maximum of 488 hours of maritime restrictions would occur around CCSFS per year. Figure 3.4-1 depicts the typical location of NOTMAR hazard areas in relation to historical vessel traffic for an expendable launch. Figure 3.4-2 depicts some of the popular fishing areas around CCSFS in comparison to the typical NOTMAR hazard areas and the Super Heavy booster landing area. Vessels may have to divert around the NOTMAR hazard areas to get to popular fishing areas; however, some of the popular fishing areas would not be within the NOTMAR hazard areas and likely outside of the Super Heavy landing area. For example, Chris Benson reef, a popular fishing spot according to local commercial fisherman, is outside of both the NOTMAR hazard area and the Super Heavy Booster landing area. The launch NOTMARs adjacent to the installation (Figure 3.4-1) would have the potential to interfere with vessel routes near Port Canaveral, which could affect commercial fishing operations originating from the Cape Canaveral area.

To minimize disruptions, advance notice via NOTMARs would assist local commercial fishing operations in anticipating and scheduling around any temporary disruption of maritime activities. Local commercial fishing operations should be able to temporarily adjust their routes or find other suitable locations to fish to avoid revenue loss during these restricted activities. SpaceX intends to reuse all launch vehicle components, limiting debris in the ocean and minimizing the potential for damage or loss of commercial fishing gear and equipment resulting from contact with debris. An official process for submitting claims to SLD 45 associated with Starship-Super Heavy activities from SLC-37 will be established prior to the launch vehicle arriving at CCSFS. Once in place, the CCSFS Public Affairs Office will notify the public and direct people to the necessary procedures, including the SpaceX insurance claims email (insurance@SpaceX.com) **(Socioeconomic Mitigation-2)**. The effects on EFH would also be minimal (refer to Section 3.9).

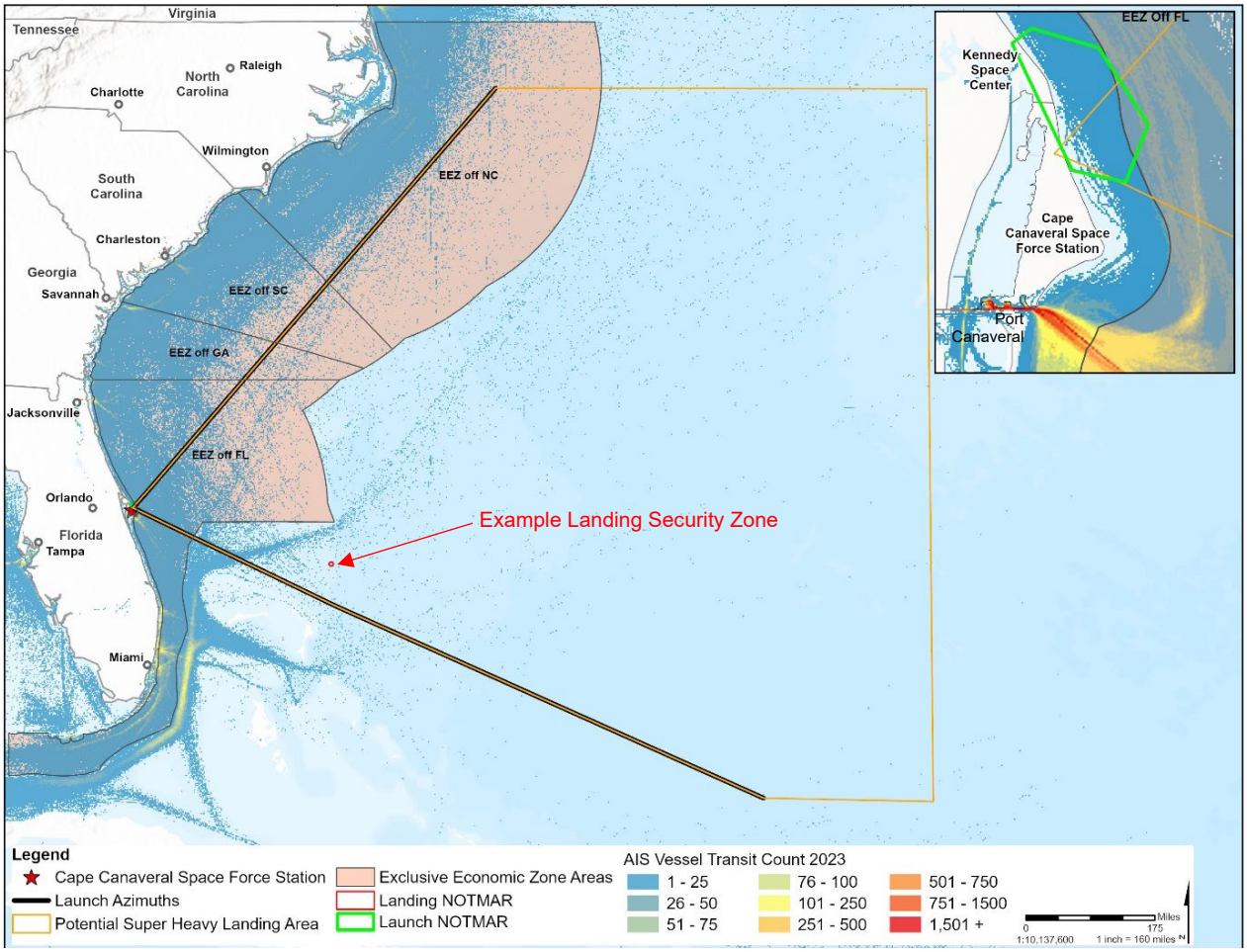


Figure 3.4-1. Example of Launch and Expendable Landing NOTMARs and Vessel Counts within South Atlantic Exclusive Economic Zone

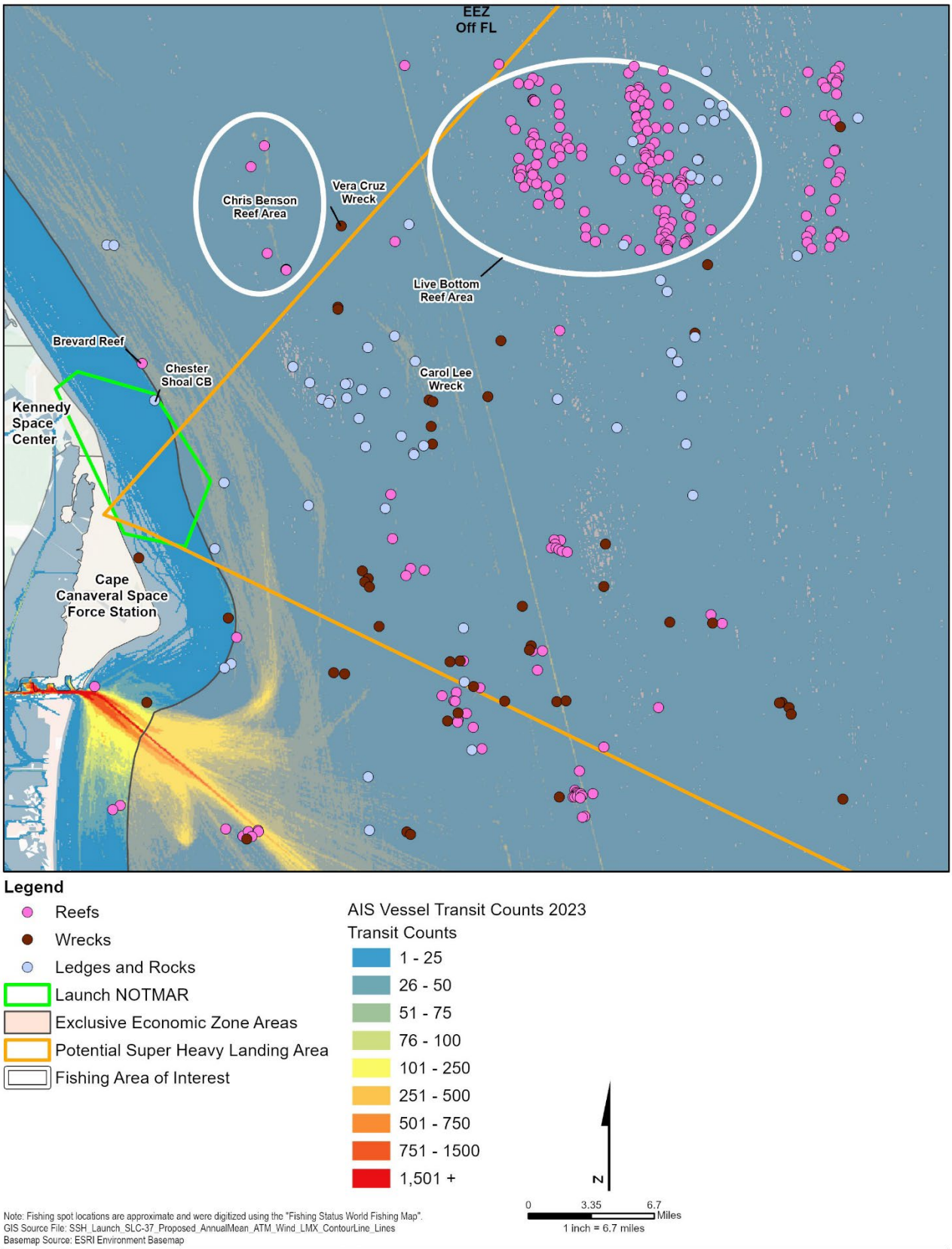


Figure 3.4-2. Locations of Popular Fishing Spots Near CCSFS

Recreational Fishing Industry

The approximately 80 charter boats at Port Canaveral could delay their trips or take alternate routes when temporary restrictions are activated (USSF 2024b); however, NOTMARs would allow charter captains to plan around restrictions and mitigate potential revenue losses.

Cruise Industry

Cruise vessel movement would be temporarily affected during launch and landing operations; however, established shipping lanes would not be changed, and Port Canaveral would remain open. To minimize disruptions, advance notice via NOTMARs would assist cruise operators in anticipating and scheduling around any temporary disruption of maritime activities.

Local Tourism

A small portion of the public areas of MINWR would be temporarily restricted during launch and landing operations, while no portion of CANA would be restricted during launches (Section 3.13). CANA may experience a diminishment of the values for which it was established (i.e., uncrowded setting, natural soundscapes, and opportunities for solitude) because of a potential increase in visitation to CANA from Starship-Super Heavy launch and landing activities and other launches. These launch and landing activities could cause changes to local tourism patterns and recreational uses at CANA and MINWR that may require temporary closures of these areas. Crowd control measures resulting from excessive visitor volume would be coordinated between CCSFS security, USFWS, and NPS. Parking lots would be monitored to ensure thresholds are not exceeded and roadways would be monitored for acceptable emergency egress. While these measures may limit the number of individuals who can view a launch from MINWR, the measures would be temporary and only affect individuals who would cause an exceedance of safety thresholds. Refer to Section 3.5 for a discussion on noise impacts to these areas.

Regional Industries Conclusion

Operations would not substantially change the regional economy or business volume, cause relocation of regional businesses, or substantially change the community tax base. Operations would have **no significant impact** on regional industries **(Socioeconomic Impact-6)**.

3.4.2.2 No Action Alternative

Under the No Action Alternative, the DAF would not enter into a real property agreement with SpaceX, SpaceX would not redevelop SLC-37 for Starship-Super Heavy operations, and the FAA would not issue a vehicle operator launch license for Starship-Super Heavy operations at SLC-37. SLC-37 would remain consistent with existing conditions. The potential for housing demand, public services use, and employment in the area would continue as evaluated in existing NEPA documents. There would be a **beneficial impact** on housing and income and there would be **no significant impact** on regional industries from the No Action Alternative.

3.4.3 Summary of Mitigation Measures and Impacts

This section provides a summary of the mitigation measures and impacts for socioeconomics.

3.4.3.1 Summary of Mitigation Measures

The following mitigation measures would be implemented as necessary:

- **Socioeconomic Mitigation-1**: SLD 45 would aim to reduce scheduling conflicts between launch service providers and would develop mitigation strategies to reduce conflicts.
- **Socioeconomic Mitigation-2**: An official process for submitting claims to SLD 45 associated with Starship-Super Heavy activities from SLC-37 will be established prior to the launch vehicle arriving at CCSFS. Once in place, the CCSFS Public Affairs Office will notify the public and direct people to the necessary procedures, including the SpaceX insurance claims email (insurance@SpaceX.com).

3.4.3.2 Summary of Impacts

Table 3.4-1 provides a summary of the impacts on socioeconomics, as described in this section.

Table 3.4-1. Summary of Socioeconomic Impacts

Impacts	Proposed Action SLC-37	No Action Alternative
Socioeconomic Impact-1: Impact on population and housing from construction	No significant impact	No additional impact
Socioeconomic Impact-2: Impact on employment and income from construction	Beneficial impact	No additional impact
Socioeconomic Impact-3: Impact on regional industries from construction	No impact	No additional impact
Socioeconomic Impact-4: Impact on population and housing from operations	No significant impact	No additional impact
Socioeconomic Impact-5: Impact on employment and income from operations	Beneficial impact	Beneficial impact
Socioeconomic Impact-6: Impact on regional industries from operations	No significant impact	No significant impact

3.5 Noise and Vibration

The ROI for noise and vibration includes CCSFS and the surrounding community that may be affected by noise. The 1 pound per square foot (psf) contour for sonic boom overpressures was used to define the outer limits of a noise ROI, as it represents the largest area that could experience readily perceptible noise.

3.5.1 Affected Environment

For the purposes of this section, noise is defined as an unwanted, extraneous, or annoying sound that interferes or disrupts normal human activities. The noise environment around CCSFS is heavily influenced by rocket launches and other aerospace activities. While much of the community surrounding CCSFS is accustomed to frequent noise events associated with launches, a number of noise sensitive areas surrounding CCSFS may experience adverse effects from increased noise. These noise sensitive areas include residential areas, religious facilities, parks, recreational areas, and wildlife refuges. For the purposes of this EIS, noise sensitive and relevant representative areas such as KSC and CCSFS were identified as points of interest (POIs); these POIs are shown in Table 3.5-1 and on Figure 3.5-1. The identified POIs are not inclusive of all noise sensitive areas that may be exposed to construction and operational noise, but they are used as representative noise sensitive locations. Potential noise effects associated with historic structures and biological resources are discussed in Section 3.7 and Section 3.9, respectively.

Table 3.5-1. Points of Interest

Name	Location	Type
CCSFS	CCSFS	CCSFS Representative Area
SpaceX Operations Area	KSC	KSC Representative Area
Titusville Beach	KSC	Restricted Beach
Playalinda Beach	CANA	National Park Recreational Area
KSC Visitor Complex	KSC	KSC Representative Area
KSC Child Development Center	KSC	School
MINWR Visitor Center	KSC	Wildlife Conservation Area
Pine Island Conservation Area/Pine Island Estates	KSC	Wildlife Conservation Area
Kings Park Estates – Courtenay	Courtenay	Residential
Jetty Park Campground	Cape Canaveral	Recreational Area
Rockledge High School	Rockledge	School
Merritt Island	Merritt Island	Residential
Oak Park Elementary School	Titusville	School
Titusville High School	Titusville	School
Summerwood Villas	Titusville	Residential
Atlantis Elementary School	Port St. John	School

Name	Location	Type
Fairglen Elementary School	Cocoa	School
Lewis Carroll Elementary School	Merritt Island	School
City of Cocoa	Cocoa	Residential
Cocoa Beach	Cocoa Beach	Residential
Pinegrove Estates	Mims	Residential
Fern Meadows	West Cocoa	Residential
KSC Office Outside BDA	KSC	KSC Representative Area
The Rock Church	Fontain Grant	Place of Worship

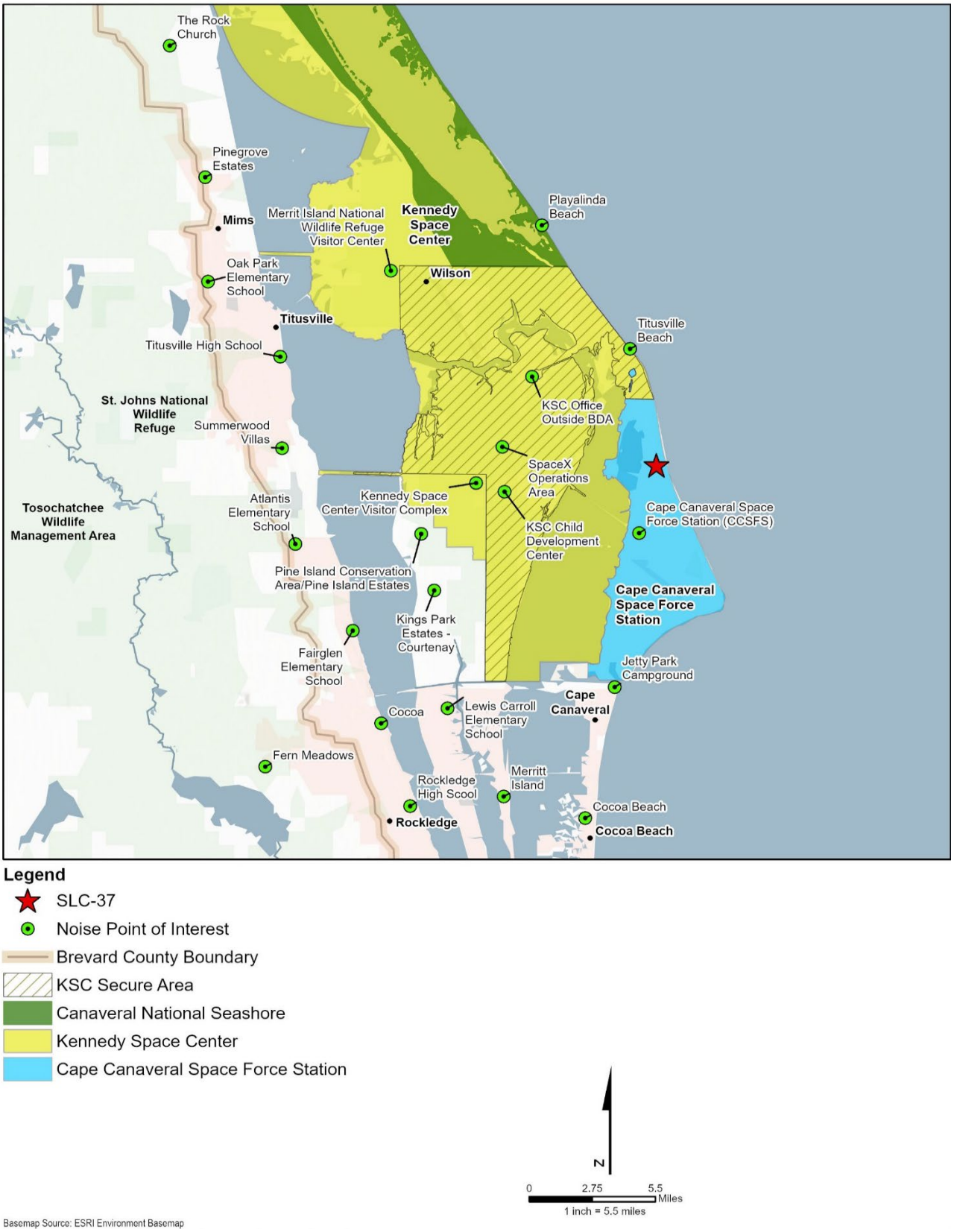


Figure 3.5-1. Noise Points of Interest

3.5.2 Environmental Consequences

A variety of acoustic metrics are used to describe how noise affects people, structures, and the environment; some metrics account for an individual event, while others account for the cumulative noise of multiple events over time. The following noise metrics were used to determine the potential effects from noise for this EIS. A detailed explanation of all common noise metrics, including supplemental metrics such as sleep disturbance, speech interference, and classroom learning interference is provided in the Noise Assessment in Appendix 3.5A, which is incorporated by reference. The impacts associated with supplemental metrics are captured within the community annoyance assessment and are not discussed separately here.

- Maximum unweighted sound level (L_{max}) is the highest instantaneous sound level that would be experienced. It is unweighted and may be used to evaluate the potential for structural damage from noise during a single event. It is measured in decibels (dB).
- Maximum A-weighted sound level (L_{Amax}) is used to evaluate potential noise-induced human hearing impairment from a single noise event. It is measured in A-weighted decibels (dBA). The A-weighting is applied to account for the relative loudness perceived by the human ear, which is less sensitive to low audio frequencies.
- Day-Night Average Sound Level (DNL) quantifies the cumulative noise exposure using a 24-hour average of L_{Amax} sound levels. A 10-dBA adjustment is added for nighttime noise levels occurring between 10:00 p.m. to 7:00 a.m. The 10-dBA adjustment is added to account for increased sensitivity to noise levels at night because ambient noise levels at night are typically about 10 dBA lower than during the day.
- Sonic booms are shock waves resulting from the displacement of air during supersonic speeds. Instantaneous sonic boom peak overpressure is measured using psf.
- C-weighted Day-Night Average Sound Level (CDNL) is used to estimate the cumulative effects from sonic boom overpressures. CDNL is computed using C-weighted decibel (dBC) frequencies to emphasize the low frequencies associated with sonic booms. CDNL is calculated by converting the sonic boom psf overpressure to dBC. A 10-dBC adjustment is added for nighttime noise levels occurring between 10:00 p.m. to 7:00 a.m.
- Ground vibrations are measured by peak particle velocity (PPV), which is the maximum rate of change of ground displacement with time and is measured in inches per second (in/sec).

The following parameters were used to analyze noise and vibration:

- Community annoyance from new exposure to a DNL 65-dBA threshold from launch noise, CDNL 60 dBC from sonic booms, or a 1.5-dBA increase for areas already within a DNL 65-dBA contour[9]. The existing DNL contour for the area around CCSFS is presented on Figure 3.5-2; the existing CDNL contour is presented on Figure 3.5-3. The DNL 65-dBA contour is considered the threshold at which noise can start to interfere with daily activities; all land uses are considered compatible with noise levels less than DNL 65 dBA according to 14 CFR Part 150.

[9] FAA Order 1050.1F defines significance at a 1.5-dB increase that either results in, or occurs within, a DNL 65-dBA contour. A CDNL of 60 dBC equates to a DNL of 65 dBA.

- Potential hearing damage to the public from exposure to noise levels that exceed the following safety standards for unprotected hearing outlined in Air Force Instruction 48-127, *Occupational Noise and Hearing Conservation Program.*
  - No unprotected exposure above 115 dBA
  - 0.5 minute for 115 dBA
  - 0.9 minute for 112 dBA
  - 1.5 minutes for 110 dBA
  - 1.9 minutes for 109 dBA
  - 2.4 minutes for 108 dBA
- Potential structural damage from exposure to 140 dB L_{max} for noise, greater than 10 psf for sonic boom overpressures, and 2 in/sec PPV for vibration. Below these thresholds, the probability of damage to structures is unlikely (Fenton and Method 2016; FAA 1976; USBM 1980).

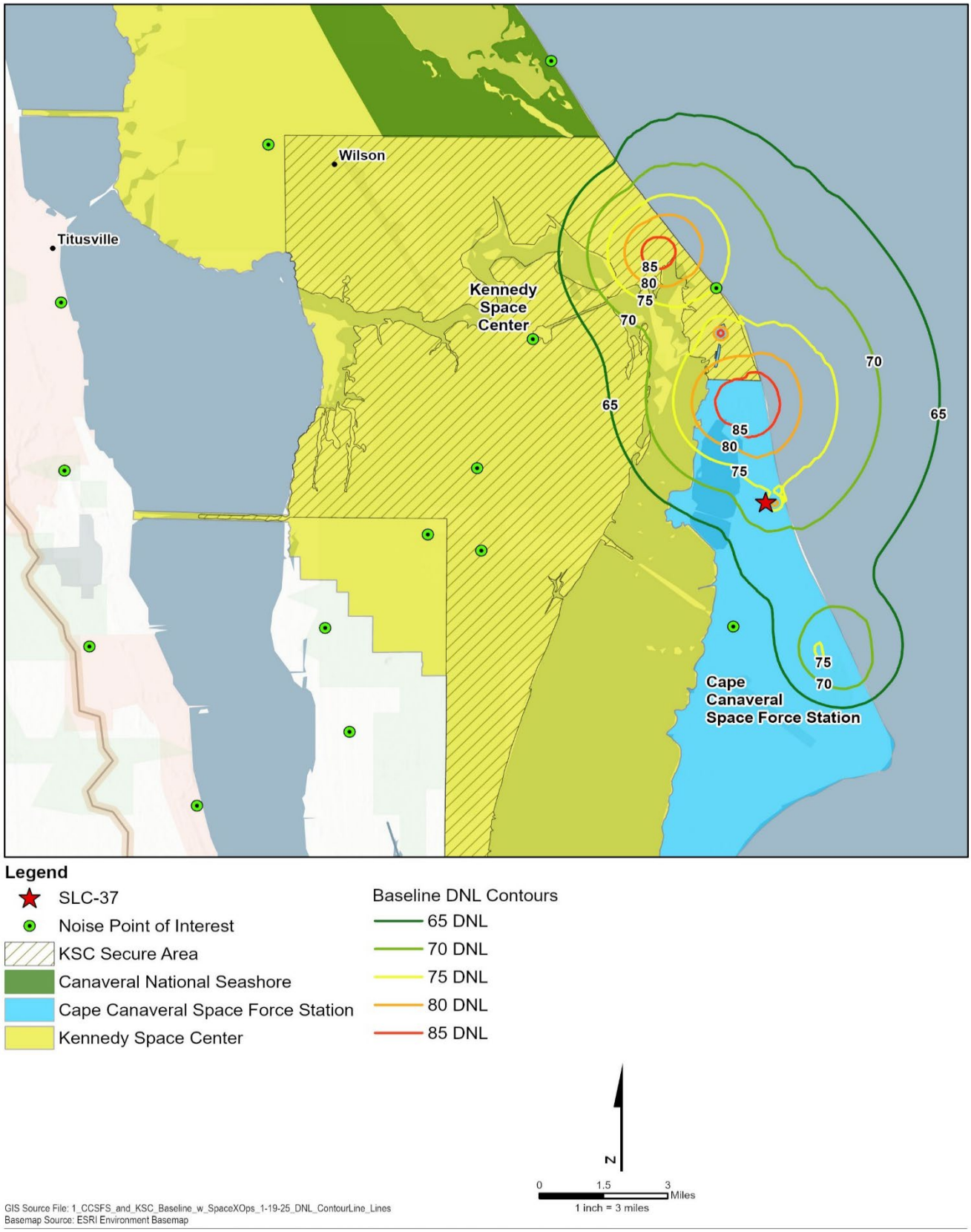


Figure 3.5-2. Current Baseline DNL

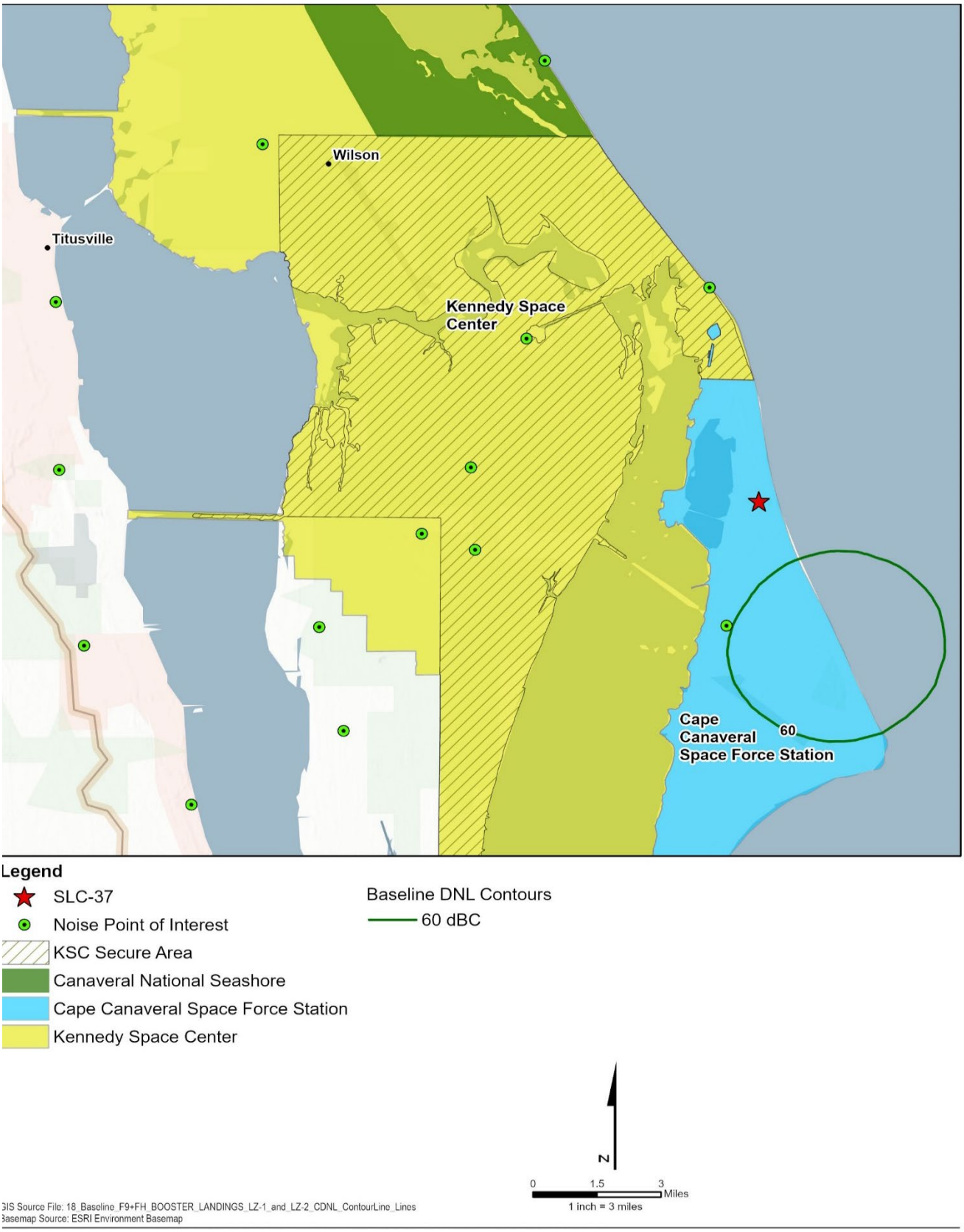


Figure 3.5-3. Current Baseline CDNL (only 60 dBC shown)

3.5.2.1 Proposed Action: SLC-37 at CCSFS

This section details the potential effects from noise and vibration during construction and operations.

3.5.2.1.1 Construction

Temporary noise and vibration from construction would generally be limited to less than 100 feet from the construction site. Construction vehicles typically generate between 65 and 100 dBA at 50 feet. A pile driver has the highest vibration potential at a PPV of 1.518 in/sec at 25 feet and 0.5 in/sec at 53 feet (FTA 2018). Construction noise and vibrations would remain primarily within the SLC-37 fence line and there are no sensitive POIs in proximity to SLC-37. Construction noise would not create a community annoyance, pose a risk to hearing, or present a risk of structural damage. Construction would have **no significant impact** from noise **(Noise Impact-1)**.

3.5.2.1.2 Operations

Rocket noise was modeled using RNOISE and sonic boom noise was modeled using PCBoom (Appendix 3.5A). The actual noise exposure at a particular location or time during a launch event varies depending on different factors, including weather, physical, and operational parameters. For the purposes of this EIS, the highest potential noise environment was used to determine the potential for a significant impact from individual events. The Starship-Super Heavy launch would be the loudest single rocket noise event of all operations and the landing of the Super Heavy Booster at the launch pad would be the greatest sonic boom experienced by local communities. The analysis assumes that half of the noise events would occur in the daytime (7:00 a.m. to 10:00 p.m.) and half of the noise events would occur at nighttime (10:00 p.m. to 7:00 a.m.). The noise modeling does not consider the beneficial effects of the water deluge system, which reduces noise and vibrations generated during launches. The estimated noise duration for each operational activity is shown in Table 3.5-2.

Table 3.5-2. Estimated Noise Duration for Operational Activities

Operational Activity	Estimated Noise Duration
Launch *Loudest Noise Event*	2 minutes of sound No overpressure on land; overpressure over ocean
Landing – Super Heavy Booster *Loudest Sonic Boom Overpressure Event*	30 seconds of sound Overpressure would be milliseconds
Static-fire Tests – Starship and Super Heavy Booster	15 seconds of sound No overpressure
Landing – Starship	30 seconds of sound Overpressure would be milliseconds

SpaceX has developed several sound suppression strategies to mitigate the effects of noise. For example, the water deluge system sprays water onto the launch pad during liftoff to absorb sound energy and convert heat to steam, which helps dampen noise. Additionally, flame trenches are deployed to redirect and reduce sound energy away from noise sensitive areas **(Noise Mitigation-1)**.

3.5.2.1.2.1 Community Annoyance

The potential for community annoyance from launch noise was assessed using DNL, which considers how a community experiences noise during a 24-hour period, with a recognition of increased annoyance from nighttime noise. The DNL 65-dBA contour for Starship-Super Heavy launches and landings would remain on CCSFS and KSC and would not affect noise sensitive POIs off the installations (Figure 3.5-4).

Regarding sonic booms, individuals would be able to readily perceive a 1-psf instantaneous overpressure event, though a 2-psf overpressure equates to a nearby thunderclap and could result in a startle. The overpressure contour for Super Heavy landings at SLC-37 would be the only activity that could result in a 2-psf or greater contour that could affect the public. Sonic boom overpressures generated from launches would occur over the ocean, where the public would be unlikely to be exposed to the noise event. The sonic boom overpressures from Starship landing would result in a psf of no greater than 1.6 psf, which equates to the sound of distant thunder. Figure 3.5-5 provides a combined launch and landings contour for the instantaneous sonic boom overpressures. While most of the community around CCSFS could experience sonic boom overpressures in the 2 psf range, some members of the public in Cocoa Beach, the City of Cape Canaveral, and areas of CANA, such as Playalinda Beach, could experience sonic boom overpressures between 4 and 6 psf (Figure 3.5-5).

The CDNL 60 dBC measures the cumulative noise from all sonic boom overpressures (including launch and landings) and was used to assess the potential for a significant community impact. The CDNL 60 dBC contour (Figure 3.5-6) extends outside the CCSFS and KSC and may affect POIs in Titusville, Cocoa Beach, Merritt Island, the City of Cape Canaveral, and CANA. Local communities could be exposed to relatively high-level CDNL and DNL noise and overpressure environments. In addition to the sound suppression systems **(Noise Mitigation-1)**, SpaceX would work with SLD 45 to notify the community of potential substantial noise and sonic boom events. Launch information is provided on various websites[10] and social media platforms to allow individuals to prepare for launch noise and any potential disruptions **(Noise Mitigation-2)**. Operations would have a **significant impact** on community annoyance **(Noise Impact-2)**.

Elevated noise levels above background may cause sleep disturbance, which can prevent people from falling asleep or wake them from sleeping. The percent awakening metric, detailed in Appendix 3.5A, represents the percentage of the population that would be awakened at least once per event due to Starship-Super Heavy launches and landings. The sound exposure level metric was used for prediction of sleep disturbance. At locations off-base where people may be sleeping in structures with closed windows, the average percent awakening for a Starship-Super Heavy launch would range from 7% to 11%. At locations off-base where people may be sleeping outside or in structures providing negligible noise attenuation (e.g., mobile homes or tents), the average percent awakening from a Starship-Super Heavy launch would range from 16% to 21%. Awakenings from sonic boom overpressures would average 54% and range from 0% to 86% percent awakening, with conservatively no noise reductions, at locations off-base where people may sleep (this includes people sleeping outside or inside). Most of the acoustic energy from a sonic boom occurs at low frequency, which is only minimally attenuated by typical structures. This repeated, acute noise exposure resulting in sleep disturbance may cause stress associated with secondary physiological, psychological, and behavioral adverse health outcomes.

[10] Refer to the "Next Launch" column on the homepage of USSF Space Launch Delta 45's website (https://www.patrick.spaceforce.mil/).

However, individual reactions to noise and awakenings are variable and it would be speculative to further characterize effects.

3.5.2.1.2.2 Hearing Damage

Studies involving human exposure to sonic booms have shown no adverse health consequences from sonic booms (NASA 2014). Studies have also found no evidence of adverse health effects from long-term exposure to sonic booms (USAF 1986).

Noise contours greater than 115 dBA (Figure 3.5-7) are considered unsafe without hearing protection. However, the 115-dBA contour would be within CCSFS, where Occupational Safety and Health Administration (OSHA) standards are enforced, and workers would have access to hearing protection. Specific requirements for hearing protection would depend on the specific launch parameters and would be managed by the SLD 45 safety program; hearing conservation measures would be applied to individuals working within the 115-dBA L_{Amax} contour.

The longest duration noise event would be 2 minutes (Table 3.5-2) for the Starship-Super Heavy launch from SLC-37. It is considered safe for individuals to be exposed to up to 108 dBA for 2.4 minutes without hearing protection. Figure 3.5-7 shows the maximum exposure levels associated with the Starship-Super Heavy launch and the 108-dBA L_{Amax} contour remains on CCSFS and KSC. However, these noise contours represent the loudest noise during the 2-minute exposure period; individuals would not be subjected to 108-dBA L_{Amax} for 2 minutes straight. Any individuals exposed to greater than 108 dBA for 2 minutes would be located on CCSFS or KSC and have access to hearing protection. Members of the public would be exposed to sound levels lower than the thresholds of concern (Air Force Instruction 48-127). Operations would have **no significant impact** on hearing **(Noise Impact-3)**.

3.5.2.1.2.3 Structural Damage

The Starship-Super Heavy noise launch contours for significant structural damage (140-dB L_{max}) would be entirely within CCSFS (Figure 3.5-8). The structures within this contour are components of active launch complexes and would exceed normal building standards, meaning they should withstand 140-dB noise exposures. A small portion of City of Cape Canaveral would be within the 120-dB L_{max} contour that represents a low probability for structural damage claims (Guest and Slone 1972).

Previous measurements from Starship-Super Heavy launches in Texas show a maximum vibration PPV of 2 in/sec at 0.75 mile from the launch pad (Straam Group 2023). Applied to SLC-37, vibrations would remain within the CCSFS launch complex area, where structures should be able to withstand the exposure to this level of vibration.

The DAF acknowledges that structural damage to unreinforced or unhardened buildings or to exposed hardware is possible within the 10-psf contour. Appendix 3.5B includes a table of the structures and major buildings within the 10-psf contour. The 10-psf contour for Super Heavy landings would be located within the boundaries of CCSFS and KSC. While upgrades and renovations have been made to infrastructure within CCSFS, it is important to recognize that some buildings were originally constructed to support legacy launch programs and vehicles from an earlier era. Consequently, impacts to windows or other structural elements are possible. Although certain facilities have been hardened to enhance resilience, this is not universally the case. Even though the likelihood of structural damage to government and launch service provider facilities is possible within the 10-psf contour for sonic booms from reentry, the probability would be very unlikely. Also, it would be a reasonable expectation that other launch service providers would house their launch vehicles, payloads, and any other non-fixed components in a protective

manner within their SLC during launch and reentry operations at SLC-37. In the event of demonstrable/proven structural or property damage from Starship Super-Heavy launch or reentry operations, SpaceX's liability insurance, as required by the FAA, would cover damages up to the Maximum Probable Loss to private developments on federal installations, including launch service providers uninvolved in the launch proven to have caused the damage. Excess coverage is provided by government indemnification. Portions of Cocoa Beach and the City of Cape Canaveral would be within the 6-psf and 4-psf overpressure contours (Figure 3.5-5). The probability of a structural damage claim from a 6-psf sonic boom is generally between 1 in 10,000 and 1 in 100,000 which is considered extremely unlikely, though there is a higher potential to affect windows and bric-a-brac (small decorative objects) (FAA 1976; NASA 2014).

The probability of structural damage depends on the type and condition of the structures (FAA 1976; NASA 2014). The coastal environment around CCSFS is susceptible to hurricanes, resulting in building codes that require the use of reinforced and impact-resistance materials (Brevard County n.d.). Construction since the inception of the Florida Building Code in the 1990s and buildings that have undergone improvements since then should not be damaged by sonic boom overpressures; however, older structures in need of repair could experience some damage, especially to windows and bric-a-brac.

The slight movement, or shaking, of windows is a critical structural function. Windows are designed to flex, making them better able to withstand the forces of hurricane-strength winds and sound vibrations, such as those from launches and landings, and helping them absorb and dissipate pressure. Although the shaking of windows would occur more frequently, the probability of windows breaking would be very low. The probability of window breakage at 2 psf could range from about 1 in 10,000 to 1 in 1,000,000 (Appendix 3.5A).

FAA regulations and the Commercial Space Launch Act require SpaceX to carry insurance to cover claims by third parties that result from licensed activities. If structural damage results from noise-induced vibrations or sonic booms, the damage claim would be subject to the insurance policy terms. The DAF also has established procedures in cases of damage resulting from sonic booms from non-commercial launch activities. The DAF investigates all submitted claims to determine the cause of the damage, with claimants compensated accordingly. The claims process begins by contacting the CCSFS Public Affairs Office, which would contact legal counterparts and provide information on filing a claim. An official process for submitting claims associated with Starship-Super Heavy operations at SLC-37 will be established prior to the launch vehicle arriving at CCSFS, including the SpaceX insurance claims email (insurance@SpaceX.com) **(Noise Mitigation-3)**. SLD 45 is working with the U.S. Army Engineer Research and Development Center to study structural impacts from sonic booms and will provide the data upon completion of the study (**Noise Mitigation-4)**.

There is a low potential for an effect and mitigation measures would be implemented. Operations should have **no significant impact** from the potential of structural damage **(Noise Impact-4)**.

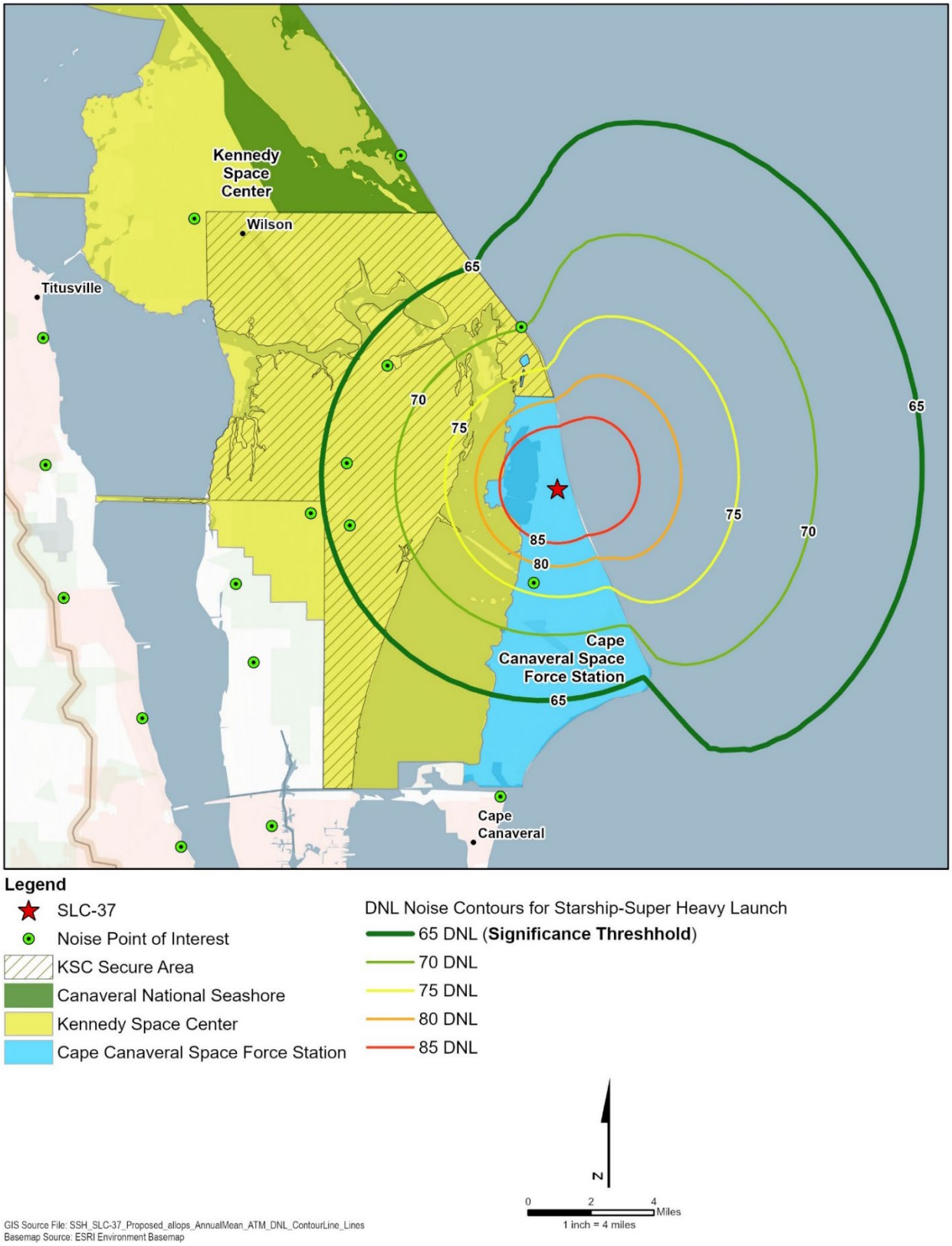


Figure 3.5-4. DNL Noise Contours for Starship-Super Heavy Launch

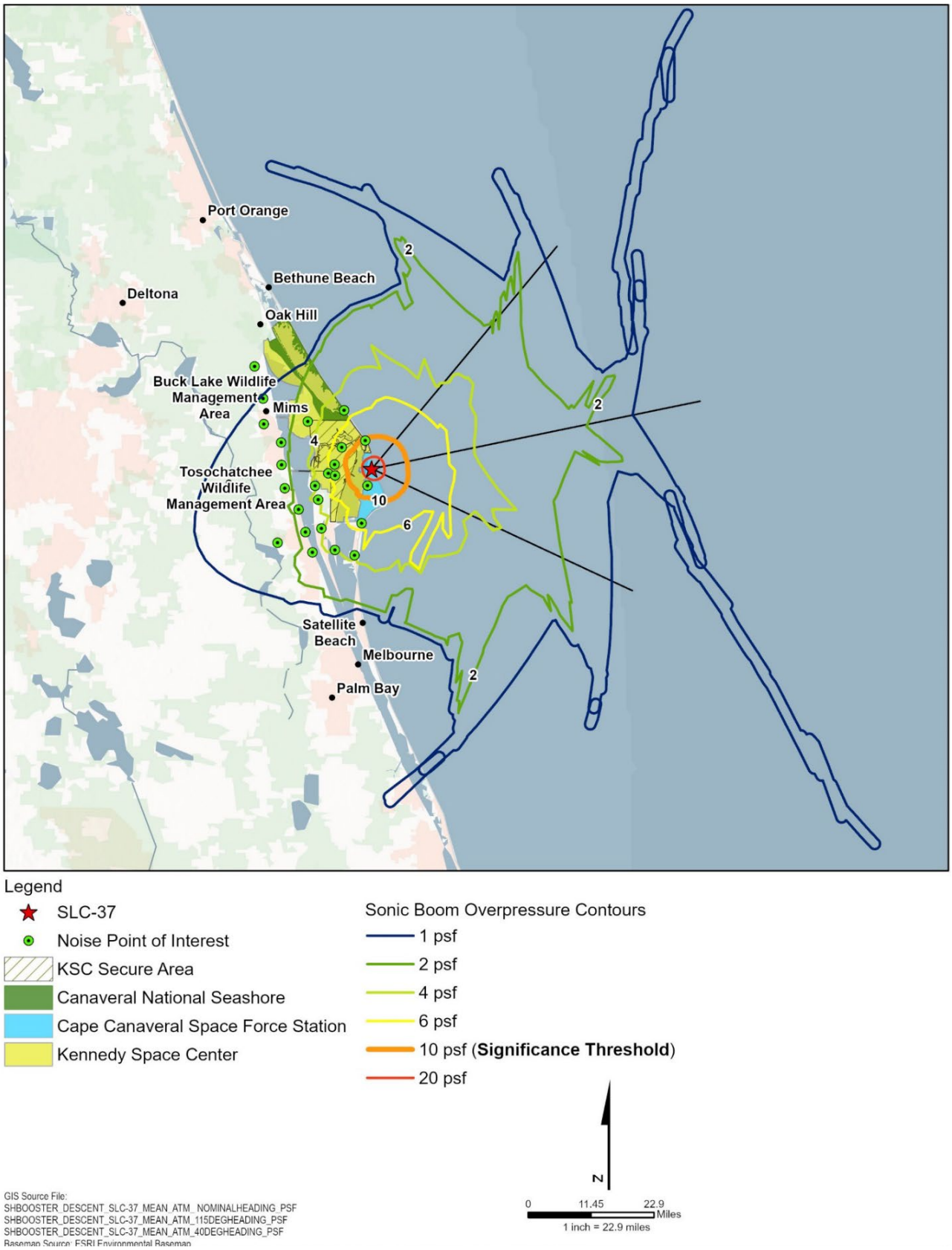


Figure 3.5-5. Sonic Boom Overpressure Contours for Super Heavy Landing

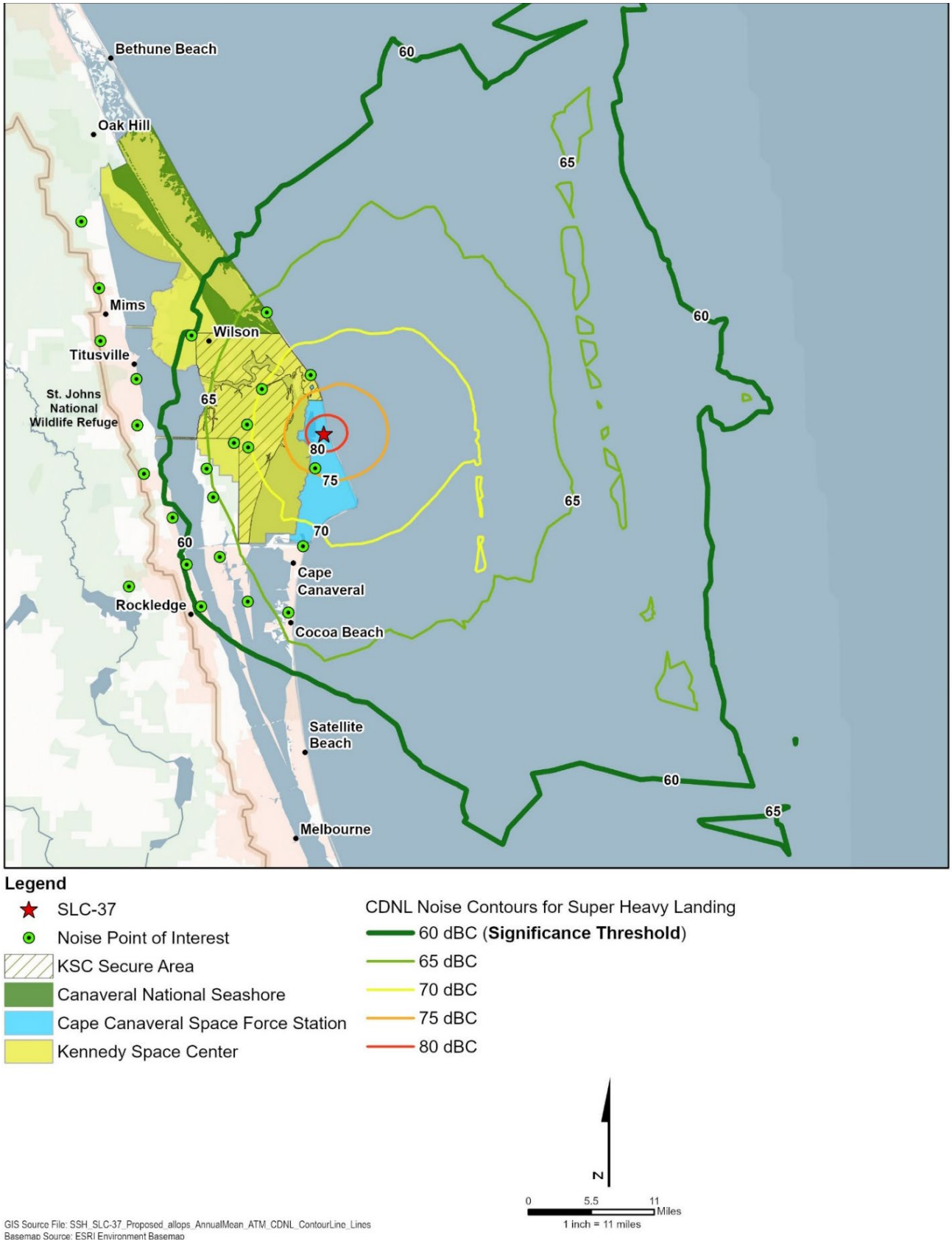


Figure 3.5-6. CDNL Contours for Super Heavy Landing

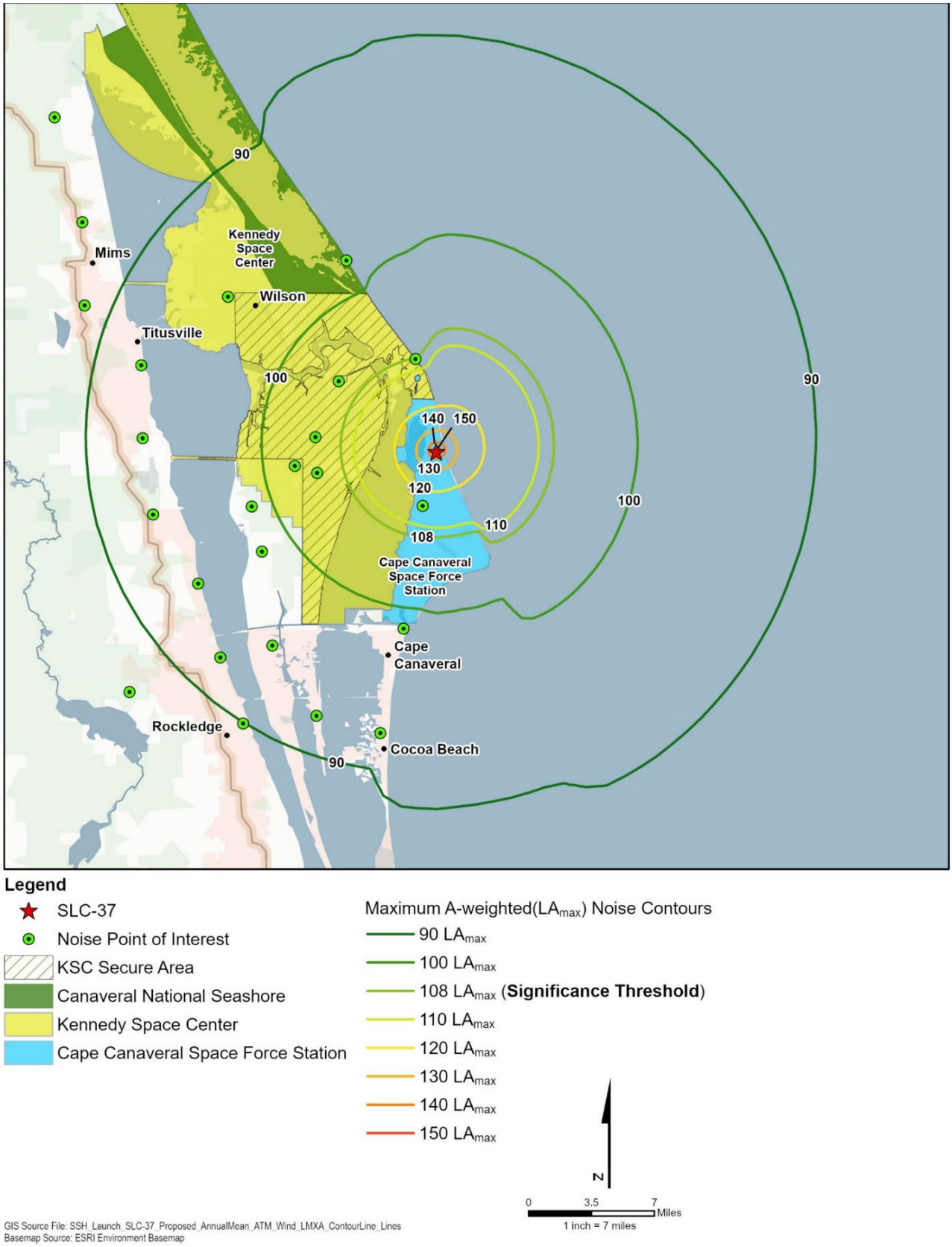


Figure 3.5-7. Noise Contours for Starship-Super Heavy Launch Maximum A-weighted (L_{Amax})

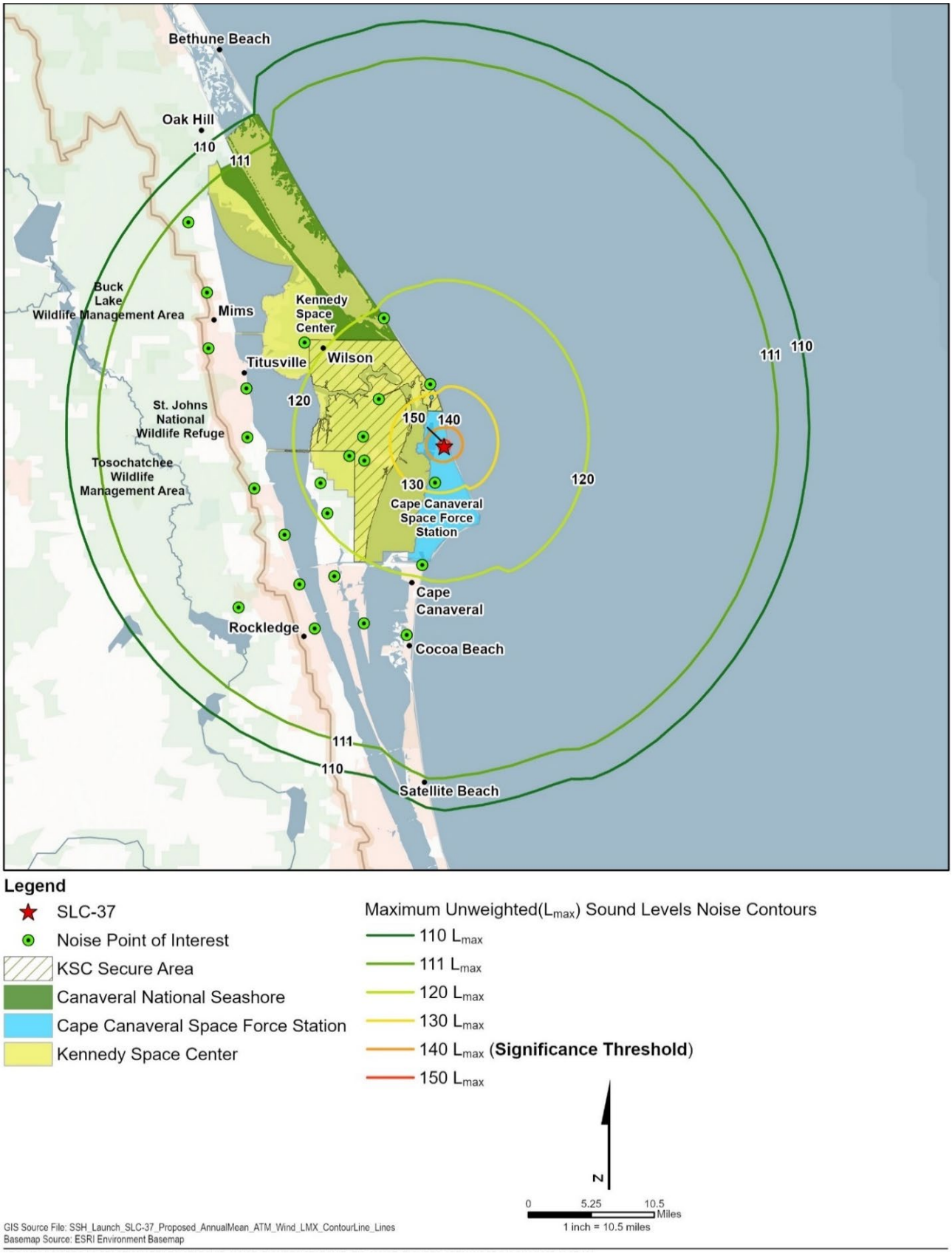


Figure 3.5-8. Noise Contours for Starship-Super Heavy Launch Maximum Unweighted Sound Levels (L_{max})

3.5.2.2 No Action Alternative

Under the No Action Alternative, the DAF would not enter into a real property agreement with SpaceX, SpaceX would not redevelop SLC-37 for Starship-Super Heavy operations, and the FAA would not issue a vehicle operator launch license for Starship-Super Heavy operations at SLC-37. SLC-37 would remain consistent with existing conditions. The cadence of operations at CCSFS and KSC would increase; however, the noise contours of concern should continue to remain on KSC and CCSFS property. There would be **no significant impact** from noise or vibration from the No Action Alternative. For a detailed explanation and associated noise contours for the noise effects of future launch operations, refer to Section 3.14.

3.5.3 Summary of Mitigation Measures and Impacts

This section provides a summary of the mitigation measures and impacts for noise and vibration.

3.5.3.1 Summary of Mitigation Measures

The following is a list of the mitigation measures that would be implemented:

- **Noise Mitigation-1**: SpaceX would employ sound suppression systems such as water deluge and flame diverters to reduce noise from launch activities.
- **Noise Mitigation-2**: SpaceX would work with SLD 45 to notify the community of potential substantial noise and sonic booms events.
- **Noise Mitigation-3**: Structural damage claims would be investigated, and claimants compensated according to FAA regulations, the Commercial Space Launch Act, and DAF policy. An official process for submitting claims associated with Starship-Super Heavy operations at SLC-37 will be established prior to the launch vehicle arriving at CCSFS, including the SpaceX insurance claims email (insurance@SpaceX.com).
- **Noise Mitigation-4:** SLD 45 is working with the U.S. Army Engineer Research and Development Center to study structural impacts from sonic booms and will provide this data upon completion of the study.

3.5.3.2 Summary of Impacts

Table 3.5-3 provides a summary of the impacts from noise and vibration, as described in this section.

Table 3.5-3. Summary of Impacts from Noise and Vibration

Impact	Proposed Action SLC-37	No Action Alternative
Noise Impact-1: Impact from construction noise	No significant impact	No additional impact
Noise Impact-2: Community annoyance from operations	**Significant** impact	No significant impact
Noise Impact-3: Impact on hearing from operations	No significant impact	No significant impact
Noise Impact-4: Structural damage from operations	No significant impact	No significant impact

3.6 Health and Safety

This section describes the human health and safety considerations for Starship-Super Heavy, including public safety, onsite worker safety, and the protection of children. The ROI includes CCSFS, KSC, the proposed Super Heavy landing areas, the proposed Starship landing areas, and the communities adjacent to CCSFS and KSC.

3.6.1 Affected Environment

The following federal and agency regulations related to health and safety apply to construction and operations at CCSFS:

- OSHA regulations at 29 CFR Part 1910, "Occupational Safety and Health Standards"
- OSHA regulations at 29 CFR Part 1926, "Safety and Health Regulations for Construction"
- EO 13045, "Protection of Children from Environmental Health Risks and Safety Risks"
- FAA regulations at 14 CFR Part 450, "Launch and Reentry License Requirements"
- DAF Instruction 91-202, *The Department of the Air Force (DAF) Mishap Prevention Program*
- SSCM 91-710, *Volume 1, Range Safety User Requirements Manual – Space Systems Command Range Safety Requirements and Procedures* (Space Systems Command 2022)
- USCG regulations at 33 CFR Part 165, "Regulated Navigation Areas and Limited Access Areas"
- USCG regulations at 33 CFR Part 147, "Safety Zones"

3.6.1.1 Construction Safety

Construction site safety regulations are designed to safeguard employees and curtail the risk of harm, illness, fatality, and property destruction. All contractors performing construction at CCSFS must adhere to OSHA regulations at 29 CFR Parts 1910 and 1926. These standards mandate that work procedures be performed without increasing health and safety risks to the workers or the public.

3.6.1.2 Range Safety

At CCSFS, SLD 45 Range Safety assesses, authorizes, oversees, and if needed, implements safety stoppages on all pre-launch, launch, and landing activities. The purpose of the range safety program is to ensure an acceptable safety standard for the public, installation resources, and onsite workers. Range safety at CCSFS adheres to DAF requirements, including SSCM 91-710, and public laws that relate to safety, including 29 CFR Part 1910. A central tenet of range safety are risk assessments for mission-specific operations; through this process, SLD 45 Range Safety establishes Launch Safety Exclusionary Zones for every launch. A detailed explanation of Launch Safety Exclusionary Zones is provided in Section 3.13.

In addition to SLD 45 Range Safety, the FAA is also responsible for overseeing the safety of launches. In accordance with 14 CFR Part 450, "Launch and Reentry License Requirements," the FAA issues safety approvals only if it is determined that a launch can be conducted without jeopardizing health and safety, including risks to property.

3.6.1.3 Security

CCSFS access is controlled through manned guard stations and fencing, necessitating access badges for entry by employees and visitors. CCSFS upholds USSF security standards, which encompass the mitigation of terrorist threats.

3.6.1.4 Protection of Children

EO 13045, "Protection of Children from Environmental Health Risks and Safety Risks," requires federal agencies to identify and assess health and safety risks that may disproportionately affect children. There are no residential areas, schools, or community resources adjacent to, or directly surrounding, CCSFS. The distances to the nearest community areas and schools are shown in Table 3.6-1.

Table 3.6-1. Distances to Community Areas and Schools

Location	Distance to SLC-37 (miles)
KSC Child Development Center	5.7
City of Cape Canaveral	8.8
Merritt Island	7.6
South of KSC	9.2
Cape View Elementary School	9.6
Robert Lewis Stevenson School of Arts	10.9
Fairglen Elementary School	13.2
Atlantis Elementary School	14.0

3.6.2 Environmental Consequences

This section evaluates potential health and safety impacts resulting from the Proposed Action.

The following parameters were used to analyze effects to health and safety:

- Increases to the safety risk to installation personnel, contractors, or the public.
- Hinderances to the ability to respond to an emergency.
- Introduction of new health or safety risks that installation personnel are not prepared to manage or respond to.
- Increases to health or safety risks to children.

3.6.2.1 Proposed Action: SLC-37 at CCSFS

This section details the potential effects on health and safety from construction and operations under the Proposed Action.

3.6.2.1.1 Construction

The following sections describe the potential construction impacts on health and safety.

3.6.2.1.1.1 Worker Safety

Construction involves inherent safety risks from potential exposure to loud noise, heavy machinery, debris, electricity, weather, and hazardous materials used or encountered during work. Construction conducted on CCSFS and KSC would be performed in accordance with CCSFS and KSC safety requirements and OSHA-prescribed standards and proper controls would be implemented for worker protection. Construction would have **no significant impact** on onsite construction personnel with implantation of proper worker protection controls **(Health and Safety Impact-1)**.

3.6.2.1.1.2 Public Safety

A member of the public is defined as an individual outside the restricted areas on CCSFS. All construction would be inside the CCSFS-controlled perimeter and at least 7.5 miles from the nearest developed community. Construction would have **no impact** on public safety **(Health and Safety Impact-2)**.

3.6.2.1.1.3 Protection of Children

No child-specific resources such as schools, parks, or residential areas are adjacent to SLC-37, The nearest child-specific resource is the KSC Child Development Center, located approximately 5.7 miles away from SLC-37 would be a safe distance from all construction. Additionally, children would be prohibited from accessing the launch site because of the security requirements at CCSFS. Construction would have **no impact** on children **(Health and Safety Impact-3)**.

3.6.2.1.2 Operations

The following sections describe the potential operational impacts on health and safety.

3.6.2.1.2.1 Worker Safety

The DAF, SLD 45, and SpaceX would implement protective measures to minimize risks to workers on CCSFS and KSC to the extent practicable, including potential risks to launch service providers operating on other CCSFS SLCs. SLD 45 Range Safety would oversee the safety requirements at SLC-37, including compliance with all applicable laws and regulations related to operations. These regulations set procedures for assessments, authorizations, and operational safety and include the establishment of Launch Safety Exclusion Zones. Launch Safety Exclusion Zone requirements include closing roads, evacuating personnel, and ceasing non-mission critical operations within the closure areas. SLD 45 also coordinates and schedules launch and landings to prevent conflicts between operations at neighboring SLCs.

Fire protection systems would comply with NFPA requirements, applicable UFCs, and DOD Engineering Technical Letter guidance and direction. The CCSFS Fire Department would monitor fire protection alarms at SLC-37.

Potential effects associated with worker exposure to noise are discussed in Section 3.5. Any workers operating within a threshold of concern for noise would have access to the appropriate hearing protection.

SLD 45 and Space would adhere to all established safety procedures, regulations, and federal law. Operations would have **no significant impact** on the health and safety of onsite personnel **(Health and Safety Impact-4)**.

3.6.2.1.2.2 Public Safety

All launches and landings must comply with established government safety requirements and cannot jeopardize public safety or property according to 14 CFR Part 450, DAF Instruction 91-202, and SSCM 91-710. The DAF safety requirements (SSCM 91-710) establish acceptable risk to an individual member of the public. The probability of any component of a launch or landing, including a mishap, substantially affecting a member of the public or their property, must be extremely unlikely (generally defined as less than 1 in 1,000,000) for a mission to be authorized for launch and landing. An input into the risk analysis performed by SLD 45 includes an estimate of the probability of failure of a launch vehicle. For a new range user or new launch vehicle, this value is informed by performance of similar vehicles launching under similar conditions. For existing launch vehicles, the probability of failure is informed by the demonstrated reliability, or lack thereof, of the launch vehicle. Risk analyses performed by SLD 45 produce hazard areas of

affected land, sea, and airspace. These hazard areas grow and shrink based on inputs that include launch vehicle data, mission information, weather data, and probability of failure estimates. The Launch Safety Exclusions Zones for the Starship-Super Heavy operations cannot extend into local communities according to DAF and FAA regulations. The thresholds for hearing damage are described in Section 3.5. All areas of concern for hearing damage would be within the boundaries of CCSFS and away from any publicly accessible areas during launch. There would be no potential effects on the offsite public.

SLD 45 and Space would adhere to all established safety procedures, regulations, and federal law.

Operations would have **no significant impact** on the health and safety of onsite personnel **(Health and Safety Impact-5)**.

3.6.2.1.2.3 Protection of Children

Children would be prohibited from accessing the launch site given the security requirements at CCSFS. There are no child-specific resources within the threshold for hearing damage; however, there are child- specific resources located within the contours for potential community annoyance. The KSC Child Development is located 5.7 miles from SLC-37 and is located within the thresholds for community annoyance for Starship-Super Heavy launch and Super Heavy booster landings (65 DNL and 6 psf). There are also numerous child-specific resources within the 60 CDNL and 2 psf contours for sonic boom overpressure. While individuals in these areas may experience annoyance associated with the interference of speech, these occurrences would be sporadic and instantaneous for sonic boom overpressures (refer to Section 3.5 for more details on noise impacts). The KSC Child Development Center could experience noise exposures of up to 2 minutes during launches and static-fire tests, which would have a larger effect on speech interference when the children are outside; however, these events would be sporadic and when children are located inside the building, the effects would be reduced. Launch notifications would continue to be provided to the Child Development Center from KSC via kennedyspacecenter@dcnotify.com. KSC-PLN-5000_SIMS_Rev_B includes mitigation measures such as sheltering indoors to leverage the attenuation of the facility **(Health and Safety Mitigation-1)**. Operations would have **no significant impact** on children **(Health and Safety Impact-6)**.

3.6.2.1.2.4 Maritime Safety

SLD 45 coordinates efforts to make sure commercial aircraft and marine vessels are clear of restricted areas during launch countdowns, and partners with the USCG to patrol water within the launch safety zone. Waters within the launch safety zone are patrolled jointly by the USCG and the DAF. Given the established USCG and DAF procedures for maritime safety around launches, the potential safety risk to the maritime community is extremely unlikely. All launch and reentry operations would comply with the necessary notification requirements, including the issuance of NOTMARs. A risk analysis would be performed for each mission and required marine hazard areas would be established in accordance with 33 CFR Parts 147 and 165, and SSCM 91-710. SLD 45 and SpaceX would coordinate with the USCG to implement a security zone, ship hazard area, and regulated navigation area (if necessary) for each launch. These areas would be monitored to decrease the risk to the maritime community and the Maritime Transportation System.

SpaceX's license application must also meet FAA safety, risk, and financial responsibility requirements under 14 CFR Parts 111 and 450. To receive safety approval, SpaceX must verify to the FAA's satisfaction that acceptable performance criteria have been met. Notification procedures for NOTAMs would also be implemented.

Given established safety regulations and policies, operations would not substantially increase risk to the marine community. Operations would have **no significant impact** on marine safety **(Health and Safety Impact-7)**.

3.6.2.2 No Action Alternative

Under the No Action Alternative, the DAF would not enter into a real property agreement with SpaceX, SpaceX would not redevelop SLC-37 for Starship-Super Heavy operations, and the FAA would not issue a vehicle operator launch license for Starship-Super Heavy operations at SLC-37. SLC-37 would remain consistent with existing conditions. The cadence of operations at CCSFS and KSC would increase; however, these operations would follow established safety procedures, regulations, and federal law. The potential for health and safety risks to workers, the public, children, or to the airspace and maritime community would continue as evaluated in existing NEPA documents. There would be **no significant impact** on health and safety from the No Action Alternative.

3.6.3 Summary of Mitigation Measures and Impacts

This section provides a summary of the mitigation measures and impacts for health and safety.

3.6.3.1 Summary of Mitigation Measures

The following is a list of the mitigation measures that would be implemented:

- **Health and Safety Mitigation-1**: Launch notifications would continue to be provided to the Child Development Center from KSC via kennedyspacecenter@dcnotify.com. KSC-PLN-5000_SIMS_Rev_B includes mitigation measures such as sheltering indoors to leverage the attenuation of the facility.

3.6.3.2 Summary of Impacts

Table 3.6-2 provides a summary of the impacts on health and safety, as described in this section.

Table 3.6-2. Summary of Impacts on Health and Safety

Impacts	Proposed Action SLC-37	No Action Alternative
Health and Safety Impact-1: impact on workers during construction	No significant impact	No additional impact
Health and Safety Impact-2: impact on the public during construction	No impact	No additional impact
Health and Safety Impact-3: impact on children during construction	No impact	No additional impact
Health and Safety Impact-4: impact on workers during operations	No significant impact	No significant impact
Health and Safety Impact-5: impact on the public during operations	No significant impact	No significant impact
Health and Safety Impact-6: impact on children during operations	No significant impact	No significant impact
Health and Safety Impact-7: impact on marine safety	No significant impact	No significant impact

3.7 Cultural Resources

Cultural resources consist of prehistoric and historic districts, sites, buildings, structures, objects, artifacts, and any other physical evidence of human activity considered important to a culture or community. This section describes aboveground cultural resources, including historic buildings, structures, and districts; National Historic Landmarks (NHLs); archaeological resources; and Native American cultural properties.

Regulations related to cultural resources include the following:

- NHPA (54 U.S.C. Sections 300101 et seq.): The NHPA includes Section 106 (54 U.S.C. Section 30618), which requires federal agencies to identify and assess the effects of their actions on historic properties, including prehistoric and historic districts, sites, buildings, structures, and objects listed in, or eligible for listing in, the National Register of Historic Places (NRHP). As part of this process, it requires federal agencies to consult with the SHPO, Tribal Historic Preservation Officers, and other parties to develop and evaluate alternatives or modifications to the undertaking, where necessary, to avoid or minimize adverse effects on historic properties. If avoidance is not achievable, then adverse effects must be mitigated.
- Air Force Manual (DAFMAN) 32-7003, *Environmental Conservation*: DAFMAN32-7003 requires the protection of cultural resources on DAF-managed lands. DAFMAN32-7003 offers a Section 106 process for resolving effects on historic properties tailored to DAF properties, including Programmatic Agreements (PAs) and Memoranda of Agreement.
- DAFI90-2002, *Interactions with Federally Recognized Tribes*: DAFI90-2002 provides procedures for interacting with tribes that have a documented interest in DAF lands and activities. It assigns responsibilities and outlines procedures to guide DAF interactions with federally recognized tribes.

An Area of Potential Effects (APE) is the geographic area where an undertaking may directly or indirectly cause alterations in the character or use of historic properties (36 CFR 800.16(d)). After historic properties within the APE are identified and evaluated, effects evaluations are completed to determine whether the proposed project could affect historic properties. The APE for the Proposed Action includes the areas where construction would occur and the 2-psf sonic boom overpressure contour (Figure 3.7-1). The probability of structural damage from a 2-psf sonic boom overpressure is approximately 1 in 1,000,000, though there is a higher potential to affect windows and architectural bric-a-brac (small decorative objects) (FAA 1976; NASA 2014).

The process for evaluating effects on historic properties is governed by the *Programmatic Agreement Among the United States Space Force Cape Canaveral Space Force Station, Florida State Historic Preservation Officer, and Space Exploration Technologies Corp. Regarding the Assessment of Adverse Effects for SpaceX Starship – Super Heavy Operations at Space Launch Complex 37, Brevard County, Florida* (Appendix 3.7C).

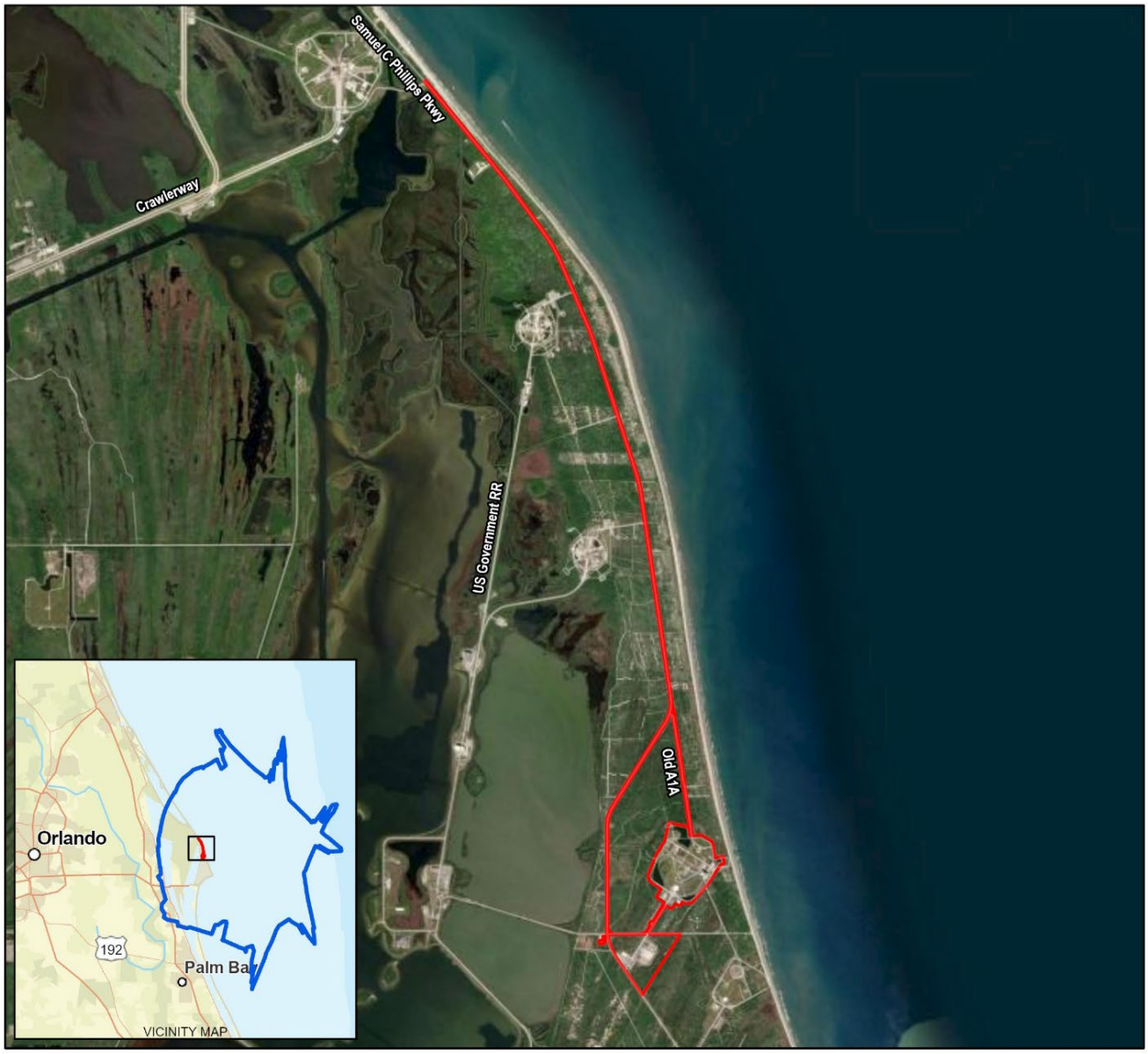


Figure 3.7-1. Area of Potential Effects

3.7.1 Affected Environment

This section presents information on cultural resources and identifies known historic properties. A more detailed discussion of cultural resources is included in Appendix 3.7B.

3.7.1.1 Historic Buildings, Structures, and Districts

Within the APE are approximately 691 previously recorded historic buildings and structures and 41 districts. Each of these previously recorded historic properties are either individually eligible, a historic district, or a contributing resource to an eligible or listed NRHP or NHL district.

The historic buildings, structures, and districts at CCSFS are associated with its use as an active launch ground since the late 1950s. The one exception is the Cape Canaveral Lighthouse (Florida Master Site File [FMSF] No. BR00212) which predates launch activities at CCSFS. The only historic property within the construction area is the Launch Control Center (LCC) (FMSF No. BR02790). The LCC, also known as the Blockhouse at SLC-37, was constructed in 1962 as the control center for Saturn I and Saturn IB launches at SLC-37. The building has a circular plan and dome design similar to other CCSFS launch control centers of the same period, including those at SLC-13, SLC-14, SLC-19, and SLC-34. Of these, the building at SLC-37 is larger, as each building was scaled to the systems used at their complex. The building was previously determined eligible for listing in the NRHP under Criteria A, B, C, and D, including for significant engineering and construction methods, as displayed in its domical form.

Previously identified NRHP-listed or eligible historic districts at CCSFS are SLC-13 (BR02198); SLC-14 (BR02209); SLC-19 (BR02260); SLC-34 (BR-02279); Solid Rocket Booster Disassembly and Refurbishment Complex Historic District (BR01996); Facility 50305: Skid Strip (BR02336); Skid Strip Historic District (BR03186); Control Tower Road Tracking Sites (BR03433); CCAFS Industrial Area Historic District (BR03369 and BR03073); and ICBM Road (BR04191). The construction area does not encompass any NRHP districts.

Historic properties that are within the 2-psf sonic boom overpressure contour but not on federal lands were identified in portions of Cape Canaveral, Cocoa, Cocoa Beach, Merritt Island, Titusville, and Rockledge. Most of these historic properties were constructed in the late 1800s to 1960s. Examples of NRHP-listed or eligible historic properties in this part of the APE include the following:

- Judge George Robbins House (FMSF No. BR00399), Titusville, a Dutch Colonial Revival building
- Wager House (FMSF No. BR00397), Titusville, a wood-frame vernacular building with decorative elements and wood-sash windows
- Spell House (FMSF No. BR00480), Titusville, a Queen Anne building
- Imperial Towers (FMSF No. BR04215), Titusville, a mid-century modern apartment complex
- City Point Community Church (FMSF No. BR01657), Cocoa, a wood-frame building with decorative elements and wood-sash windows
- Dr. George E. Hill House (FMSF No. BR00860), Merritt Island, a wood-frame building with decorative elements and wood-sash windows
- Old St. Luke’s Episcopal Church and Cemetery (FMSF No. BR00581), Merritt Island, a Late Gothic Revival building
- Rockledge Drive Residential District (FMSF No. BR01611), Rockledge, a residential district built in the late 1800s to 1920s

- Jonathan H. Sams Farmstead (FMSF No. BR04229), Merritt Island, a late 1800s homestead with two vernacular wood-frame buildings

3.7.1.2 National Historic Landmarks

NHLs are historic properties of national significance and are dually listed in the NRHP (NPS 2024a). The APE contains one NHL. The discontinuous 132.5-acre CCAFS NHL District (BR00216), designated an NHL on April 16, 1984, spans CCSFS and NASA properties, and at the time of listing, covered six launch complexes (SLC-5/6, SLC-26, SLC-13, SLC-14, SLC-19, and SLC-34), Hangar S, and the Mission Control Center. The NHL nomination states that the CCAFS NHL District is significant at the national level under NRHP Criterion A in the areas of communications, science, and space exploration and under Criterion C for its engineering, with a period of significance from 1949 to 1984 (the time of designation).

There are no World Heritage List sites within the APE.

3.7.1.3 Archaeological Resources and Native American Cultural Properties

The earliest known evidence of human occupation at CCSFS dates to at least 5,000 Before Common Era. Undiscovered Native American cultural sites may be present at CCSFS. Archaeological surveys were conducted to identify the presence of archaeological resources and potential Native American cultural properties in the construction area (DAF 2025). The Seminole Tribe of Florida, the Seminole Nation of Oklahoma, and the Miccosukee Tribe of Florida were consulted prior to conducting the archaeological surveys and were given an opportunity to review the survey methodology. The surveys did not find new archaeological resources or Native American cultural properties in the construction area.

There are numerous identified archaeological resources and Native American cultural properties at CCSFS outside the construction area, as well as many sites within the 2-psf sonic boom overpressure contour, but beyond federal land boundaries.

3.7.2 Environmental Consequences

This section describes the potential effects on cultural resources within the APE. The following parameters were used to analyze effects on cultural resources:

- Alterations, damage, or destruction to the integrity of an NRHP-listed or eligible property or important cultural resource so that the resource no longer conveys significance.
- Alterations to the characteristics of the surrounding environment that contribute to a resource's cultural significance so that the resource no longer conveys significance.
- Neglect of a cultural resource to the extent that it is deteriorated or destroyed.

3.7.2.1 Proposed Action: SLC-37 at CCSFS

This section details the potential effects on cultural resources during construction and operations.

3.7.2.1.1 Construction

The following sections describe the potential construction impacts on cultural resources.

3.7.2.1.1.1 Historic Buildings, Structures, and Districts

Only one NRHP-eligible building is within the construction area: LCC (BR02790). SpaceX would avoid the removal of the LCC (BR02790) and would use the building for administrative purposes. No structural damage from construction noise or vibrations would be expected as the

building was designed to withstand launch impacts. The property would be monitored in accordance with the SLD 45 Integrated Cultural Resources Management Plan (ICRMP). If there are unanticipated effects from construction, the response will be governed by the PA, which stipulates that SLD 45 direct SpaceX to implement measures to protect the affected property(s) from further damage while consultation with the Florida SHPO and other consulting parties takes place regarding the nature of the effect along with potential avoidance or minimization measures. **(Cultural Resources Mitigation-1)**. Construction would have **no significant impact** on aboveground NRHP-listed or eligible historic properties or important aboveground cultural resources **(Cultural Resources Impact-1)**.

3.7.2.1.1.2 National Historic Landmarks

No changes to the CCAFS NHL District would occur. Noise and vibration from construction would be temporary and the historic integrity of location, design, setting, materials, workmanship, feeling, and association of the CCAFS NHL District and its contributing resources would be retained. Construction would have **no significant impact** on NHLs **(Cultural Resources Impact-2)**.

3.7.2.1.1.3 Archaeological Resources and Native American Cultural Properties

No known archaeological resources or Native American cultural properties are within the construction area (DAF 2025). Site 8BR0083 is adjacent to the Delta Substation. No new disturbance is planned for the substation improvements, but construction monitoring would be implemented in compliance with DAFMAN32-7003 due to the site's sensitive archaeological context. In the event of unanticipated discoveries, the SLD 45 Cultural Resources Manager would be notified and all project-related activities within one-hundred feet of the discovery would cease to avoid or minimize harm to the property. The response to unanticipated discoveries would be governed by the PA, which stipulates that SLD 45 would determine whether interim protection measures are needed, and if they are, would direct SpaceX to implement such measures. SLD 45 would consult with the Florida SHPO and other consulting parties regarding the determination of eligibility for the newly discovered property and the finding of effects, if necessary **(Cultural Resources Mitigation-2)**. Construction would have **no significant impact** on archaeological resources or Native American cultural properties **(Cultural Resources Impact-3)**.

3.7.2.1.2 Operations

The following sections describe the potential construction impacts on cultural resources.

3.7.2.1.2.1 Historic Buildings, Structures, and Districts

Noise and sonic booms from launches and landings could affect aboveground historic properties within the APE, including properties outside of CCSFS. Although the potential is exceedingly low (1 in 10,000 to 1 in 1,000,000) (FAA 1976), buildings and structures in the 2-psf sonic boom overpressure contour could experience damage to plaster and bric-a-brac, structural damage to highly vulnerable buildings and structures, and window breakage. However, at this time it is unknown whether any damage would occur or whether that damage would be sufficient to diminish the integrity of the characteristics that qualify the properties for inclusion in the NRHP. Noise and vibration from operations would not be expected to affect historic properties within CCSFS because they are primarily associated with launch infrastructure.

Ocean landings and expendable launches could affect the ocean environment where historic sites such as shipwrecks may occur on the ocean floor. However, SpaceX intends to return Starship and Super Heavy booster directly to the launch site and retrieve expended vehicles to the degree possible; therefore, it would be unlikely a historic marine site would be affected by operations.

There would be a low potential for effects on historic properties from noise and sonic boom overpressures. Operations should have **no significant impact** on aboveground historic buildings, structures, and districts **(Cultural Resources Impact-4).** The DAF initiated consultation in accordance with Section 106 of the NHPA with the Florida SHPO and other interested parties (Appendix 3.7A) to develop a PA to address the unknown nature of the potential effects (Appendix 3.7C). The PA provides a process for determining adverse effects of Starship-Super Heavy operations at SLC-37 based on evaluating the results of vibration monitoring at historic buildings and structures. If a potential adverse effect were found, SLD 45 would consult with the Florida SHPO and other Consulting Parties to avoid or minimize the adverse effect. If the adverse effect could not be resolved through avoidance or minimization measures, then the parties would consult on mitigation measures that would be implemented by SpaceX **(Cultural Resources Mitigation-3)**.

3.7.2.1.2.2 National Historic Landmarks

Noise and vibration from operations would not be expected to affect the CCAFS NHL District, which is primarily associated with launch infrastructure. Operations would have **no significant impact** on NHLs **(Cultural Resources Impact-5)**.

3.7.2.1.2.3 Archaeological Resources and Native American Cultural Properties

While there is no expected ground disturbance from operations, the impacts from sonic boom overpressures on archaeological resources and Native American cultural properties are unknown. The DAF has consulted with the Florida SHPO and other interested parties, including Native American tribes, in accordance with Section 106 of the NHPA to develop a PA to address the unknown nature of the potential effects (Appendix 3.7C). The PA provides a process for determining adverse effects of Starship-Super Heavy operations at SLC-37 based on evaluating the results of vibration monitoring at archaeological sites and Native American cultural properties. If a potential adverse effect were found, SLD 45 would consult with the SHPO, tribes, and other consulting parties to avoid or minimize the adverse effect. If the adverse effect could not be resolved through avoidance or minimization measures, then the parties would consult on mitigation measures that would be implemented by SpaceX **(Cultural Resources Mitigation-3)**. Operations should have **no significant impact** on archaeological sites or Native American cultural properties **(Cultural Resources Impact-6)**.

3.7.2.2 No Action Alternative

Under the No Action Alternative, the DAF would not enter into a real property agreement with SpaceX, SpaceX would not redevelop SLC-37 for Starship-Super Heavy operations, and the FAA would not issue a vehicle operator launch license for Starship-Super Heavy operations at SLC-37. SLC-37 would remain consistent with existing conditions. The potential impacts from noise, sonic booms, vibration, and ground disturbance from other projects that could affect cultural resources would continue as evaluated in their existing NEPA documents and regulatory consultations. There would be **no significant impact** on cultural resources from the No Action Alternative.

3.7.3 Summary of Mitigation Measures and Impacts

This section provides a summary of the mitigation measures and impacts for cultural resources.

3.7.3.1 Summary of Mitigation Measures

The following is a list of the mitigation measures that would be implemented:

- **Cultural Resources Mitigation-1:** SpaceX would retain the LCC (BR02790) at SLC-37. If damage were discovered, the SLD 45 Cultural Resources Manager would implement measures stipulated in the PA to protect the affected historic property(s) from further damage while consultation with the Florida SHPO and other consulting parties takes place regarding the nature of the effect along with potential avoidance or minimization measures.
- **Cultural Resources Mitigation-2:** In the event of unanticipated discoveries during construction, such as encountering artifacts or human remains, the SLD 45 Cultural Resources Manager would be notified and all project-related activities within one hundred feet of the discovery would cease to avoid or minimize harm to the property. The response to unanticipated discoveries would be governed by the PA.
- **Cultural Resources Mitigation-3:** If monitoring results show that noise or sonic boom overpressures from launches and landings may adversely affect aboveground historic properties, archaeological resources, or Native American cultural properties within the APE, these effects would be evaluated and mitigated as stipulated in the PA.

3.7.3.2 Summary of Impacts

Table 3.7-1 summarizes the impacts on cultural resources, as described in this section.

Table 3.7-1. Summary of Impacts on Cultural Resources

Impacts	Proposed Action SLC-37	No Action Alternative
Cultural Resources Impact-1: Impact on aboveground cultural resources and historic buildings, structures, and districts during construction	No significant impact	No additional impact
Cultural Resources Impact-2: Impact on NHLs during construction	No significant impact	No additional impact
Cultural Resources Impact-3: Impact on archaeological resources and Native American cultural properties during construction	No significant impact	No additional impact
Cultural Resources Impact-4: Impact on aboveground cultural resources and historic buildings, structures, and districts during operations	No significant impact	No significant impact
Cultural Resources Impact-5: Impact on NHLs during operations	No significant impact	No significant impact
Cultural Resources Impact-6: Impact on archaeological resources and Native American cultural properties during operations	No significant impact	No significant impact

3.8 Visual Resources

Visual resources and visual character are any naturally occurring or human-made features that contribute to the aesthetic value of an area, including lighting aspects. Visual resources may include buildings, sites, historic properties, and other natural or human-made landscape features that are visually important or have unique characteristics. The ROI for visual resources is CCSFS and the areas immediately adjacent, including the Atlantic coastline, MINWR, and CANA.

3.8.1 Affected Environment

The affected environment for visual resources is discussed in the following sections.

3.8.1.1 Natural Features

Natural features in the ROI include native upland and wetland habitat, the Atlantic Coast, the Banana River Lagoon, and the Indian River. Because CCSFS is a restricted-access military installation, natural features on CCSFS are visible to the public only from a distance, such as at designated viewing locations at KSC, during tours, and along the Atlantic Coast. CCSFS is buffered from public views by the Banana River Lagoon and Indian River Lagoon to the west, the Atlantic Ocean to the east, and KSC to the north and west. The nearest communities to SLC-37 are Cape Canaveral and Merritt Island, which are approximately 10 miles away. The public enjoys natural scenic qualities outside the CCSFS property at MINWR and CANA.

3.8.1.2 Built Features

Visual resources include built features such as buildings, structures, objects, launch complexes, transportation and communication infrastructure, and human-made barrier islands. Built features on CCSFS have been in the landscape since the late 1950s and early 1960s, when a series of launch complexes and surface roads were constructed by USAF. Similar to natural features, built features on CCSFS are visible only from a distance, such as at designated viewing locations at KSC, during tours, from nearby beaches, on the water along the Atlantic Coast, and from the Banana River.

3.8.1.3 Dark Skies

The dark skies at CANA provide some of the best opportunities for night sky viewing in central eastern Florida. The effects of light pollution emanating from CCSFS have been a growing concern, and several initiatives have been implemented at CCSFS to reduce the effects of light pollution and advocate for dark skies.

3.8.2 Environmental Consequences

This section describes the potential impacts on visual resources, including natural and built features within the ROI.

The following parameters were used to analyze visual resources:

- Increased light emissions that interfered with normal activities or affected the visual character of the area.
- Effects on the importance, uniqueness, and aesthetic value of visual resources, including night skies.
- Permanent obstructions to the views of a valued visual resource.

3.8.2.1 Proposed Action: SLC-37 at CCSFS

This section details the potential effects on visual resources from construction and operations under the Proposed Action.

3.8.2.1.1 Construction

Construction would occur within the existing launch complex and associated infrastructure and along existing roadway corridors on CCSFS and KSC. Construction could cause temporary changes in the viewshed from having material stockpiles, partially constructed facilities, construction vehicles, heavy machinery, and temporary external lighting onsite. However, these impacts would end once construction is completed. Construction lighting would also follow the UFC 3-530-01, *Interior and Exterior Lighting Systems*, and construction lighting plans that minimize excess light and glare.

SpaceX would build infrastructure that would have a vertical component, including two concrete launch pads, two launch mounts, two integration towers, natural gas pretreatment system, CH_4 liquefier, and a propellant generation ASU. Other components, such as new utilities, would be underground and would not have any visual impact; therefore, they are not analyzed further. The launch mounts would be vertically oriented on the landscape, with noticeable changes in the setting but would be similar to the existing visual character of SLC-37. The integration towers could be visible beyond CCSFS, such as within the MINWR in the Banana River and CANA along the Atlantic Coast. They would be compatible with the existing visual character of SLC-37 and minimally disruptive, given the distance from public vantage points. By keeping SLC-37 as a launch complex, the use of SLC-37 would not introduce built features into a previously undeveloped natural setting. The viewscape would be compatible in appearance with CCSFS. None of these areas are accessible to the public.

Construction would not affect the visual character of the area; diminish the importance, uniqueness, or aesthetic value of visual resources; or permanently obstruct views of visual resources. Construction would have **no significant impact** on visual resources **(Visual Impact-1)**.

3.8.2.1.2 Operations

The use of external lighting would be required for both routine ground support operations and launch operations. SpaceX would perform routine ground support operations 24 hours a day, 7 days a week, throughout the year. The primary difference in nighttime launch activity and daytime launch activity would be SpaceX's need for bright spotlighting for short durations when illuminating the launch vehicle at the launch site at night. This nighttime lighting would be needed to ensure the protection and safety of SpaceX personnel and hardware during operations. To minimize impacts from lighting on the nearby coastline, a lighting management plan (LMP) would be developed following 45th Space Wing Instruction (SWI) 32-7001, *Exterior Lighting Management* (April 23, 2018), and UFC 3-530-01, *Interior and Exterior Lighting Systems*, in accordance with CCSFS requirements **(Visual Mitigation-1)**. Light emissions could be perceived in the surrounding area but would not be expected to cause impacts on public enjoyment of visual resources or noticeably alter the current night sky conditions, which include launch operations. Operations would have **no significant impact** on visual resources **(Visual Impact-2)**.

3.8.2.2 No Action Alternative

Under the No Action Alternative, the DAF would not enter into a real property agreement with SpaceX, SpaceX would not redevelop SLC-37 for Starship-Super Heavy operations, and the FAA would not issue a vehicle operator launch license for Starship-Super Heavy operations at SLC-37. SLC-37 would remain consistent with existing conditions. The impacts on visual resources, such as impacts from light emissions, would continue as evaluated in existing NEPA documents and regulatory consultations and would be managed in accordance with lighting management procedures. There would be **no significant impact** on visual resources from the No Action Alternative.

3.8.3 Summary of Mitigation Measures and Impacts

This section provides a summary of the mitigation measures and impacts for visual resources.

3.8.3.1 Summary of Mitigation Measures

The following mitigation measures would be implemented:

- **Visual Resources Mitigation-1**: The development of an LMP would minimize interference with normal activities or aesthetic value following SWI 32-7001, *Exterior Lighting Management*.

3.8.3.2 Summary of Impacts

Table 3.8-1 summarizes the impacts on visual resources, as described in this section.

Table 3.8-1. Summary of Impacts on Visual Resources

Impacts	Proposed Action SLC-37	No Action Alternative
Visual Resource Impact-1: Impact on visual resources from construction	No significant impact	No additional impact
Visual Resource Impact-2: Impact on visual resources from operations	No significant impact	No significant impact

3.9 Biological Resources

This section describes biological resources, including vegetation, wildlife, and protected species. The ROI for biological resources includes the construction areas and the areas impacted by launch and landing activities, including the effects associated with noise, vibration, heat, light, and vehicle traffic.

3.9.1 Affected Environment

The following sections describe the current conditions of the biological resources within the ROI that could be affected by the Proposed Action.

3.9.1.1 Vegetation

The most common natural community type on CCSFS and in the surrounding area is coastal strand, followed by live oak/saw palmetto shrubland, live oak/saw palmetto hammock, and scrub (DAF 2023a). The natural landscape of CCSFS is fragmented by launch complexes, buildings, roads, ditches, and an aircraft runway. Additionally, fire protection activities such as prescribed burning have affected and altered vegetative communities (DAF 2023a).

Forty-four invasive and noxious plant species have been identified on CCSFS; the most common is the Brazilian pepper (*Schinus terebinthifolius*). CCSFS implements SLD 45's Invasive Plant Species Control Plan (USAF 2019a) to control or eradicate noxious and invasive plant species at CCSFS (DAF 2023a).

Most of the vegetation at SLC-37 was removed during construction in early 2000 to support the Delta IV Heavy mission. Alterations at SLC-37 included constructing roads, buildings, deluge ponds, and launch platforms. The remaining vegetation was landscaped and is regularly mowed, though native plants have the potential to occur within SLC-37. The areas surrounding SLC-37 are a mixture of beaches, mixed rangelands, treeless hydric savanna, shrub and brushlands, and xeric oak.

3.9.1.2 Wildlife

More than 25 mammalian species, 50 amphibian and reptile species, and 200 avian species are known to occur on, or in the vicinity of, CCSFS. Insects and invertebrates also occur. Common terrestrial wildlife species at CCSFS include bobcats, feral hogs, deer, foxes, alligators, rattlesnakes, passerine birds, shorebirds, butterflies, and wading birds (DAF 2023a). Because SLC-37 is developed, it contains low-quality habitat for most wildlife. The roadway improvement areas are currently maintained and mowed; however, these areas may have suitable foraging habitat for some species. The beach dunes occurring east of SLC-37 provide habitat for mammal, reptile, bird, and invertebrate species.

CCSFS is located on a barrier island, with the Banana River to the west and the Atlantic Ocean to the east. The Banana River is part of the Indian River Lagoon system, which is home to a diverse array of aquatic species, including marine mammals such as manatees and dolphins. Marine turtles are known to nest on the beach dunes on CCSFS (NASA 2015).

The Starship and Super Heavy booster landing areas include the open oceans of the Gulf of America, Atlantic, Pacific, and Indian Oceans (Figure 2-7). While the relative density of wildlife is generally low in the open ocean, an abundant array of marine organisms exists in the ocean environment, including whales, dolphins, sharks, and many fish species.

3.9.1.3 Protected Species and Critical Habitats

Protected species have been categorized depending on whether they live in a terrestrial (land) or aquatic (water) environment. The following federal laws relate to protected species:

- ESA (16 U.S.C. Sections 17.1531 et seq.) requires the U.S. Government to protect threatened and endangered plants and animals and the habitats upon which they depend. Section 7 of the ESA specifies that any agency that proposes a federal action that may affect an ESA-listed species or critical habitat (i.e., destruction or adverse modification) must participate in a consultation process with the USFWS or NMFS.
- Migratory Bird Treaty Act (MBTA) (16 U.S.C. Sections 703 et seq.) protects bird species that migrate between the U.S. and other countries. Under this Act, it is unlawful to pursue, hunt, take, capture, wound, or kill a migratory bird by any means, including any part, egg, or nest, unless otherwise authorized.
- Bald and Golden Eagle Protection Act (BGEPA) (16 U.S.C. Sections 668a through 668d) provides for the protection of bald and golden eagles. Under this Act, it is unlawful to pursue, hunt, take, capture, wound, or kill a bald or golden eagle by any means.
- MMPA (16 U.S.C. Sections 18.1361 through 18.1407) protects marine mammals, including whales, dolphins, porpoises, manatees, and other marine species within U.S. waters. Under MMPA, it is unlawful to pursue, hunt, take, capture, wound, or kill a marine mammal by any means, unless otherwise authorized. The USFWS and the NMFS share responsibility for implementing MMPA.
- MSA (50 CFR 600.305(b)(2)) governs marine fisheries management in U.S. federal waters. The MSA requires interagency coordination if a federal agency could adversely affect EFH. EFH is defined as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.”

3.9.1.3.1 Terrestrial ESA-listed Species

Terrestrial species listed under the ESA could occur in the ROI. These species, along with the potential of their occurrence, are described in Table 3.9-1. An additional 15 ESA-listed species were identified and eliminated from further analysis, as it was determined that the Proposed Action would have no effect on the species because of the availability of preferred habitats, the ability of the species to receive the type of stressor created, or the records of occurrence for the species. There are no ESA-listed plant species in the construction area. A detailed accounting of all these species is provided in the Biological and Conference Assessment (BCA) for SLC-37, which is incorporated by reference into this EIS and can be found in Appendix 3.9A.

Table 3.9-1. Terrestrial ESA-listed Species Occurring in the ROI

Class	Common Name (*Scientific Name*)	Federal Status	Habitat	Potential to Occur in ROI
Mammal	Southeastern beach mouse *(Peromyscus polionotus niveiventris)*	Threatened	Occurs in coastal scrub, oak, and sand dunes that are vegetated by sea oats and dune panic grass; may also occur in structures and ruderal areas such as grassy road shoulders or other mowed areas.	Construction area and noise contours

Class	Common Name (*Scientific Name*)	Federal Status	Habitat	Potential to Occur in ROI
Mammal	Tricolored bat *(Perimyotis subflavus)*	Proposed	Roosts among leaf clusters of live or recently dead deciduous hardwood trees, and within artificial roosts like barns and beneath porch roofs, bridges, and concrete bunkers	Construction area and noise contours
Bird	Band-rumped storm-petrel (*Oceanodroma castro*)	Endangered	Occurs in the Pacific Ocean and nests on islands.	Ocean landing areas
Bird	Bermuda petrel (*Pterodroma cahow*)	Endangered	Adults forage in the open North Atlantic Ocean, from areas offshore the east coast of North America to western European waters.	Ocean landing areas
Bird	Black-capped petrel (*Pterodroma hasitata*)	Endangered	Forages in high concentrations off the coast of North Carolina; however, the marine range extends across much of the western Atlantic (Nova Scotia to Venezuela) and into the Caribbean Sea and northern Gulf of America.	Ocean landing areas
Bird	Crested caracara *(Caracara plancus audubonii)*	Threatened	Occurs in dry/wet prairies with scattered cabbage palms, improved pasture lands, and wooded areas with stretches of grassland	Launch and landing noise contours
Bird	Eastern black rail *(Laterallus jamaicensis jamaicensis)*	Threatened	Occurs in tidally or non-tidally influenced, salt, brackish or freshwater marshes with dense cover and upland areas surrounding such marshes	Launch and landing noise contours
Bird	Everglade snail kite *(Rostrhamus sociabilis plumbeus)*	Endangered	Occurs in shallow freshwater marshes and shallow grassy shorelines of lakes	Launch and landing noise contours
Bird	Florida scrub-jay *(Aphelocoma coerulescens)*	Threatened	Occurs in low-growing (less than 6.5 feet tall) oak scrub and scrubby flatwoods with open bare patches of sand	Construction area and noise contours
Bird	Hawaiian petrel (*Pterodroma sandwichensis*)	Endangered	Occurs in the Pacific Ocean and nests in high-elevation areas of the Hawaiian Islands.	Ocean landing areas
Bird	Newell's shearwater (*Puffinus newelli)*	Threatened	Occurs in the Pacific Ocean and nests on cliffs of the Hawaiian Islands.	Ocean landing areas

Class	Common Name (*Scientific Name*)	Federal Status	Habitat	Potential to Occur in ROI
Bird	Piping plover *(Charadrius melodus)*	Threatened	Occurs in Florida during overwintering and forages in wash zones, intertidal ocean beach fronts, wrack lines, washover passes, mud, sand flats, ephemeral ponds, and salt marshes; shelters in dunes, debris, and sparce vegetation areas	Launch and landing noise contours
Bird	Roseate tern (*Sterna dougallii dougallii)*	Endangered	Occurs throughout the Pacific Ocean. Uses different habitats for nesting, including small offshore islands, marine rocks, cays, islets, areas near vegetation or jagged limestone rock, open sandy beaches, and among coral rubble	Ocean landings areas
Bird	Rufa red knot *(Calidris canutus rufa)*	Threatened	Occurs in Florida outside the breeding season in intertidal marine habitats	Launch and landing noise contours
Bird	Short-tailed albatross (*Phoebastria albatrus)*	Endangered	Occurs in the Pacific Ocean and nests on islands and mainland coastlines.	Ocean landings areas
Bird	Woodstork *(Mycteria americana)*	Threatened	Occurs in cypress swamps, marshes, ponds, and lagoons; forages mainly in fresh water, including shallow marshes, flooded farm fields, ponds, and ditches	Launch and landing noise contours
Reptile	Eastern indigo snake *(Drymarchon couperi)*	Threatened	Occurs in xeric pine-oak sandhills, typically cohabitating gopher tortoise burrows	Construction area and noise contours
Insect	Monarch butterfly *(Danaus Plexippus)*	Proposed	Breeding areas include patches of milkweed; coastal regions are important flyways, and nectar plants (wild or in gardens) are an important resource	Construction area and noise contours

Source: DAF 2023a; USFWS 2023a, 2023b, 2025

3.9.1.3.2 Aquatic ESA-listed Species

Aquatic ESA-listed species could occur in the ROI. No aquatic species have the potential to occur within the boundary of SLC-37 or the roadway improvement areas. These species, along with the potential of their occurrence, are described in Table 3.9-2. Aquatic ESA-listed species are generally under the jurisdiction of the NMFS; however, sea turtles are under the jurisdiction of the USFWS when they nest on land. A detailed accounting of all these species is provided in the NMFS Biological Assessment (BA), which is incorporated by reference in this EIS (Appendix 3.9B). Species under the jurisdiction of USFWS are discussed in the BCA for SLC-37 (Appendix 3.9A).

Table 3.9-2. Aquatic Federally Listed Species Potentially Occurring in the ROI

Class	Common Name *(Scientific Name)*	Federal Status	Habitat	Potential to Occur in ROI
Mammal	Blue whale/pygmy blue whale *(Balaenoptera musculus)*	Endangered	Generally prefer cold waters and open seas, but young are born in warmer waters of lower latitudes.	Ocean landings areas
Mammal	False killer whale *(Pseudorca crassidens)*	Endangered	Occurs in tropical and subtropical ocean, typically in deep offshore areas.	Ocean landings areas
Mammal	Fin whale *(Balaenoptera physalus)*	Endangered	Usually found in largest numbers 25 miles or more from shore. Young are born in the warmer waters of the lower latitudes.	Ocean landings areas
Mammal	Humpback whale *(Megaptera novaeangliae)*	Endangered/ Threatened	Occurs in deep water in the Atlantic, Pacific, and Arctic Oceans.	Ocean landings areas
Mammal	North Atlantic right whale (*Eubalaena glacialis)*	Endangered	Occurs in nearshore and offshore waters. Mainly coastal in the North Atlantic.	Ocean landings areas
Mammal	Sei whale (*Balaenoptera borealis)*	Endangered	Occurs in deep water along the edge of continental shelves and in open ocean.	Ocean landings areas
Mammal	Sperm whale (*Physeter macrocephalus)*	Endangered	Prefers deep water, sometimes around islands or in shallow shelf waters. Tends to occur in highest densities near productive waters, and often near steep drop-offs or strong oceanographic features, e.g., edges of continental shelves, large islands, and offshore banks and over submarine trenches and canyons.	Ocean landings areas
Mammal	Guadalupe fur seal *(Arctocephalus townsendii)*	Threatened	Occurs in tropical waters of the Pacific coast of Mexico and southern California, primarily in rocky coastal areas and caves.	Ocean landings areas
Mammal	Hawaiian monk seal *(Neomonachus schauinslandi)*	Endangered	Occurs in subtropical waters in open ocean, reefs, and lagoons. Uses sandy beaches for nesting.	Ocean landings areas
Mammal	West Indian manatee *(Trichechus manatus latirostris)*	Threatened	Occurs in shallow, slow-moving waters of rivers, estuaries, saltwater bays, canals, and coastal areas. Occurs in fresh water, brackish water, and salt water.	Ocean landings areas, barge transport areas, and noise contours
Fish	Atlantic sturgeon *(Acipenser oxyrinchus oxyrinchus)*	Endangered	Primarily marine, but close to shore, when not breeding; migrates to rivers for spawning, moves downstream afterward.	Ocean landings areas

Class	Common Name *(Scientific Name)*	Federal Status	Habitat	Potential to Occur in ROI
Fish	Giant manta ray *(Manta birostris)*	Threatened	Occurs offshore in oceanic waters and in productive coastal areas. Species has been observed in estuarine waters, oceanic inlets, and within bays and intercoastal waterways.	Ocean landings areas
Fish	Nassau grouper *(Epinephelus striatus)*	Threatened	Occurs in a variety of habitats, including coral reefs, rocks, ledges, mangrove, seagrass, and estuarine areas.	Ocean landings areas
Fish	Oceanic whitetip shark *(Carcharhinus longimanus)*	Threatened	Occurs in open ocean on the outer continental shelf or around oceanic islands in deep water areas.	Ocean landings areas
Fish	Scalloped hammerhead shark *(Sphyrna lewini)*	Endangered	Occurs in coastal warm temperate and tropical seas, including the continental and insular shelves of the Florida Gulf and Atlantic coasts. Known to enter estuarine habitats and nearshore areas, occasionally moving offshore in search of prey.	Ocean landings areas
Fish	Smalltooth sawfish *(Pristis pectinate)*	Endangered	Occurs in shallow tropical and subtropical waters in coastal and estuarine parts of the Atlantic Ocean.	Ocean landings areas
Reptile	Green sea turtle *(Chelonia mydas)*	Threatened	Occurs in sandy sloping coastal beaches for laying eggs, coastal waters with lush seagrass beds, inshore bays, lagoons, and shoals with abundant seagrass meadows and algae.	Ocean landings areas and noise contours
Reptile	Hawksbill sea turtle *(Eretmochelys imbricata)*	Endangered	Occurs in tropical and subtropical waters, predominantly around coral reefs. Nests on beaches.	Ocean landings areas and noise contours
Reptile	Kemp's Ridley Sea Turtle *(Lepidochelys kempii)*	Endangered	Typically occurs in Gulf of America, but regularly occurs along the Atlantic seaboard. Nests in Mexico	Ocean landings areas and noise contours
Reptile	Leatherback sea turtle *(Dermochelys coriacea)*	Endangered	Occurs in Atlantic, Pacific, and Indian Oceans. Nests on beaches primarily in tropical latitudes.	Ocean landings areas and noise contours
Reptile	Loggerhead sea turtle *(Caretta caretta)*	Threatened	Occurs in subtropical and temperate regions of the Atlantic, Pacific, and Indian Oceans and in the Mediterranean Sea. Feeds in coastal bays and estuaries. Nests on sandy beaches in tropical and subtropical areas.	Ocean landings areas and noise contours
Reptile	Olive ridley sea turtle (*Lepiodochelys olivacea*)	Endangered	Occurs in tropical and subtropical waters in the Atlantic, Pacific, and Indian Oceans and mostly in open ocean. Nests on sandy beaches in tropical and subtropical areas.	Ocean landings areas and noise contours

3.9.1.3.3 ESA-Designated Critical Habitat

There is no ESA-designated critical habitat on CCSFS. Within the off-installation environment of the ROI, there is designated critical habitat for the West Indian manatee, loggerhead sea turtle, green sea turtle (proposed), rufa red knot (proposed), and the North Atlantic right whale that could be affected by the Proposed Action.

3.9.1.3.4 MBTA and BGEPA Species

All bird species found on CCSFS are considered protected under MBTA. The bald eagle (*Haliaeetus leucocephalus*), which is protected under BGEPA, has the potential to occur on CCSFS; however, no bald eagle nesting behavior or nests have been observed near SLC-37. The closest occupied nest is across the Banana River on KSC, 4.3 miles from SLC-37.

3.9.1.3.5 MMPA Species

The MMPA protects all marine mammals within U.S. waters. The U.S. waters within the ROI are within the Atlantic Ocean Exclusive Economic Zone (EEZ) around Florida. Species in this area typically include the West Indian manatee, bottle noise dolphin, and North Atlantic right whales.

3.9.1.3.6 EFH

Several types of EFH exist in the aquatic environment adjacent to CCSFS, including reefs, sandy shoals and offshore bars, coastal inlets, nursery habitats, and high-profile rocky bottom and barrier island ocean-side waters. The species of particular concern in these areas include snapper-grouper complex, dolphin wahoo, South Atlantic shrimp, coastal migratory pelagic species, highly migratory pelagic species, spiny lobster, golden crab, coral, live/hardbottom habitats, and pelagic sargassum (DAF 2023a).

3.9.2 Environmental Consequences

This section describes the potential impacts on biological resources, including vegetation, wildlife, and protected species within the ROI.

The following parameters were used to analyze effects on biological resources:

- Jeopardy to the continued existence of a federally listed or proposed for listing endangered or threatened species or its habitat.
- Destruction or modification of critical habitat.
- A substantial loss of regional populations or habitat of a protected species that could jeopardize the continued existence of that species in the project region.
- A substantial loss or long-term disruption of a major wildlife movement corridor.
- A substantial loss of native vegetation or wildlife community diversity.

3.9.2.1 Proposed Action: SLC-37 at CCSFS

This section details the potential effects on biological resources from construction and operations under the Proposed Action.

3.9.2.1.1 Construction

The following sections describe the potential construction impacts on biological resources.

3.9.2.1.1.1 Vegetation

Impacts on vegetation from trampling and permanent removal of vegetation would occur during construction. The construction area is approximately 160 acres of vegetated area, and most of this area is routinely mowed. The widening of Phillips Parkway and addition of new turn radiuses would occur within the existing roadway right-of-way, which is regularly mowed and maintained. Old A1A is not in use or mowed; therefore, some of the vegetation that has encroached on the road would require removal. The vegetation types in the construction area are common to CCSFS. Construction would not change the existing habitat values of SLC-37 or the roadway improvement areas, as these areas are already primarily developed and maintained. Once construction is complete, all temporarily disturbed areas would be reseeded with a certified weed-free, native plant mix, in accordance with the DAF Integrated Natural Resources Management Plan (INRMP) (DAF 2023a) **(Biology Mitigation-1)**. Soil and vegetation disturbance from construction could create suitable conditions for the establishment of invasive, non-native, and noxious weed species capable of impacting native vegetation and wildlife. However, SpaceX would adhere to guidelines for invasive species management in the DAF INRMP (DAF 2023a) and would implement the Invasive Plant Species Control Plan (USAF 2019a) to eradicate noxious and invasive plant species as they appear on site **(Biology Mitigation-2)**. Construction would not result in a substantial loss in native vegetation or native plant community diversity and would not have a significant impact on vegetation **(Biology Impact-1)**.

3.9.2.1.1.2 Wildlife

The use of heavy equipment during construction would generate increased traffic, noise, vibration, and light that may cause mobile wildlife to temporarily leave the area. Increased construction traffic could result in wildlife strikes, though speed limits along roadways and the relatively slow movement of construction equipment during operations should limit these impacts. Displacement during construction could affect foraging, migration, and breeding behaviors, though these effects would be limited to the duration of construction and species would be expected to resume normal behavior after construction is complete. The loss of habitat would not disrupt wildlife movement corridors because the construction areas are surrounded by modified human environments. Construction would have **no significant impact** on wildlife **(Biology Impact-2)**.

3.9.2.1.1.3 Protected Species and Critical Habitat

The following is a summary of the potential effects on protected terrestrial and aquatic species from construction. A BCA was prepared and updated to support the Section 7 consultation with the USFWS for activities associated with SLC-37 (Appendix 3.9A) and has been incorporated as reference into this EIS. The BCA provides a more detailed assessment of the Proposed Action's effects on the following federally listed species. Section 7 consultation has been completed, and the mitigation measures outlined are subject to change if there is a discovery of new information or changed circumstances that require re-initiation.

3.9.2.2 Terrestrial ESA-listed Species

The following ESA-listed terrestrial species could be affected during construction.

- **Southeastern Beach Mouse:** It is anticipated that approximately 72.3 acres of habitat associated with construction and vegetation clearing during construction and roadway widening would be converted to habitat unable to be used by southeastern beach mice (i.e., permanently lost) and would result in the incidental take of southeastern beach mice through mortality or injury. Southeastern beach mouse habitat is typically restored at a 1:1 ratio for

impacts on CCSFS. Under the Proposed Action, SpaceX would mitigate impacts to the southeastern beach mouse and its habitat by providing funds for habitat restoration or offset for the permanent loss of habitat that is not included in the USFWS translocation effort, including non-paved habitats around the HIF, mowed rights-of-way along Phillips Parkway, and non-paved southeastern beach mouse habitat along Old A1A. Temporarily disturbed habitat would be restored to its original condition within 1 year of the end of the temporary impacts **(Biology Mitigation-3)**. Additionally, neither the USSF nor SpaceX would implement land-disturbing activities or construction within the southeastern beach mouse habitat inside the fence line of SLC-37 prior to completion of USFWS trapping and relocation effort for southeastern beach mouse. The USSF will coordinate with the USFWS to facilitate the trapping and relocation of beach mice from the approximately 20 acres of habitat within the fence line of SLC-37. This translocation effort will also minimize impacts to individuals expected to occur within this construction area. Relocated mice will be transferred by USFWS to a recipient site located outside CCSFS but within the species' current and historical range to reintroduce or augment an existing population. A siltation fence along a portion of the SLC 37 perimeter would be installed and maintained as a barrier to reduce the likelihood of the southeastern beach mouse reentering the area during both the trapping and subsequent construction activities **(Biology Mitigation-13).** Increased traffic from construction will occur within the SLC-37 lease boundary, associated roadways, and the main vehicular arteries within KSC and CCSFS. No known vehicular mortalities or injuries of southeastern beach mice have been documented at either property. For these reasons, increased vehicular traffic is expected to have an insignificant effect on the southeastern beach mouse.

- **Tricolored Bat:** Approximately 133 acres of potential tricolored bat foraging habitat are at SLC-37 and in the roadway improvement area. Natural roost structures are lacking at SLC-37, but the species may periodically roost in the western launch pad facility. If tricolored bats were found roosting in idle or abandoned structures, the bats would be allowed to leave the structures voluntarily before replacement or renovation **(Biology Mitigation-4)**. The roadway improvements would not affect areas where the bat may roost. The abundance of foraging areas outside of the construction area provides ample forage habitat for the tricolored bat; therefore, no population-level effects would be expected from construction. The increased light from construction would have no impact on the tricolored bat, as it forages using echolocation.
- **Crested Caracara:** No roosting habitat exists within the construction area, though potential low quality foraging habitat exists within the roadway improvement area (approximately 30 acres). Higher quality foraging habitats surround the construction area and would remain available to the species.
- **Eastern Black Rail:** Given the limited potential for habitat, the construction noise, vibration, light, and vehicle traffic would not be expected to affect the species.
- **Everglade Snail Kite:** The Everglade snail kite has not been observed on CCSFS, but it has been observed in the vicinity of the installation, including MINWR (USAF 2023). No suitable foraging habitat exists within the SLC-37 construction area and the roadway improvement construction areas. If present, construction noise, vibration, and light could cause the species to relocate to adjacent suitable foraging habitat.
- **Florida Scrub-jay:** The Florida scrub-jay is not active within the SLC-37 fenceline . Florida scrub-jays are present just outside the SLC-37 fenceline, including the areas around the HIF, Old A1A, and Phillips Parkway. The construction area, which includes SLC-37, the HIF, and roadway areas, contains approximately 47.1 acres of Florida scrub-jay habitat. Impacts to Florida scrub-jay habitat would occur from the potential reduction in habitat. Temporarily disturbed habitat would be restored to its original condition within 1 year of the end of the

temporary impacts. For permanently lost habitat that is not included in the USFWS southeastern beach mouse translocation effort (refer to Figure 2-8 of the BCA), actual acreages would be calculated once design plans are finalized. Within 30 days of SLD 45's receipt of SpaceX's final design plans, which would inform the amount of Florida scrub-jay habitat expected to be impacted, SLD 45 would provide SpaceX with habitat restoration or offset costs. For each phase of construction, payment for the initial year of required habitat restoration or offset would be made by SpaceX into the Canaveral Conservation Fund within 90 days of impact to a specific habitat area. Any changes in this timeline would be coordinated with, and authorized by, SLD 45 and the USFWS.**(Biology Mitigation-3)**. If Florida scrub-jays nest near the road in scrub habitat, nest abandonment could occur from road widening or from the proximity of traffic to scrub habitat. The Florida scrub-jay would likely construct nests farther into available scrub habitat and away from the roadways. Preconstruction surveys of the construction areas would be completed for the presence of Florida scrub-jays. If the species were detected in the construction areas, additional consultation with USFWS would be completed before the work **(Biology Mitigation-5)**.

- **Piping Plover:** The construction areas do not contain habitat for the piping plover. Their presence is limited to the Atlantic Ocean beaches approximately 250 feet to the east of the construction areas and shorelines along the Banana River, where construction-related noise and vibrations should be minimal.
- **Rufa Red Knot:** The construction areas do not contain habitat for the rufa red knot. Their presence is limited to the Atlantic Ocean beaches approximately 250 feet to the east of the construction areas and shorelines along the Banana River, where construction-related noise and vibrations should be minimal.
- **Wood Stork:** The SLC-37 construction area and roadway improvement areas are not within core foraging habitat for wood stork. If present, the wood stork occasionally forges in aquatic habitats, including wetlands, canals, and ditches. The roadway improvements would remove some existing roadway ditch habitats; however, these would be replaced in-kind as part of roadway widening. No loss of foraging habitat would be expected. Clearing vegetation and construction noise and vibration may cause foraging wood storks to relocate to available habitats away from the construction areas.
- **Eastern Indigo Snake:** The SLC-37 construction area contains less than 1 acre of suitable habitat, and the roadway improvement areas contain approximately 30 acres for eastern indigo snakes. The habitat within the roadway improvement areas is considered low quality for the species because of periodic mowing and frequent human presence. Construction noise and vibration may startle the species, if present. Vehicle traffic would increase the likelihood of a vehicle strike, as snakes are known to use roadways as a heat source and are unable to avoid approaching vehicles. However, no eastern indigo snake vehicle strikes have been previously reported on CCSFS and only one strike has been reported on KSC, suggesting that the event is unlikely to occur (USFWS 2021). Qualified biologists would monitor construction to minimize the potential for impacts on eastern indigo snakes and implement USFWS standard protection measures **(Biology Mitigation-6)**. The eastern indigo snake is a commensal species with the gopher tortoise. A pedestrian survey would be conducted to locate and flag/stake all gopher tortoise burrows prior to construction, and burrows would be avoided to the maximum degree possible. Affected gopher tortoise burrows would be excavated, and a qualified biologist would relocate captured tortoises to a Fish and Wildlife Conservation Commission (FWC)-approved recipient site off CCSFS in accordance with FWC permitting requirements **(Biology Mitigation-7)**. If eastern indigo snakes were observed during gopher tortoise surveys, they would be allowed to vacate the construction areas, and no burrows would collapse without confirming the absence of the species.

- **Monarch Butterfly:** The SLC-37 construction area does not contain monarch butterfly habitat. The roadway improvement area contains approximately 35 acres of potential habitat the species could use for foraging for nectar plants. Increased vehicular traffic from construction could increase the potential for monarch butterflies to be struck by vehicles. The foraging habitat along Phillips Parkway and turn radiuses is of low quality because of periodic mowing, which limits the sources of nectar; the foraging habitat along Old A1A is of moderate quality.
- **Seabirds:** The construction areas do not contain habitat for pelagic seabirds or birds that spend the majority of their life at sea, including the Bermuda petrel. black-capped petrel and roseate tern. Construction would have no effect on these species.

Aquatic ESA-listed Species

The following listed aquatic species could be affected by construction.

- **West Indian Manatee:** The construction areas do not contain habitat for the West Indian manatee; however, manatees could occur within the regional waterways where barges may navigate. Construction noise would not be expected to affect this species because of the natural reduction or attenuation of these effects in water (Richardson et al. 1995). Standard construction mitigation would prevent runoff into nearby waters **(Biology Mitigation-8)**. Increased barge traffic may occur within West Indian Manatee critical habitat; however, the operation of barges associated would occur within areas that have high recreational and commercial boat traffic, including large cruise ships from the Port Canaveral. The minor increase in vessel traffic is unlikely to result in collisions with West Indian Manatees.
- **Marine Turtles:** The construction areas do not contain sea turtle habitat. Construction noise and vibration would be unlikely to affect sea turtles because the construction area is about 250 feet from nesting beaches (refer to Section 3.5 for further detail on vibration). Construction lighting could result in disorientation of hatching and nesting sea turtles on beaches. Temporary external lighting for construction would comply with the SWI 32-7001, *Exterior Lighting Management* (April 23, 2018). SpaceX would develop and implement an LMP that would include measures to minimize the effects of nighttime lighting on wildlife **(Visual Mitigation-1)**. Sea turtles would continue to be monitored at CCSFS in accordance with the SLD 45 Sea Turtle Management Plan (DAF 2023a). There are no expected impacts on loggerhead and proposed green sea turtle critical habitat from construction.

MBTA and BGEPA Species

Construction areas would be monitored for the presence of migratory birds and bald eagle nests before any earth-movement or construction would begin. If a nest with an egg were identified, SLD 45 biologists would be notified, and a determination would be made regarding whether work would be adjusted to avoid impacts on the nest. If an active bald eagle nest were identified within 500 feet of the construction areas, a determination would be made in consultation with the USFWS regarding whether work would be adjusted to avoid impacts to the nest and the USFWS Bald Eagle Management Guidelines would be implemented (USFWS 2007) **(Biology Mitigation-9)**.

MMPA Species

The construction areas do not contain habitat for marine mammals. Construction noise would not be expected to affect this species because of the natural reduction or attenuation of these effects in water (Richardson et al. 1995). Standard construction mitigation would prevent runoff into nearby waters **(Biology Mitigation-8)**.

EFH

The construction area does not contain aquatic habitat. Standard construction mitigation would be employed to protect nearby tidal waters from sediment runoff **(Biology Mitigation-8)**. Construction would not impact any designated EFH in nearshore waters adjacent to SLC-37 (Appendix 3.9C).

Protected Species Summary

With the implementation of the prescribed mitigation measures **(Biology Mitigations 1-9),** construction would not jeopardize the existence of any protected species or their habitat. Construction would have **no significant impact** on protected species **(Biology Impact-3)**.

3.9.2.2.1 Operations

The following sections describe the potential operational impact on biological resources.

3.9.2.2.1.1 Vegetation

Vegetation within SLC-37 and along the improved roadways would continue to be mowed and maintained, and invasive weeds would be managed in accordance with SLD 45's Invasive Plant Species Control Plan (USAF 2019a) **(Biology Mitigation-2)**. The heat from launch events could result in burned vegetation; dry grass tends to burn at approximately 140°F, and a sustained burn would require approximately 300°F (USDA n.d.). Launch pad engineering designs, including deluge systems, lofted diverters, and berms, would limit the ground dispersion of the heat plume temperature and control the areas of extreme heat. The launch pads at SLC-37 would be designed to contain temperatures above ambient conditions within the SLC-37 fence line **(Biology Mitigation-10)**.

For the purposes of habitat restoration and hazardous fuels reduction, the fire management program on CCSFS is coordinated by 45 CES/CEIE-C for SLD 45 and administered by the Air Force Wildland Fire Branch (AFCEC/CZOF). The fire management program on KSC is managed by MINWR (USFWS). Unless superseded or revised, the Prescribed Burn Memorandum of Understanding (MOU), KCA-4205 Revision C (2025) between SLD 45, NASA, and USFWS (Appendix 3.9E) outlines the procedures these agencies will utilize to schedule and coordinate prescribed burning with launch operations **(Biology Mitigation-11)**.

Operations would not cause a substantial loss of vegetation community diversity and would have **no significant impact** on vegetation **(Biology Impact-4)**.

3.9.2.2.1.2 Wildlife

Wildlife would be exposed to light, vehicle traffic, noise (including sonic boom overpressures), vibration, and heat during launch operations. Lighting from operations, including pad illumination, and light from the rocket engines have the potential to disrupt nocturnal wildlife foraging and nesting activities. The light from rocket engines would last only a few minutes and the implementation of an LMP would help reduce the effects from illumination **(Visual Mitigation-1)**.

Operations would cause an increase in vehicle and heavy equipment traffic on CCSFS, as well as an increase in barge traffic in local waterways. Species within or adjacent to roadways and affected waterways could be exposed to increased vehicle strikes, though vehicle speed limits and the slow movement of launch convoy vehicles and barges would reduce this probability.

Wildlife around SLC-37 have been exposed to launch noise from CCSFS and KSC launch complexes since the late 1950s, and SLC-37 was the site of Delta IV launches until 2024. However, the intensity of noise and overpressures from Starship-Super Heavy launches would

exceed previous launch cadences. Refer to Section 3.5 for a detailed explanation of noise and overpressure impacts. Wildlife generally responds to noise and overpressure exposures through a startle reaction, which ranges from temporary changes in body position to more pronounced reactions, such as panic and fleeing the sound source (Manci 1988). It is unclear whether animals exposed to noises and overpressures with similar characteristics on a regular basis would become conditioned to the stimuli (FAA 2002). There is no evidence of direct mortality or physical damage to wildlife from noise exposure at the levels and duration associated with Starship-Super Heavy launch and landings (refer to Appendix 3.5A for further details).

Previous measurements from Starship-Super Heavy launches in Texas show a maximum vibration PPV of 2 in/sec at approximately 4,000 feet from the launch pad (Straam Group 2023). Any wildlife within this area would also be exposed to a high level of noise and sonic boom overpressure and would be expected to exhibit a similar startle behavior. Available literature does not indicate that vibration affects avian and reptilian eggs that may be present in these areas, though some effects on individual eggs could be possible.

During static-fire tests and launches, heat and exhaust would be directed through the flame trench and away from the launch pad for approximately 20 seconds. SLC-37 would be designed to contain temperatures above ambient conditions within the SLC-37 fence line **(Biology Mitigation-10)**. Wildlife is unlikely to occur within SLC-37 during launch activities because of human presence and the low quality of habitat. It would be expected that any wildlife present would disperse from the heat plume area before being exposed to a lethal amount of heat.

Expended launch vehicle components have the potential to impact ocean species. The primary concern is a direct impact from an object landing on an aquatic species, as the effects from noise, overpressure, and heat would be attenuated in water (Richardson et al. 1995). In general, wildlife has a low density in the open ocean, so the probability of a direct impact is extremely unlikely.

While individual wildlife organisms would experience impacts from launch activities, there would not be a substantial loss of wildlife species diversity on CCSFS or regionally. Operations would have **no significant impact** on wildlife **(Biology Impact-5)**.

3.9.2.2.1.3 Protected Species

The following is a summary of the potential effects on protected terrestrial and aquatic species and their critical habitat from operations, including launches and landings. Effects could include habitat degradation, noise, vibration, strikes/collisions, lighting, and restricted access for management and monitoring (including prescribed burns). BCAs were prepared to support the Section 7 consultation with the USFWS for activities at SLC-37 (Appendix 3.9A) and with the NMFS for landing activities in the ocean (Appendix 3.9B); these documents are incorporated by reference. The Biological Opinion from USFWS is in Appendix 3.9D.

Terrestrial ESA-listed Species

The following is a summary of potential effects on the ESA-listed species that exist within the ROI.

- **Southeastern Beach Mouse:** Noise, vibrations, and sonic booms from operations could startle southeastern beach mice. The startling events would last less than 2 minutes. It is unclear, at present, whether exposure to noises and overpressures with similar characteristics on a regular basis would result in conditioning to the stimuli (FAA 2002) or a behavioral response, and there is no evidence of direct mortality or physical damage from noise, vibration, or overpressure exposure at the duration associated with Starship-Super Heavy launches and landings. SpaceX, in coordination with SLD 45 and USFWS, would develop a monitoring plan to better understand noise and overpressure impacts on the

southeastern beach mouse **(Biology Mitigation-12)**. Impacts on individual beach mice from exposure to the heat plume would not be expected as the design would direct heat upward or away from the ground. Light during nighttime operations could deter the species from foraging; however, an LMP will be developed **(Visual Mitigation-1)**, and the species would likely use adjacent non-lit suitable habitats. Potential degradation of beach mouse habitat because of restrictions to prescribed burning and monitoring activities would be managed in accordance with the Prescribed Burn MOU **(Biology Mitigation-11)**.

- **Tricolored Bat:** Noise, vibrations, and sonic booms from operations would not affect tricolored bats near the launch site. The tricolored bat is a high frequency echolocator, and noise frequencies from operations would be at a lower frequency than the bat can hear. Vibration and overpressure exposure could result in a startle response to the species; however, these events would be episodic and of short duration (up to 2 minutes). The species would not be expected to be present in the vicinity of the heat plume due to a lack of foraging habitat and would be expected to vacate that area because of increased human activity, lighting, and noise, reducing the likelihood for any adverse effects. The increased light from construction would have no impact on the tricolored bat, as they forage using echolocation. Expended stages would drop into the open ocean many miles from shore and would have no effect on the tricolored bat. Potential degradation of tricolored habitat because of restrictions to prescribed burning and monitoring activities would be managed in accordance with the Prescribed Burn MOU **(Biology Mitigation-11)**.
- **Audubon's Crested Caracara:** The Audubon crested caracara is not expected to nest in the vicinity of SLC-37. Noise and sonic booms from operations could result in a startle response in foraging birds. No impact would be expected from the heat and exhaust plumes, as the species would be expected to vacate the area because of increased human activity, lighting, and noise prior to engine ignition. Light would not be expected to interfere with foraging, as the species forages only during the day, when light would not have an increased effect above ambient conditions. Expended stages would drop into the open Atlantic Ocean many miles from shore and would have no effect on the Audubon's crested caracara.
- **Eastern Black Rail:** The eastern black rail is not known to occur in the vicinity of SLC-37 and thus, noise and sonic booms from operations would not result in a startle response. There would be no effect on the eastern black rail from heat and exhaust plume, as there is no suitable foraging habitat within SLC-37. Light from construction and operations would not be expected to interfere with foraging of the eastern black rail. Expended stages would drop into the open ocean and would have no effect on the species.
- **Everglade Snail Kite:** The Everglade snail kite is not expected to nest in the vicinity of SLC-37. If present, the noise and sonic booms from operations could result in a startle response; however, because this species is infrequently observed in the area, these impacts would be unlikely to occur. There would be no effect from heat and exhaust plume, as there is minimal suitable habitat within SLC-37. Light from construction and operations would not be expected to interfere with Everglade snail kite foraging as the species forages only during the day when operational lighting would not have an increased effect above ambient conditions. Since the species is not known to nest on CCSFS, light from nighttime operations would have no effect on the species. Expended stages would drop into the open ocean and would have no effect on the Everglade snail kite.

- **Florida Scrub-jay:** The Florida scrub-jay is known to forage and nest in the vicinity of SLC-37. Florida scrub-jays could startle and potentially abandon nests or experience increased stress responses if nesting in the vicinity of SLC-37. SpaceX, in coordination with SLD 45 and USFWS, would develop a monitoring plan to better understand operational noise and overpressure impacts on the Florida scrub-jay **(Biology Mitigation-12)**. There would be no impacts from the heat plume, as there is no Florida scrub-jay habitat within SLC-37, where the temperatures of concern from the heat plume would occur. Light from construction and operations would not interfere with foraging of the Florida scrub-jay as the species forages only during the day. Expended stages would drop into the open ocean many miles from shore and would have no effect on the Florida scrub-jay. Potential degradation of Florida scrub-jay habitat because of restrictions to prescribed burning and monitoring activities would be managed in accordance with the Prescribed Burn MOU **(Biology Mitigation-11)**.
- **Piping Plover:** The piping plover does not nest in Florida but could forage and rest on beaches in the vicinity of SLC-37. Piping plovers have been occasionally documented on CCSFS beaches. Noise and sonic booms from operations could result in a startle response if the bird is present. There would be no impact from the heat plume, as there is no piping plover habitat within SLC-37. Increased light during launch operations would not be expected to interfere with piping plover foraging activities, as piping plovers are active only during the day. Expended stages would drop into the open ocean many miles from shore and would have no effect on the piping plover.
- **Rufa Red Knot:** The rufa red knot does not nest in Florida but occasionally forages and rests on beaches and shorelines in the vicinity of CCSFS. Proposed critical habitat within the ROI for noise and overpressure is over 7 miles from SLC-37 and is outside the area of concern for vibrations from launches. Noise and sonic booms from operations could result in a startle response in foraging birds; however, operations would be of short duration and episodic, so birds would be expected to resume normal behavior after the event. There would be no impact from the heat plume, as there is no rufa red knot habitat within SLC-37. Operational lighting would not be expected to interfere with foraging as the species forages only during the day, but could interfere with resting during nighttime operations, if present. Expended stages would drop into the open ocean many miles from shore and would have no effect on the rufa red knot.
- **Wood Stork:** The wood stork is not expected to nest in the vicinity of SLC-37. Noise and sonic booms from operations may result in a startle response. However, operations would be temporary and episodic. There would be no impact from the heat plume, as there is no wood stork habitat within SLC-37. Operational lighting would not be expected to interfere with foraging by the wood stork as the species forages only during the day when operational lighting would not have an increased effect above ambient conditions. Expended stages would drop into the open ocean many miles from shore and would have no effect on the wood stork.
- **Eastern Indigo Snake:** The presence of the species on SLC-37 during operations would be unlikely, as any suitable habitats and gopher tortoise burrows would be removed during construction **(Biology Mitigation-7)**. Vibrations could affect gopher tortoise burrows within 0.75 miles of SLC-37, and a snake could be exposed to ground vibrations. Lighting from operations would not be expected to interfere with eastern indigo snakes foraging as the species forages only during the day when operational lighting would not have an increased effect above ambient conditions. Expended stages would drop into the open ocean many miles from shore and would have no effect on the eastern indigo snake.
- **Monarch Butterfly:** There is a lack of monarch butterfly habitat within SLC-37 because the area consists of mostly developed land and grassy areas that are regularly mowed and maintained. There are no milkweed hosts in the area. Operations would have no effect on the monarch butterfly.

Aquatic ESA-listed Species

Expendable launch vehicle landings may affect ESA-protected marine species throughout the ocean landing areas, including whales (blue, pygmy blue, fin, North Atlantic right, sei and sperm), sharks (Oceanic whitetip, and scalloped hammerhead), Atlantic sturgeon, Nassau grouper, and giant manta ray. A BCA was prepared to support the Section 7 consultation with the NMFS for Starship-Super Heavy landing operations, and it discusses the effects on these species (Appendix 3.9B). Effects on aquatic species would be limited to direct impacts from fallen objects. All expendable components would be inert and when they are unretrievable would sink through the water column, where the components should be avoidable by any organisms present. The relative infrequency of ESA-listed species at the water's surface, spatially and temporally, combined with the low frequency of launch and landing events, would make the likelihood of impacts extremely low. Additionally, the launch vehicle fuel exhaust products would not contain any pollutants that would contaminate water resources or marine species habitats, because LOX and liquid methane combusts to water vapor and CO_2.

Sonic booms would occur during launches and landings. Acoustic energy in the air does not effectively cross the air-water interface and most of the noise is reflected off the water surface (Richardson et al. 1995). Accordingly, the amount of energy transmitted through the water is 0.11% and approximately 99.9% of the sonic boom intensity reflects off the water's surface. Underwater noise and pressure levels would be unlikely to result in effects on ESA-listed species.

The following species could be affected by both launch and landing operations at SLC-37 and were considered in the BCA (Appendix 3.9A):

- **West Indian Manatee:** Noise, sonic booms, and operational lighting would be unlikely to affect the West Indian manatee, given the natural attenuation of these stimuli in water (Richardson et al. 1995). Under the expendable scenarios, the expended stages would drop into the open ocean many miles from shore where it would be very unlikely to strike a West Indian manatee, as it prefers nearshore habitats. The heat plume would not extend into marine environments. The minor increase in barge traffic transporting vehicle components before and after launches would increase the potential for manatees to be struck, particularly when the barges are operating in inshore waters during winter months. Barge operation may occur within West Indian manatee critical habitat. However, the operation of barges associated with operations would occur within areas that have high recreational and commercial boat traffic, including large cruise ships from the Port Canaveral. Because of the minor increase in vessel traffic and the absence of the species from offshore habitats, strikes and collisions would be considered unlikely.
- **Marine Turtles:** Noise and sonic booms from operations could result in a startle response to nesting marine turtles and hatchlings in the dune environment near SLC-37. After the noise event ends, marine turtles would be expected to return to nesting activities and hatchlings would not be precluded from orienting toward the sea. Vibrations could reach the dunes adjacent to SLC-37; however, available literature provides no indication that vibration from human activities influences nesting sea turtles or hatchlings. The heat plume would not extend into marine environments. Light associated with infrastructure and nighttime operational events could result in disorientation or misorientation of sea turtle adults and hatchlings that nest on the beaches within approximately 250 feet to the east of the launch site. The effects from lighting during nesting season could affect approximately 4 acres of loggerhead sea turtle critical habitat and green sea turtle proposed critical habitat. Sea turtle nesting occurs between May and October, with approximately 57 events occurring at night during this time. To minimize potential impacts on sea turtles from lighting, an LMP would be completed by SpaceX and submitted to SLD 45 and USFWS for approval, in accordance with the SWI 32-7001, *Exterior Lighting Management* (April 23, 2018) **(Visual Mitigation-1)**.

- **Seabirds:** Under the expendable and ocean landing scenarios, the stages would land on a remote ship or drop into the open ocean, where seabirds could occur because they spend most of their life on the open ocean. However, the probability of the presence of a seabird at the time of landing is extremely unlikely and foraging seabirds in the landing zone would flee from the area when the vehicle lands and continue their foraging elsewhere.

MBTA and BGEPA Species

Operations could startle birds and cause them to suspend foraging and temporarily abandon nests. These events would be episodic and of short duration (less than 2 minutes) and the species would be expected to resume normal behavior after the event. SLD 45 would continue monitoring for the presence of bald eagle nests at the installation. If an active bald eagle nest were identified near SLC-37, a determination would be made in consultation with the USFWS regarding whether work would be avoided to avoid impacts to the nest and the USFWS Bald Eagle Management Guidelines would be implemented (USFWS 2007) **(Biology Mitigation-9)**.

MMPA-listed Species

The effects on MMPA-listed species would be similar to those described for aquatic ESA-species and limited to direct impacts from fallen objects. The relative infrequency of marine mammals at the water's surface, combined with the low frequency of the launches and landings, would make the likelihood of impacts extremely low. Underwater noise and pressure levels are unlikely to result in effects on marine mammals (Richardson et al. 1995).

EFH

There is a low probability of a direct impact or other launch effect, such as noise or vibration, on EFH. Noise and vibration are unlikely to disrupt or diminish the quality of habitats because of the combination of factors related to how sound and vibration travel through different mediums (i.e., air, land, and water) and given that the designated EFH is miles away from the launch pad. A large amount of sound energy is reflected off the water surface, meaning only a fraction of the remaining energy would be transmitted into the water. The distance of the EFH from the launch pad means that the energy would dissipate over the large distance. It would be highly unlikely that designated EFH would be affected by the Proposed Action.

Overall Effect on Protected Species

With the implementation of the prescribed mitigation measures **(Biology Mitigations-1 to -13)**, operations would not jeopardize the continued existence of any protected species population or result in the substantial loss of protected species habitat. Operations would have **no significant impact** on protected species **(Biology Impact-3)**.

3.9.2.3 No Action Alternative

Under the No Action Alternative, the DAF would not enter into a real property agreement with SpaceX, SpaceX would not redevelop SLC-37 for Starship-Super Heavy operations, and the FAA would not issue a vehicle operator launch license for Starship-Super Heavy operations at SLC‑37. SLC-37 would remain consistent with existing conditions. The potential for noise (including sonic boom overpressures), traffic, vibration, light, heat, and general disturbance to affect biological resources would continue as evaluated in existing NEPA documents and regulatory consultations. There would be **no significant impact** on biological resources from the No Action Alternative.

3.9.3 Summary of Mitigation Measures and Impacts

This section provides a summary of the mitigation measures and impacts for biological resources.

3.9.3.1 Summary of Mitigation Measures

The following mitigation measures would be implemented as necessary:

- **Biology Mitigation-1**: All areas of temporary disturbance would be reseeded with a certified weed-free, native plant mix in accordance with the DAF INRMP and recommendations from the USFWS.
- **Biology Mitigation-2:** SpaceX would adhere to guidelines for invasive species management in the DAF INRMP (DAF 2023a) and would implement the Invasive Plant Species Control Plan (USAF 2019a) to eradicate noxious and invasive plant species as they appear on site.
- **Biology Mitigation-3**: For the southeastern beach mouse and Florida scrub-jay, temporarily disturbed habitat would be restored to its original condition within 1 year of the end of the temporary impacts. For permanently lost southeastern beach mouse and Florida scrub-jay habitat that is not included in the USFWS southeastern beach mouse translocation effort (refer to Figure 2-8 of the BCA), actual acreages would be calculated once design plans are finalized. Within 30 days of SLD 45's receipt of SpaceX's final design plans, which would inform the amount of southeastern beach mouse and Florida scrub-jay habitat expected to be impacted, SLD 45 would provide SpaceX with habitat restoration or offset costs. For each phase of construction, payment for the initial year of required habitat restoration or offset would be made by SpaceX into the Canaveral Conservation Fund within 90 days of impact to a specific habitat area. Any changes in this timeline would be coordinated with, and authorized by, SLD 45 and the USFWS.
- **Biology Mitigation-4:** If tricolored bats were found roosting in idle or abandoned structures scheduled to be demolished, the bats could be allowed to leave the structures before demolition begins.
- **Biology Mitigation-5:** Preconstruction surveys of construction areas would be completed for Florida scrub-jays.
- **Biology Mitigation-6:** Qualified biologists could monitor clearing activities during construction to minimize the potential for impacts on eastern indigo snakes and implement standard protection measures (USFWS 2021).
- **Biology Mitigation-7:** A pedestrian survey would be conducted to locate and flag/stake all gopher tortoise burrows and burrows could be avoided to the maximum degree possible. The affected gopher tortoise burrows could be excavated, and captured tortoises could be relocated by a qualified biologist to an FWC-approved recipient site off of CCSFS in accordance with FWC permitting requirements.
- **Biology Mitigation-8:** Construction practices would be used to avoid runoff to nearby waterways.
- **Biology Mitigation-9:** Construction areas would be monitored for the presence of bird nests before beginning any activities. If a nest with an egg was identified, SLD 45 biologists would be notified, and a determination would be made regarding whether work must be adjusted to avoid impacts on the nest. If a bald eagle nest were identified within 500-feet of SLC-37, the USFWS's National Bald Eagle Management Guidelines would be implemented (USFWS 2007).

- **Biology Mitigation-10:** The launch pad infrastructure could be designed to contain the entire heat plume within the SLC-37 fence line.
- **Biology Mitigation-11:** SpaceX would operate in a manner consistent with the requirements and goals of the Prescribed Burn MOU, KCA-4205 Revision C (USSF, USFWS, and NASA 2025), unless superseded or revised, to the extent possible given constraints of sensitive payloads and mission operations.
- **Biology Mitigation-12:** SpaceX, in coordination with SLD 45 and USFWS, would develop a monitoring plan within the BCA to better understand operational impacts on the southeastern beach mouse and Florida scrub-jay.
- **Biology Mitigation-13**: No land-disturbing activities or construction would occur within southeastern beach mouse habitat inside the fence line of SLC-37 prior to completion of the USFWS trapping and relocation effort for southeastern beach mice. The USSF would coordinate with USSF to facilitate the trapping and relocation of southeastern beach mice from the approximately 20 acres of southeastern beach mouse habitat within the fence line of SLC-37. This translocation effort will also minimize impacts to individuals expected to occur within this construction area. Relocated mice will be transferred by USFWS to a recipient site located outside CCSFS but within the species' current and historical range to reintroduce or augment an existing population. A siltation fence along a portion of the SLC‑37 perimeter would be installed and maintained as a barrier to reduce the likelihood of the southeastern beach mouse reentering the area during both the trapping and subsequent construction activities.

3.9.3.2 Summary of Impacts

Table 3.9-3 provides a summary of the impacts on biological resources, as described in this section. Table 3.9-4 lists the Section 7 determination for each of the potentially effected ESA-protected species, Table 3.9-5 lists the Section 7 determinations for critical habitat. Refer to Appendix 3.9A for additional details on how these determinations were made.

Table 3.9-3. Summary of Impacts on Biological Resources

Impacts	Proposed Action SLC-37	No Action Alternative
Biology Impact 1: Impact on vegetation from construction	No significant impact	No additional impact
Biology Impact-2: Impact on non-protected wildlife species from construction	No significant impact	No additional impact
Biology Impact-3: Impact on protected species from construction	No significant impact	No additional impact
Biology Impact-4: Impact on vegetation from operations	No significant impact	No significant impact
Biology Impact-5: Impact on wildlife from operations	No significant impact	No significant impact
Biology Impact-6: Impact on protected species from operations	No significant impact	No significant impact

Table 3.9-4. Summary of USFWS ESA Section 7 Determinations for Potentially Effected Species

Class	Species Common Name (Latin Name)	Federal Status	USFWS ESA Section 7 Determination
Mammals	Southeastern beach mouse (*Peromyscus polionotus niveiventris*)	Threatened	May Affect, Likely to Adversely Affect
Mammals	Tricolored bat (*Perimyotis subflavus*)	Proposed Endangered	May Affect, Not Likely to Adversely Affect
Mammals	West Indian manatee (*Trichechus manatus latirostris*)	Threatened	May Affect, Not Likely to Adversely Affect
Birds	Band-rumped storm-petrel (*Oceanodroma castro*)	Endangered	May Affect, Not Likely to Adversely Affect
Birds	Bermuda petrel (*Pterodroma cahow*)	Endangered	May Affect, Not Likely to Adversely Affect
Birds	Black-capped petrel (*Pterodroma hasitata*)	Endangered	May Affect, Not Likely to Adversely Affect
Birds	Crested caracara (*Caracara plancus audubonii*)	Threatened	May Affect, Not Likely to Adversely Affect
Birds	Eastern black rail (*Laterallus jamaicensis jamaicensis*)	Threatened	May Affect, Not Likely to Adversely Affect
Birds	Everglade snail kite (*Rostrhamus sociabilis plumbeus*)	Endangered	May Affect, Not Likely to Adversely Affect
Birds	Florida scrub-jay *(Aphelocoma coerulescens*)	Threatened	May Affect, Likely to Adversely Affect
Birds	Hawaiian petrel (*Pterodroma sandwichensis)*	Endangered	May Affect, Not Likely to Adversely Affect
Birds	Newell's shearwater (*Puffinus newelli*)	Threatened	May Affect, Not Likely to Adversely Affect
Birds	Piping plover (*Charadrius melodus*)	Threatened	May Affect, Not Likely to Adversely Affect
Birds	Roseate tern (*Sterna dougallii dougallii)*	Endangered	May Affect, Not Likely to Adversely Affect
Birds	Rufa red knot (*Calidris canutus rufa*)	Threatened	May Affect, Not Likely to Adversely Affect
Birds	Short-tailed albatross (*Phoebastria albatrus*)	Endangered	May Affect, Not Likely to Adversely Affect
Birds	Wood stork (*Mycteria americana*)	Threatened	May Affect, Not Likely to Adversely Affect
Reptiles	Eastern indigo snake (*Drymarchon corais couperi*)	Threatened	May Affect, Likely to Adversely Affect
Reptiles	Green sea turtle (*Chelonia mydas*)	Threatened	May Affect, Likely to Adversely Affect
Reptiles	Hawksbill sea turtle (*Eretmochelys imbricata*)	Endangered	May Affect, Likely to Adversely Affect

Class	Species Common Name (Latin Name)	Federal Status	USFWS ESA Section 7 Determination
Reptiles	Kemp's ridley sea turtle *(Lepidochelys kempii*)	Endangered	May Affect, Likely to Adversely Affect
Reptiles	Leatherback sea turtle *(Dermochelys coriacea*)	Endangered	May Affect, Likely to Adversely Affect
Reptiles	Loggerhead sea turtle (*Caretta caretta*)	Threatened	May Affect, Likely to Adversely Affect
Insects	Monarch butterfly (*Danaus Plexippus*)	Proposed	May Affect, Not Likely to Adversely Affect

Table 3.9-5. Summary of ESA Section 7 Determinations for Critical Habitat

Common Name (Latin Name)	Federal Status	ESA Section 7 Determination
West Indian Manatee (*Trichechus manatus latirostris*)	Final and proposed	May Affect, Not Likely to Adversely Affect
Loggerhead Sea Turtle (*Caretta caretta*)	Final	May Affect, Likely to Adversely Affect
Green Sea Turtle (*Chelonia mydas*)	Proposed	May Affect, Likely to Adversely Affect
Rufa Red Knot (*Calidris canutus rufa*)	Proposed	May Affect, Not Likely to Adversely Affect

3.10 Geology

This section describes the geology and soil at CCSFS, including geologic hazards and erosion potential. The ROI for geology includes SLC-37 and roadway improvement areas.

3.10.1 Affected Environment

The affected environment for geology is discussed in the following sections.

3.10.1.1 Geology

The Cape Canaveral Peninsula is part of the barrier island complex along the Atlantic Coast. The topography at SLC-37, including roadway improvement areas, is relatively flat, with elevations ranging from sea level to 30 feet above mean sea level. The higher elevations occur along the eastern portion of SLC-37, with a gentle slope to lower elevations toward the north and south portions of the launch complex. All of SLC-37 is within the beach ridge and dune geologic unit. The USGS National Seismic Hazard Model indicates a low concern for seismic activity to occur within, or in areas surrounding, CCSFS (USGS 2024a). The U.S. Landslide Inventory shows no landslide potential in or around CCSFS (USGS 2024b).

3.10.1.2 Soil Types

The primary source of parent material for CCSFS soils is loose marine sediments resistant to weathering. Prominent soil types in the barrier system are moderately well to excessively drained, making these soil types especially dry and very poor for agriculture (DAF 2023a). The Natural Resources Conservation Service (NRCS) has identified three soil types within SLC-37:

- Canaveral-Urban land complex, which is found primarily around structures and impenetrable surfaces.
- Urban land, which occurs in flatwoods, rises, knolls, ridges, and hills on marine terraces.
- Pomello sand, which are soils on ridges, hills, and knolls.

3.10.2 Environmental Consequences

This section describes the potential impact on geology, including soil, geologic hazards, and erosion potential within the ROI.

The following parameters were used to analyze effects on geology:

- Increases to foundation instability, land subsidence, or other severe geologic hazards.
- Loss of soil used for agriculture or habitat; the aesthetic value from a unique landform; or mineral resources.
- Severe erosion or sedimentation from construction, or operations.

3.10.2.1 Proposed Action: SLC-37 at CCSFS

This section details the potential effects on geology and soil from construction and operations under the Proposed Action.

3.10.2.1.1 Construction

The following sections describe the potential construction impacts on geology and soils.

3.10.2.1.1.1 Geology

Construction would disturb previously undisturbed soil; however, no unique geological features of exceptional interest, mineral resources, or agricultural land occur within the project area and geologic hazards are of low concern. Construction would not result in any geologic hazards or changes to a unique landform. Construction would have **no impact** on geology **(Geology Impact-1)**.

3.10.2.1.1.2 Soils

The final elevations of various infrastructure on SLC-37 would be determined during final design of the site and would vary by infrastructure. While increased erosion and sedimentation may be caused by site preparation and construction, these effects would be avoided or minimized by incorporating standard erosion-control measures, such as erosion-control-control blankets, silt fences, and check dams **(Geology Mitigation-1)**. Construction would have **no significant impact** on soil **(Geology Impact-2)**.

3.10.2.1.2 Operations

The following sections describe the potential operations impacts on geology and soils.

3.10.2.1.2.1 Geology

Once operational, Starship-Super Heavy would not be expected to cause any measurable change on geology within or adjacent to SLC-37. Operations would have **no impact** on geology **(Geology Impact-3)**.

3.10.2.1.2.2 Soils

Once operational, Starship-Super Heavy would not be expected to have any measurable impact on soil within or adjacent to SLC-37. Studies performed at CCSFS and KSC to assess impacts on the environment from the Titan, Atlas, and Delta launch programs showed a short-term impact on soil chemistry, mainly consisting of a drop in soil pH levels resulting from the deposition of launch vehicle exhaust (Schmalzer et al. 1998); however, pH readings and alkalinity measurements returned to pre-launch levels within 96 hours of the launch (NASA 2014). Operations would not result in permanent soil changes that could affect the vegetation used for agriculture or habitat. Operations would **have no significant impact** on soil **(Geology Impact-4)**.

3.10.2.2 No Action Alternative

Under the No Action Alternative, the DAF would not enter into a real property agreement with SpaceX, SpaceX would not redevelop SLC-37 for Starship-Super Heavy operations, and the FAA would not issue a vehicle operator launch license for Starship-Super Heavy operations at CCSFS. SLC-37 would remain consistent with existing conditions. The potential for erosion and sedimentation to affect geology would continue as evaluated in existing NEPA documents. There would be **no impact** on geology from the No Action Alternative.

3.10.3 Summary of Mitigation Measures and Impacts

This section provides a summary of the mitigation measures and impacts for geological resources.

3.10.3.1 Summary of Mitigation Measures

The following is a list of the mitigation measures that would be implemented:

- **Geology Mitigation-1**: Standard erosion-control measures, such as erosion-control blankets, silt fences, and check dams, would be deployed during construction.

3.10.3.2 Summary of Impacts

Table 3.10-1 provides a summary of the impacts on geology resources, as described in this section.

Table 3.10-1. Summary of Impacts on Geology Resources

Impacts	Proposed Action SLC-37	No Action Alternative
Geology Impact-1: Impact on geology from construction	No impact	No additional impact
Geology Impact-2: Impact on soil from construction	No significant impact	No additional impact
Geology Impact-3: Impact on geology from operations	No impact	No additional impact
Geology Impact-4: Impact on soil from operations	No significant impact	No additional impact

3.11 Water Resources

This section describes water resources at CCSFS, including groundwater, surface waters, wetlands, and floodplains. The ROI includes CCSFS and the adjacent waterways, including the Atlantic Ocean to the east and the Banana River to the west.

3.11.1 Affected Environment

The affected environment for water resources is discussed in the following sections.

3.11.1.1 Groundwater

Groundwater is defined as water below the land surface, while an aquifer is defined as an underground layer of permeable rock, sand, or gravel that can transmit groundwater. The FDEP regulates groundwater resources via the Safe Drinking Water Act (42 U.S.C. Sections 300f et seq.)

Brevard County has two continuous aquifer systems: the surficial aquifer and the Floridan aquifer. The surficial aquifer lies a few feet beneath the land surface and recharges via precipitation. The surficial aquifer is separated from the underlying Floridan aquifer by a layer of clays, silts, and marl soils that limit the exchange between the aquifers. The surficial aquifer at CCSFS is classified by the FDEP as a Class G-II aquifer, meaning it can supply water for human consumption; however, it is not used to supply potable water and there is no plan to use it for potable water in the future (DAF 2023a). In general, groundwater in the surficial aquifer at CCSFS flows in a westward direction toward the Banana River. Local features such as drainage ditches and large surface water bodies influence groundwater flow direction.

3.11.1.2 Surface Waters

Surface waters refer to standing bodies of water on the Earth's surface. Surface waters include oceans, rivers, ponds, lagoons, and streams. Surface waters are regulated by the CWA, which is administrated by the U.S. Army Corps of Engineers (USACE). Two stream features and two freshwater ponds are located within SLC-37 (Figure 3.11-1). CCSFS is also bordered by the Banana River to the west, and the Atlantic Ocean to the east; SLC-37 is approximately 250 feet west of the Atlantic Ocean and over 1.5 miles east of the Banana River. The Banana River is a brackish water lagoon that connects to the Indian River south of CCSFS. The Indian River estuary is designated as an Estuary of National Significance in accordance with the CWA because of its critical ecological, economic, and cultural importance (EPA 2024c). The Indian River Lagoon National Estuary Program maintains a Comprehensive Conservation and Management Plan to protect, restore, and enhance the environmental quality of the lagoon.

3.11.1.3 Wetlands

Wetlands are areas where the frequent and prolonged presence of water at or near the soil surface drives the natural system, including the kinds of soils that form, the plants that grow, and the wildlife communities that use the habitat (EPA 2024b). Wetlands are regulated by the CWA, which is administered by USACE. Wetlands within the ROI are shown on Figure 3.11-1 and were identified through wetland delineation surveys (Figure 3.11-1).

3.11.1.4 Floodplains

Floodplains are areas of land adjacent to rivers or the coast that could flood during storm events. The Federal Emergency Management Agency (FEMA) defines geographic areas according to varying levels of flood risk, called flood zones. Each zone reflects the severity or type of flooding in the area. The ROI is within the 100-year and 500-year flood zones. FEMA designates the 100-year floodplain as an area that has a 1% chance in any year of flooding and the 500-year floodplain as an area that has a 0.5% chance in any year of flooding.

Figure 3.11-1. Wetlands in ROI

3.11.2 Environmental Consequences

This section describes the potential impacts on water resources, including groundwater, surface waters, wetlands, and floodplains, within the ROI.

The following parameters were used to analyze effects on water resources:

- Exceedances of water quality standards established by federal, state, local, and tribal regulatory agencies, or contaminated the public drinking water supply, including associated aquifers, such that public health may be adversely affected.
- Effects on wetland's function to protect the quality or quantity of municipal water supplies, including surface waters and sole source and other aquifers.
- Alternation to the hydrology needed to sustain an affected wetland system's values and functions or those of a wetland to which it is connected.
- Reduction to an affected wetland's ability to retain floodwaters or storm runoff, thereby threatening public health, safety, or welfare (the term "welfare" includes cultural, recreational, and scientific resources or property important to the public).
- Adverse modifications to natural and beneficial floodplain values.

3.11.2.1 Proposed Action: SLC-37 at CCSFS

This section describes the potential effects on water resources from construction and operations under the Proposed Action.

3.11.2.1.1 Construction

The following sections describe the potential construction impacts on water resources.

3.11.2.1.1.1 Groundwater

Groundwater could be encountered during excavation for utilities or foundations because of the high water table. Short-term removal or dewatering of groundwater could be required, but water levels would return to normal upon completion of construction, given natural recharge via precipitation. Dewatering efforts would be coordinated with CCSFS, KSC, and FDEP to prevent adverse effects on groundwater quality or flow **(Water Mitigation-1)**. The Floridan aquifer is deeper than planned excavation activities and there are confining layers; therefore, this aquifer would not be affected during construction. Construction would not cause any exceedance in drinking water quality standards. Construction would have **no significant impact** on groundwater **(Water Impact-1)**.

3.11.2.1.1.2 Surface Waters

Exposed soil is more easily transported and can increase turbidity and nutrient loads in surface waters. Construction, including vegetation clearing, soil disturbance, and grading, could increase surface water runoff. A CWA NPDES stormwater permit would be obtained from the FDEP for construction that disturbs 1 or more acres and stormwater treatment measures would be implemented. Construction would have **no significant impact** on surface waters **(Water Impact-2)**.

3.11.2.1.1.3 Wetlands

Construction would impact an estimated 5.4 acres of wetlands within construction areas, based on the wetland delineation surveys. The wetland delineation surveys also identified wetlands adjacent to the construction boundary (Figure 3.11-1). Pursuant to EO 11990, Protection of Wetlands, and EO 11988, Floodplain Management, the DAF requested public comments in

advance of publishing the EIS to determine if there were any public concerns regarding the Action's potential to impact floodplains and wetlands, or suggested alternatives to location in floodplain and wetlands. The NOI also informed the public of this requirement. Compensatory mitigation would be developed during the CWA 404 permitting process with the USACE to ensure there are no significant impacts on wetlands **(Water Mitigation-2)**. Some potential alternative locations for the Proposed Action would likely not impact wetlands; specifically, SLC-4 and SLC-6 at Vandenberg SFB. However, those alternatives were eliminated for the reasons discussed in Section 1.5.1. SpaceX would implement mitigation measures required by CWA 404 construction permits. Construction would have **no significant impact** on wetlands **(Water Impact-3)**.

3.11.2.1.1.4 Floodplains

The Proposed Action could increase the developed areas within the 100-year and 500-year floodplains, though SLC-37 is already developed and contains impervious surfaces. An increase in impervious areas could divert floodwater to other areas and increase flood risks, though given the isolated location, only infrastructure at SLC-37 would be affected by alteration in the flood zones. Existing Environmental Resource Permits (ERPs) at SLC-37 would be transferred from ULA to SpaceX, and additional ERPs could be necessary due to the addition of imperious areas. During the stormwater permitting process with the St. Johns River Water Management District, stormwater systems would be designed to treat and attenuate volumes associated with the impacted floodplains **(Water Mitigation-3)**. With implementation of these mitigation measures the Proposed Action would not cause notable effects to the floodplain and would not be expected to substantially increase flood risk. Construction would have **no significant impact** on floodplains **(Water Impact-4)**. All potential launch pads on CCSFS are also located within the 500-year floodplain and other sites were determined not to meet the site selection criteria defined in Section 1.5.1.

3.11.2.1.2 Operations

The following sections describe the potential operations impacts on water resources.

3.11.2.1.2.1 Groundwater

The Proposed Action would not use groundwater for any purpose, and SpaceX would develop site-specific spill prevention plans in compliance with DAF policy **(Water Mitigation-4)**. The requirements in these plans would prevent contamination of groundwater during operations. The launch vehicle LOX and liquid methane fuels does not contain pollutants that would contaminate water resources. Operations would have **no significant impact** on groundwater **(Water Impact-5)**.

3.11.2.1.2.2 Surface Waters

Water required for launch operations would be obtained through the City of Cocoa municipal water distribution system and stored in retention ponds within SLC-37. Any water released into the installation stormwater system would be treated and permitted prior to release. Additional details on water usage and storage for launch operations are provided in Section 3.3. CCSFS has established environmental management plans and protocols that would prevent the contamination of surface waters during operations (refer to Sections 3.12 and 3.3). Operations would not substantially alter local hydrological patterns or impact water quality.

Ocean landings could result in water quality impacts from expendable landings in the ocean. Any releases of contaminants would be diluted or evaporate.

Operations would have **no significant impact** on surface waters **(Water Impact-6)**.

3.11.2.1.2.3 Wetlands

Standard stormwater management infrastructure would be constructed to prevent potential runoff into any nearby wetlands. Operations would have **no impact** on wetlands **(Water Impact-7)**.

3.11.2.1.2.4 Floodplains

Operations would not result in additional changes to floodplain and all permanent structures within SLC-37 would be built to withstand a 100-year storm event. Refer to Section 3.1 for additional discussion on potential effects from floods. Operations would have **no impact** on floodplains **(Water Impact-8)**.

3.11.2.2 No Action Alternative

Under the No Action Alternative, the DAF would not enter into a real property agreement with SpaceX, SpaceX would not redevelop SLC-37 for Starship-Super Heavy operations, and the FAA would not issue a vehicle operator launch license for Starship-Super Heavy operations at CCSFS. SLC-37 would remain consistent with existing conditions. The potential for soil disturbance, grading, dewatering, and increase in impervious surfaces to affect water resources would continue as evaluated in existing NEPA documents and permits. There would be **no significant impact** on water resources from the No Action Alternative.

3.11.3 Summary of Mitigation Measures and Impacts

This section provides a summary of the mitigation measures and impacts for this resource.

3.11.3.1 Summary of Mitigation Measures

The following is a list of additional mitigation measures that would be implemented:

- **Water Mitigation-1**: SpaceX would coordinate groundwater dewatering efforts with CCSFS, KSC, and the FDEP to prevent adverse effects on groundwater quality or flow.
- **Water Mitigation-2**: Compensatory mitigation would be developed during the CWA 404 permitting process to avoid significant impacts on wetlands.
- **Water Mitigation-3**: Stormwater systems would be designed to treat and attenuate volumes associated with the affected floodplains.
- **Water Mitigation-4:** SpaceX would develop site-specific spill prevention plans in compliance with DAF policy.

3.11.3.2 Summary of Impacts

Table 3.11-1 provides a summary of the impacts on water resources, as described in this section.

Table 3.11-1. Summary of Impacts on Water Resources

Impacts	Proposed Action SLC-37	No Action Alternative
Water Impact-1: Impact on groundwater from construction	No significant impact	No additional impact
Water Impact-2: Impact on surface waters from construction	No significant impact	No additional impact
Water Impact-3: Impact on wetlands from construction	No significant impact	No additional impact
Water Impact-4: Impact on floodplains from construction	No significant impact	No additional impact
Water Impact-5: Impact on groundwater from operations	No significant impact	No additional impact
Water Impact-6: Impact on surface waters from operations	No significant impact	No additional impact
Water Impact-7: Impact on wetlands from operations	No impact	No additional impact
Water Impact-8: Impact on floodplains from operations	No impact	No additional impact

3.12 Hazardous Materials, Hazardous Waste, and Solid Waste

This section describes hazardous materials, including hazardous substances, hazardous wastes, and petroleum products, and solid waste at CCSFS. The ROI for hazardous materials and solid waste includes SLC-37 and the Atlantic Ocean, which could be affected by the materials transported, stored, and used; waste generated; or spills and releases that may occur during construction and operations.

3.12.1 Affected Environment

The affected environment for hazardous materials and solid waste is discussed in the following sections.

3.12.1.1 Hazardous Materials and Hazardous Waste

Hazardous materials are substances that can pose an unreasonable risk to health, safety, and property. The management of hazardous materials is covered under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), CWA, Resource Conservation and Recovery Act (RCRA), and Toxic Substances Control Act. Hazardous wastes are wastes deemed hazardous by EPA and that possess at least one of the following four characteristics: ignitibility, corrosivity, reactivity, or toxicity (40 CFR 261.3).

Hazardous waste on CCSFS is controlled and managed from the point of generation to the point of ultimate disposal. Hazardous waste is temporarily stored at designated accumulation sites at work locations. Within 90 days, the waste is transported off-base and disposed of in accordance with applicable regulations. Patrick Space Force Base is responsible for the overall management of hazardous waste at CCSFS, including routine inspections of hazardous waste accumulations sites, spill response actions, waste characterization processes, and transportation and disposal coordination. Individual launch service providers are responsible for ensuring containers are properly labeled and stored; managing records; and monitoring accumulation time limits for waste generated (USAF 2022).

The IRP identifies, characterizes, and remediates contamination from past hazardous waste disposal operations and hazardous material spills on CCSFS. IRP-identified sites are investigated and cleaned up in accordance with CERCLA or RCRA, or an integrated approach is used based on both laws. The following four environmental remediation sites are in the ROI (Figure 3.12-1):

- Solid Waste Management Unit (SWMU) C056/IRP Site DP065 is within SLC-37 and extends outside the fence line. Volatile organic compounds (VOCs), polychlorinated biphenyl (PCB) contamination, and other paint-related contaminants were detected in groundwater and soil at concentrations exceeding screening levels. In accordance with the RCRA, a long-term monitored natural attenuation program and land use controls (LUCs) have been implemented (USAF 2021a).
- SWMU C150/IRP Site DP072 is associated with a pad-mounted transformer and support area for SLC-37. Chlorinated solvent residuals that exceed screening criteria were identified in groundwater underlying the site, and PCB contamination in excess of regulatory standards was identified in site soil. Groundwater remediation has been completed, and long-term monitoring and monitored natural attenuation is ongoing. LUCs for groundwater will be maintained until contaminant concentrations are consistently less than screening values (USAF 2021b).

- SWMU C054, which is abandoned SLC-34, is approximately 0.5 miles south of SLC-37. Groundwater contaminants include industrial solvents and soil contaminants such as PCBs, dioxins, and furans. Much of the site has been remediated, but soil with high PCB concentrations remains beneath the concrete pad at the former electrical substation. Interim LUCs including engineering controls (a fence) are in place to prevent the unplanned disturbance of this soil (USSF 2024c). Operation and maintenance of groundwater remediation interim measures are ongoing and will continue into the foreseeable future to both control and treat groundwater contamination. Remedial activities, including LUCs and monitoring, will continue until contaminant concentrations throughout the site are consistently less than the appropriate screening values.
- SWMU C046/IRP Site DP023 is associated with SLC-40. Groundwater contaminants identified at the site include manganese and iron. PCBs were identified in site soil at concentrations that exceeded screening values. The contaminated soil was removed and remediated to a safe level under industrial land use scenarios. Following a long-term monitoring program, No Further Action on groundwater was approved by regulatory agencies in 2002. USAF continues to maintain LUCs on soil to ensure that PCB contaminant residuals do not cause adverse impacts on human health or the environment (USAF 2021c).

3.12.1.2 Solid Waste

Solid waste can include items such as refuse and scrap metal, spent materials, and nonhazardous chemical byproducts (40 CFR 261.2). A private refuse contractor transports nonhazardous solid waste from CCSFS to the permitted Brevard County landfill for disposal (USSF 2021). The Brevard County Central Disposal Facility receives 3,500 tons or more of waste per day (Brevard County 2024). Several Brevard County landfill expansions are underway, and the projected life span of the Central Disposal Facility is up to 40 years (Smith, pers. comm. 2024). Items recycled at CCSFS include paper, cardboard, plastics, wood, metals, and used oil (USSF 2021).

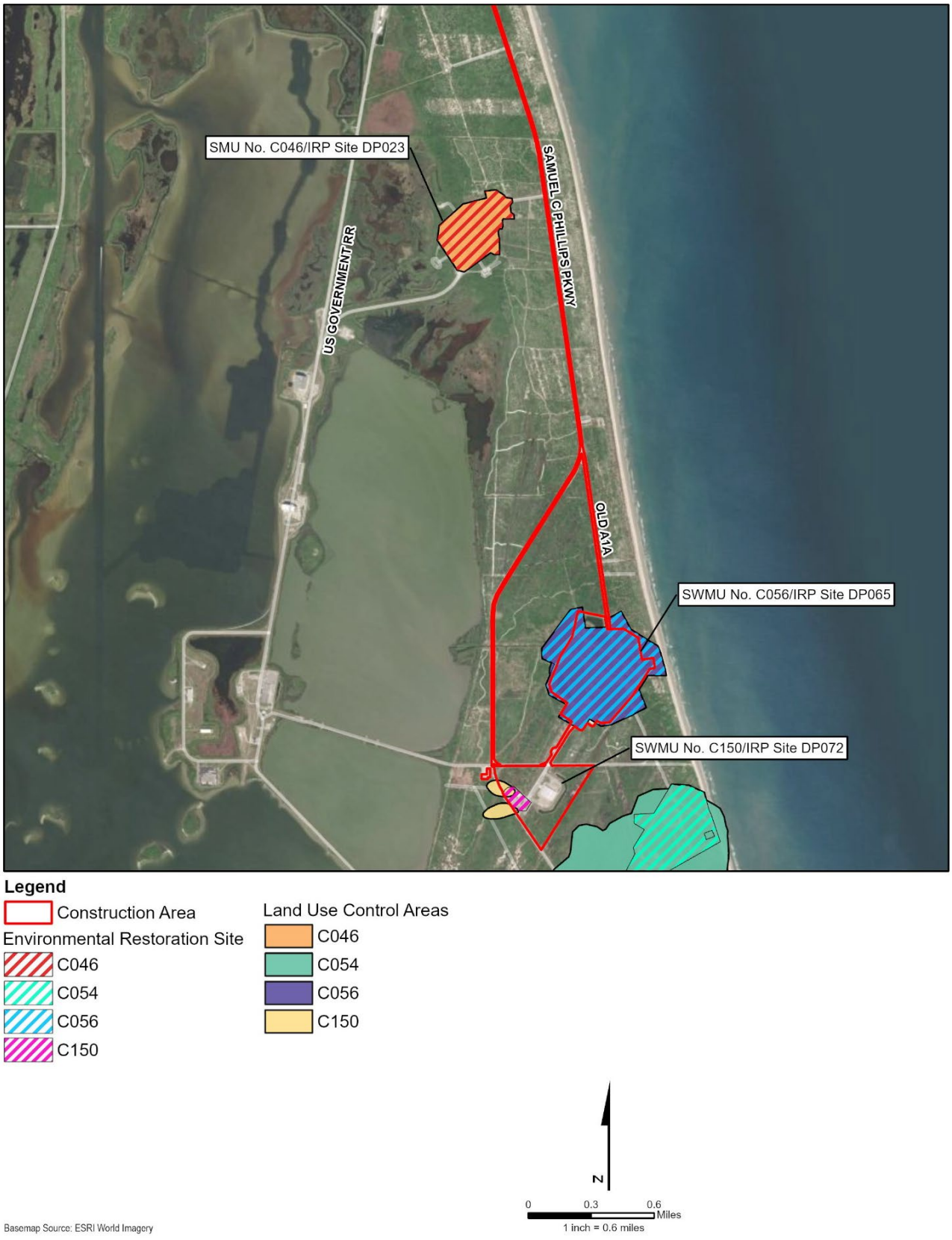


Figure 3.12-1. Environmental Restoration Sites in ROI

3.12.2 Environmental Consequences

This section describes the potential impacts from hazardous materials and solid waste within the ROI.

The following parameters were used to analyze hazardous materials and solid wastes:

- Violation of applicable federal, state, tribal, or local laws or regulations regarding hazardous materials or solid waste management.
- Production of an appreciably larger quantity or new type of hazardous waste.
- Generation of an appreciably larger quantity or new type of solid waste or uses a different method of collection or disposal and/or exceeds local capacity.
- Adverse effects on human health or the environment.

3.12.2.1 Proposed Action: SLC-37 at CCSFS

This section details the potential effects from hazardous materials and solid waste during construction and operations.

3.12.2.1.1 Construction

The following sections describe the potential construction impacts on hazardous materials.

3.12.2.1.1.1 Hazardous Materials and Hazardous Waste

Construction would involve the use of hazardous materials and would generate waste. The hazardous materials could include petroleum, spent solvents, paints, sealants, adhesives, used oil, and batteries. SpaceX would handle, store, and dispose of hazardous materials and waste, as well as use measures to prevent releases, in accordance with SLD 45 requirements and applicable federal and state regulations. Demolition of existing infrastructure at SLC-37 could involve the removal and disposal of hazardous building materials such as asbestos and lead-based paint (LBP). The removal, storage, and disposal of any hazardous building materials would be conducted in accordance with applicable federal, state, and local regulations. Management of these materials would be SpaceX's responsibility.

Construction would occur within SWMU C056 and SWMU C150. Any new facilities in these areas would be rated for industrial use and would adhere to established LUCs. SpaceX would coordinate with the IRP office to deconflict any IRP investigation areas where new infrastructure and construction and would work with SLD 45 if any deviations to the ongoing soil and groundwater monitoring and treatment efforts are needed **(Hazardous Materials and Solid Waste Mitigation-1)**. SpaceX would coordinate with SLD 45 ahead of construction activities so that activities are conducted in compliance with the RCRA permit and the LUCIP for SLC-37 **(Hazardous Materials and Solid Waste Mitigation-2)**. Upon discovery of any previously undocumented contamination during construction, including per- and polyfluoroalkyl substances (PFAS) contamination, work would cease and SLD 45 environmental staff would be notified immediately in accordance with established environmental management plans **(Hazardous Materials and Solid Waste Mitigation-3)**. During construction in the vicinity of known contaminated sites, training would be implemented to help workers identify contaminated media (soil and groundwater) for proper disposal or treatment **(Hazardous Materials and Solid Waste Mitigation-4)**.

The final elevations of various infrastructure on SLC-37 would be determined during final design of the site and would vary by infrastructure. If fill dirt would be required for the site, SpaceX would test the dirt to ensure that all fill dirt brought on site would be in accordance with any applicable DOD, federal, and state screening levels **(Hazardous Materials and Solid Waste Mitigation-7)**.

Construction would not result in a substantial increase in hazardous materials and construction would comply with all applicable laws and regulations. Construction would have **no significant impact** from hazardous materials **(Hazardous Materials and Solid Waste Impact-1)**.

3.12.2.1.1.2 Solid Waste

Debris from site redevelopment could include solid pieces of concrete, metal, glass, and lumber. SpaceX would develop a solid waste management plan, which would require construction contractors to recycle and/or reuse debris to the maximum extent practicable, thereby diverting it from landfills **(Hazardous Materials and Solid Waste Mitigation-5)**. Solid waste would be collected in dumpsters and disposed of offsite at local, permitted landfills with capacity in Brevard County. The solid waste generated would be an increase from existing conditions but would not exceed the capacity of the expanded Brevard County landfill, which has a projected lifespan of up to 40 years. Solid waste would be managed appropriately and would not exceed current landfill capacities. Construction would have **no significant impact** from solid waste **(Hazardous Materials Impact-2)**.

3.12.2.1.2 Operations

The following sections describe the potential operational impacts on hazardous materials.

3.12.2.1.2.1 Hazardous Materials and Hazardous Waste

Hazardous materials used during operations would include fuel, used oils, spent solvents, paint waste, and used batteries. SpaceX would develop a hazardous waste management plan to ensure the proper handling of all hazardous materials used during operations and would obtain all required permits under an EPA identification number for SLC-37. If an accidental spill or anomaly were to occur, SpaceX would assemble an emergency response team responsible for responding to hazards, stop work, and notify CCSFS **(Hazardous Materials and Solid Waste Mitigation-6)**.

SpaceX's bulk propellant storage would include an estimated 16,500 tons of LOX, 6,500 tons of LN_2, and 5,000 tons of liquid methane. These liquid propellants are non-toxic pollutants but can present a substantial combustion risk, and in high enough concentrations, can displace oxygen. Liquid propellants would typically be released into the atmosphere during fueling and landing operations. During an expendable launch, all liquid fuel would be consumed during landing, and only inert structural debris would remain. after the vehicle sinks to the ocean floor would not result in detectable changes to water or sediment quality. The plume from a launch would appear clear and consist of water vapor, CO_2, carbon monoxide, hydrogen, CH_4, NO_x, and oxygen. The LOX and liquid methane propellants used in the launch vehicle are non-hazardous, compared to more traditional rocket fuels such as solid propellants, which are highly toxic.

There would be a risk of a mishap anomaly occurring during launch and landing activities, which could release hazardous materials. SpaceX would report any release of hazardous materials in the ocean through the USCG National Response Center. SpaceX would bring the necessary resources for contingency and recovery actions to restore the area to normal operations as soon as possible after a mishap.

SpaceX would coordinate with SLD 45 on incorporation of proper engineering and management controls to ensure that operations comply with the RCRA permit and LUCIP, and site conditions would continue to be monitored in accordance with an SLD 45-approved monitoring plan **(Hazardous Materials and Solid Waste Mitigation-8)**.

Operations would not result in a substantial increase in hazardous materials and operations would comply with all applicable laws and regulations. Operations would have **no significant impact** from hazardous materials **(Hazardous Materials and Solid Waste Impact-3)**.

3.12.2.1.2.2 Solid Waste

Operations would generate office, food, and packaging waste. EPA estimates that a person generates 4.9 pounds of solid waste per day (EPA 2023). With the addition of 450 onsite personnel, approximately 2,205 pounds (365 tons annually) of municipal solid waste could be generated each day during operations. This amount is approximately 0.03% of the daily amount of waste currently received at the Brevard County Central Disposal Facility. The Brevard County landfills would have the capacity to accommodate solid waste generated during operations. Large commercial vessels, such as the barges or floating platforms used for offshore landing, routinely discharge ballast water, gray and black water, bilge water, deck runoff, and sewage. These discharges would be consistent with the International Convention for the Prevention of Pollution from Ships.

The reusability of the Starship-Super Heavy launch vehicle would result in a beneficial impact due to the reduction of expendable launch missions. Solid waste from operations would be managed appropriately and would not exceed current landfill capacities. Operations would have **no significant impact** from solid waste **(Hazardous Materials Impact-4)**.

3.12.2.2 No Action Alternative

Under the No Action Alternative, the DAF would not enter into a real property agreement with SpaceX, SpaceX would not redevelop SLC-37 for Starship-Super Heavy operations, and the FAA would not issue a vehicle operator launch license for Starship-Super Heavy operations at SLC-37. SLC-37 would remain consistent with existing conditions. The potential for effects from the generation of hazardous materials or solid waste would continue as evaluated in existing NEPA documents, and operations would follow established procedures for handling hazardous materials and solid waste. There would be **no significant impact** from hazardous materials or solid waste from the No Action Alternative.

3.12.3 Summary of Mitigation Measures and Impacts

This section provides a summary of the mitigation measures and impacts for this resource.

3.12.3.1 Summary of Mitigation Measures

The following is a list of additional mitigation measures that would be implemented:

- **Hazardous Materials and Solid Waste Mitigation-1**: SpaceX would coordinate with the IRP office to deconflict any IRP investigation areas with new infrastructure and construction and would work with SLD 45 if any deviations to then ongoing soil and groundwater monitoring and treatment efforts.
- **Hazardous Materials and Solid Waste Mitigation-2**: SpaceX would coordinate with SLD 45 ahead of construction so that construction is conducted in compliance with the RCRA permit and the LUCIP for SLC-37.
- **Hazardous Materials and Solid Waste Mitigation-3**: If any previously undocumented contamination is discovered during construction, including PFAS contamination, work would cease and CCSFS environmental staff would be notified immediately.
- **Hazardous Materials and Solid Waste Mitigation-4**: During construction activities in the vicinity of known contaminated sites, training will be implemented to help workers identify contaminated media (soil and groundwater) for proper disposal or treatment.

- **Hazardous Materials and Solid Waste Mitigation-5:** SpaceX would develop a solid waste management plan, which would require construction contractors to recycle and/or reuse debris to the maximum extent practicable, thereby diverting the debris from landfills.
- **Hazardous Materials and Solid Waste Mitigation-6:** If an accidental spill or an anomaly were to occur, SpaceX would assemble an emergency response team responsible for responding to hazards, stop work, contact the National Response Center, and notify CCSFS.
- **Hazardous Materials and Solid Waste Mitigation-7:** If fill dirt would be required for the site, SpaceX would test the dirt to ensure that all fill dirt brought on site would be in accordance with any applicable DOD, federal, and state screening levels.
- **Hazardous Materials and Solid Waste Mitigation-8**: SpaceX would coordinate with SLD 45 on incorporation of proper engineering and management controls to ensure that operations comply with the RCRA permit and LUCIP, and site conditions would continue to be monitored in accordance with an SLD 45-approved monitoring plan.

3.12.3.2 Summary of Impacts

Table 3.12-1 provides a summary of the impacts from hazardous materials and solid waste, as described in this section.

Table 3.12-1. Summary of Impacts from Hazardous Materials and Solid Waste

Impacts	Proposed Action SLC-37	No Action Alternative
Hazardous Materials and Solid Waste Impact-1: Impact from hazardous materials from construction	No significant impact	No additional impact
Hazardous Materials and Solid Waste Impact-2: Impact from solid waste from construction	No significant impact	No additional impact
Hazardous Materials and Solid Waste Impact-3: Impact from hazardous materials from operations	No significant impact	No significant impact
Hazardous Materials and Solid Waste Impact-4: Impact from solid waste from operations	No significant impact	No significant impact

3.13 Land Use

This section assesses potential effects associated with land use, range management, recreation, and coastal resources. The ROI is the 2-psf sonic boom overpressure contour, which includes CCSFS, KSC, and the surrounding communities.

3.13.1 Affected Environment

The following sections describe the current state of land use, recreational areas, range management, and coastal resources within the ROI.

3.13.1.1 Land Use

Land use refers to the management and modification of land utilization for various purposes. As a federal property, CCSFS and KSC land use is managed by USSF and NASA, meaning they are not included in the land use or zoning authority of Brevard County or the City of Cape Canaveral.

The following plans relate to CCSFS and KSC:

- **USSF's *Range of the Future Cape Canaveral Space Force Station District Plans* (2022)** aligns mission objectives with capital investments in facilities and infrastructure. It provides a framework to strengthen and guide the decision-making process for future development at CCSFS as launch rates continue to increase over the next 20 years. The plan provides a framework for future development to meet long-term planning goals (USSF 2022a).
- **Space Florida's *Cape Canaveral Spaceport Master Plan* (2017)** provides a suggested set of planning principles and concepts for the future operation and growth of Cape Canaveral Spaceport (Space Florida 2017). Space Florida is an aerospace economic development agency that aims to grow the space industry within Florida. While Space Florida collaborates with government agencies, such as USSF, it does not actively manage the CCSFS launch complexes.
- **KSC Master Plan (2011)** provides a 20-year plan for developing a multi-user spaceport at KSC (NASA 2011b).

CCSFS encompasses approximately 16,200 acres (25 square miles), representing about 2% of Brevard County's total land area. Land use types at CCSFS include airfield, port operations, launch operations, launch and range support, commercial aerospace ventures, maintenance areas, and open space. The beaches along CCSFS are restricted from public use. CCSFS is divided into three planning districts: Gateway Planning District, Central Planning District, and Poseidon Planning District. SLC-37 is within the Gateway Planning District, which is a dedicated launch operation area (USSF 2022a). The Gateway Planning District consists of 10,652 acres.

KSC encompasses approximately 142,000 acres of which 135,223 acres are outside of NASA's operational control and are managed by USFWS at MINWR and NPS at CANA.

SLC-37 is an active launch complex that was used for ULA's Delta IV Launch Vehicle until 2024. Current land use at SLC-37 is designated as a commercial use area. The Range of the Future District Plan outlined that SLC-37 should be reallocated to another launch service provider after the conclusion of Delta IV Heavy's launches in 2024 (USSF 2022a).

3.13.1.2 Public Recreation

Community recreation areas open to the public include locations outside of CCSFS with the potential to be affected by noise. There are 164 parks, recreational areas, and wildlife or waterfowl refuges within the ROI, including 85 beaches, and 13 boat ramps or piers (Figure 3.13-1). Most of the public parks are located south and west of CCSFS in the City of Cape Canaveral.

MINWR is located in the ROI and was established as an overlay of NASA's KSC While portions of MINWR are open to the public year-round and are regularly used for launch viewing, bird watching, nature study, fishing, and seasonal hunting, the majority of MINWR within the ROI is not publicly accessible. The Mosquito Lagoon, northern Indian River Lagoon, and Banana River are high public use areas of MINWR.

CANA is also located in the ROI and is managed by the NPS. CANA is regularly used for launch viewing, beach recreation, and nature viewing. CANA is open to the public 7 days a week from 6 a.m. to 8 p.m. in the summer and 6 p.m. in the winter.

3.13.1.3 Range Management

In order to avoid conflicts between launch operations SLD 45 implements the following range management practices:

- The 1st Range Operations Squadron Range Scheduling Office coordinates all launch, landing, static fire, and movement activities across CCSFS and KSC pads. This process deconflicts Range assets to align launch windows.
- Launch service providers must complete Launch Readiness Reviews with SLD 45, verifying compliance with safety, environmental, and operational requirements. This includes assessing pad readiness, payload integration, and Range resource availability.
- SLD 45 uses available systems to assess each launch's unique trajectory and landing profiles, ensuring safe operations. The systems include advanced telemetry, radar, command, and meteorological systems.
- SLD 45 supplements scheduling using StarGate software to optimize launch cadences, reducing conflicts for continued high-frequency operations. This tool would prioritize Range asset allocation based on mission criticality (e.g., national security payloads).
- The 45th Weather Squadron provides high-resolution forecasts, using 48 lightning detection systems and twice-daily weather balloon launches to assess launch windows. This allows for flexible scheduling to shift launches/static-fire tests around weather events (e.g., lightning, which disrupts 20 to 30% of launch windows).

SLD 45 also establishes Launch Safety Exclusionary Zones, which are areas around a SLC that could experience hazardous threats during launch and landing operations and must be evacuated by non-essential personnel. An input into the risk analysis performed by SLD 45 includes an estimate of the probability of failure of a launch vehicle. A launch vehicle's probability of failure may be informed by its own flight history or the flight history of similar launch vehicles launching under similar conditions. Risk analyses, performed by SLD 45, produce hazard areas of affected land, sea, and airspace. These hazard areas can grow and shrink based on inputs, which include launch vehicle data, mission information, weather data, and probability of failure estimates. These hazard areas or, Launch Safety Exclusionary Zones, include the following (USSF 2022c):

- **Blast Danger Areas (BDA)**: A hazardous clear area; clearance must occur prior to the establishment of a major explosive hazard. The BDA represents the area subject to fragments and dangerous overpressures resulting from the explosion of the booster/payload.
- **Flight Caution Areas (FCA)**: The controlled region of land, sea, and air along the flight path, where the individual risk from a launch vehicle malfunction during the early flight may exceed 1 in 1,000,000. Because the risk of serious injury or death from blast overpressure or debris is so significant, only launch-essential personnel/neighboring operations personnel are permitted in this area during launch. The area must be surveyed, publicized, controlled, or evacuated in order to protect public health and safety and the safety of property.
- **Flight Hazard Area (FHA):** The region of land, sea, or air that must be surveyed, publicized, controlled, or evacuated in order to control the risk to the public.

3.13.1.4 Coastal Resources

At the nearest point, SLC-37 is located approximately 250 feet from the Atlantic Coast. The CZMA establishes a national policy to preserve, protect, develop, restore, and enhance the resources of the nation's coastal zones (16 U.S.C. Section 1452). A coastal zone is defined as the coastal waters and the adjacent shorelands; however, federal lands, such as CCSFS, are excluded from the definition of coastal zone. Nonetheless, actions that may affect the coastal zone off of federal lands are to be consistent, or if not consistent, then consistent to the maximum extent practicable, with the relevant enforceable policies of Florida's approved coastal management plan (FDEP n.d.).

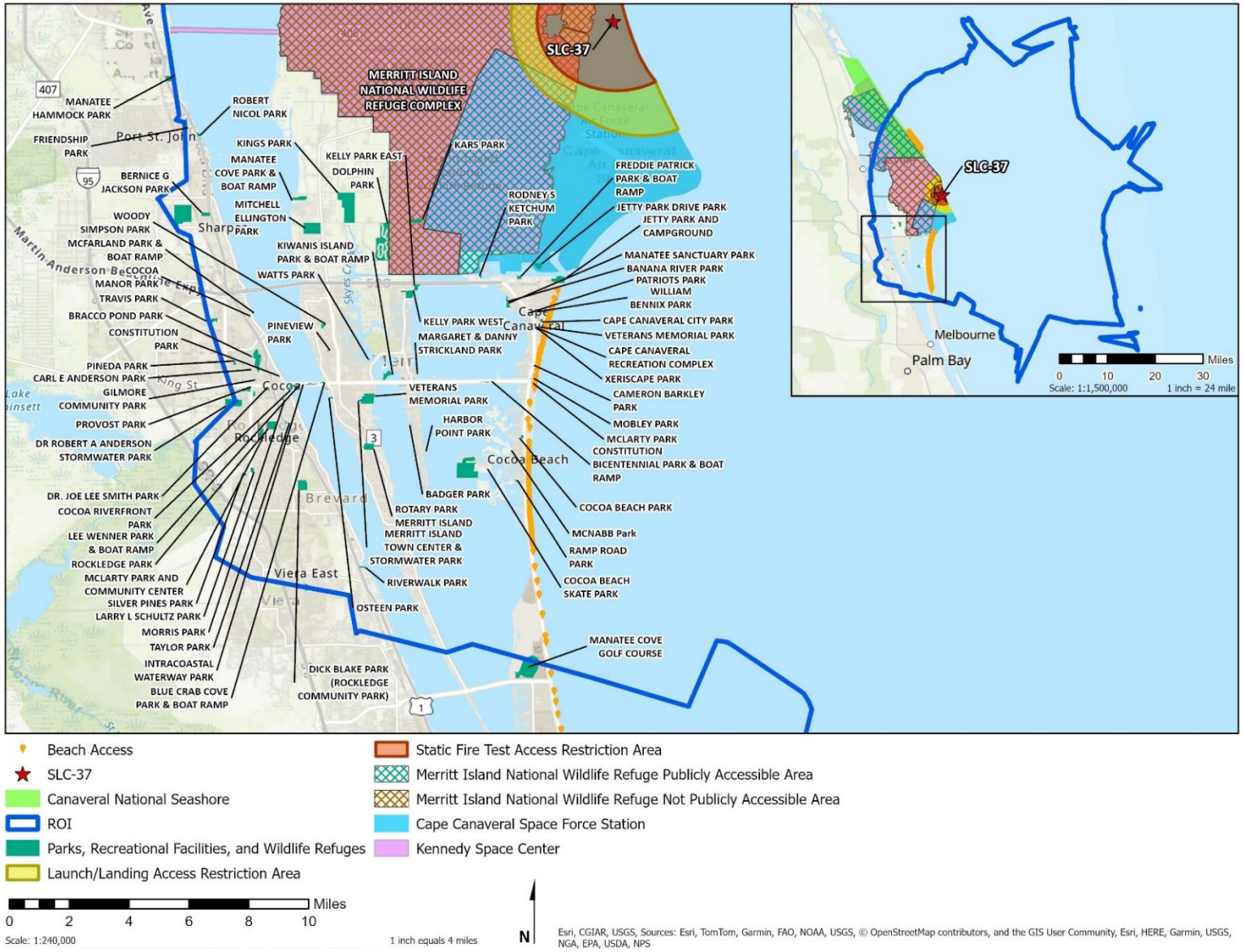


Figure 3.13-1. Public Recreation Areas in ROI

3.13.2 Environmental Consequences

This section describes the potential impacts on land use and coastal resources within the ROI. Impacts are determined by identifying any changes in land use or coastal management practices that are not in keeping with existing or future usages as described in land use plans.

The following parameters were used to analyze effects on land use:

- Consistency with applicable land use plans or policies.
- Compatibility with land uses in the vicinity to the extent that health or safety was threatened.
- Substantial reduction of regional recreational opportunities.
- Consistency with the State of Florida Coastal Management Program and CZMA.
- Impacts on other tenants' Range access and use.

3.13.2.1 Proposed Action: SLC-37 at CCSFS

This section details the potential effects on land use and coastal resources from construction and operations under the Proposed Action.

3.13.2.1.1 Construction

The following sections describe the potential construction impacts on land use, recreational areas, range management, and coastal resources.

3.13.2.1.1.1 Land Use

Under the Proposed Action, SpaceX would rebuild SLC-37, which is already developed as an active launch complex. SpaceX would also widen Phillips Parkway within the existing maintained roadway corridor, improve Old A1A for approximately 1 mile between SLC-37 to Phillips Parkway, and add two vehicle turn areas to accommodate the transportation requirements for the launch vehicle components (refer to Figures 2-2 and 2-3). A portion of the Phillips Parkway widening would occur on KSC. The improved road areas would result in the conversion of some currently disturbed and maintained vegetated areas to a transportation use; however, the Range of the Future District Plan identifies Phillips Parkway improvements to improve traffic flow for larger vehicles (USSF 2022a). Construction at SLC-37 and the roadway improvements would be consistent with land use plans and policies. Construction would have **no impact** on land use at CCSFS or the surrounding community **(Land Use Impact-1)**.

3.13.2.1.1.2 Public Recreation

Construction would occur outside of all publicly accessible recreation areas. Construction would have **no impact** on range management **(Land Use Impact-2)**.

3.13.2.1.1.3 Range Management

Construction would follow established SLD 45 requirements governing vehicle movement and construction operations. Construction would have **no impact** on range management **(Land Use Impact-3)**.

3.13.2.1.1.4 Coastal Resources

Potential effects on coastal uses and resources were analyzed through a consistency determination under the CZMA and the Proposed Action will have no impact on coastal use or resources (Appendix 3.13A). Construction and operations would have **no impact** on coastal resources **(Land Use Impact-4)**.

3.13.2.1.2 Operations

The following sections describe the potential operational impacts on land use, range management, and coastal resources.

3.13.2.1.2.1 Land Use

While SLC-37 is already designated for heavy lift launch operations, in order to accommodate Starship-Super Heavy, SLC-37 would be re-designated to a super-heavy lift SLC[11]. Although the reallocation of SLC-37 from a heavy lift to a super-heavy lift is not outlined in the Range of the Future District Plan (USSF 2022a), at the time of publication of the Plan, the concept of a Super-Heavy vehicle was in the early phases of development and not factored into SLD 45's installation planning process. Furthermore, the redesignation of SLC-37 to a super-heavy lift complex aligns with the Range of the Future District Plan's goal of maximizing development and the Gateway Planning District vertical launch requirements. The Proposed Action would also be in alignment with KSC's Master Plan.

Operations would have **no significant impact** on land use **(Land Use Impact-5)**.

3.13.2.1.2.2 Public Recreation

Although numerous parks, recreation areas, and wildlife refuges are located within the ROI, the unique characteristics of these sites would not be physically altered. Annoyance from noise exposure during launch and landing activities, and crowd control measures to ensure public safety during high profile launches could affect recreational experiences within the public parks and wildlife refuges in the ROI. However, there is a long history of launch noise at CCSFS and KSC, and the temporary noise exposure from a launch would be expected to last up to 2 minutes. In addition, approximately half of the launch and landing events under the Proposed Action would occur at night, when the parks, recreation areas, and wildlife areas are closed to visitors. Noise and sonic booms during launch and landings would not substantially impair the activities, features, or attributes associated to the publicly available recreation areas given their size. Recreational activities associated with launch viewing could be improved by the increased frequency of events.

There are no potential closures expected for CANA; however, launches and landing activities would require temporary restrictions in safety exclusion zones on a small portion of the MINWR public areas on KSC (Figure 3.13-1). Restrictions would last for approximately 3-6 hours per event (up to 76 events annually); however, only half of the closures would occur when these properties would be open to the public. Areas outside the restricted areas would be available for nature study, bird watching, and other recreational activities. Access to MINWR resources would not be restricted to the point of substantially diminishing the utility of these areas, given the temporary duration and small area of the restrictions. Temporary impacts on MINWR would be mitigated by notifying the public of potential restrictions associated with scheduled launches or landings via community engagement and by coordinating with the agencies that manage MINWR. Although CANA is not within the safety exclusion zone, it is likely that the Playalinda District of the park would receive increased visitation when Starship-Super Heavy is on the pad and during launch and landing activities. This increase in visitation may require closures to the Playalinda District, and these closures may last anywhere from a few hours to a full day. SLD 45 will coordinate with MINWR and CANA (USFWS and NPS, respectively) regarding scheduled launches and landing operations and potential restrictions **(Land Use Mitigation-1)**.

[11] SLD 45 classifies the launch complex classes based on the size of the vehicle's payload: small (less than 4,400 lb.), medium (4,400 to 44,000 lb.), heavy (44,000 to 110,000 lb.), or super heavy (greater than 110,000 lb.).

Temporary safety closures may also limit maintenance and habitat management activities, such as prescribed burn activities at MINWR, although closures would only be expected to reduce available maintenance on a portion of MINWR (Figure 3.13-1), for approximately 2 hours per launch. SpaceX will adhere to the Prescribed Burn MOU, KCA-4205 Revision C within constraints of sensitive payloads and mission operations (USSF, USFWS, and NASA 2025) **(Biology Mitigation-11)**.

Operations would have **no significant impact** on public recreation areas **(Land Use Impact-3)**.

3.13.2.1.2.3 Range Management

SLD 45 would establish mission-specific Launch Safety Exclusionary Zones, including BDAs, FCAs, and FHAs, for every Starship-Super Heavy launch and landing event. Launch Safety Exclusionary Zones at SLC-37 could affect the operations of neighboring launch service providers and could impact the prescribed fire management program. Figure 3.13-2 provides notional access restricted areas for a generic Starship-Super Heavy launch/landing and static-fire test at SLC-37. This figure is meant to demonstrate the notional extent of potential closures; however, the actual areas for a specific mission may differ based on mission requirements. Estimated closures would occur approximately 3 to 4 hours prior to a launch and closures would be lifted approximately 2 to 3 hours after a launch. SLD 45 would manage the launch schedule to minimize conflicts between launch service providers **(Socioeconomic Mitigation-1)**, and the SLD 45 commander holds ultimate authority to determine launch numbers and resolve conflicts including SpaceX's future Starship operations at SLC-37. In cases of scheduling disputes, SLD 45 mediates using objective criteria, such as national security needs, and contractual obligations. For example, a Starship-Super Heavy launch may be delayed to accommodate a time-sensitive National Security Space Launch mission.

The USSF is actively mitigating potential challenges through the development of the CCSFS Spaceport Command and Control Center (SCCC). The SCCC is specifically designed to expand capacity and efficiencies, leveraging and enhancing existing administrative and digital infrastructure to reinforce spaceport management concepts. This centralized approach aims to streamline operations and resource allocation. Furthermore, the USSF emphasizes its commitment to maximizing flexibility. Through mature process execution, the USSF has revised restrictions where possible, allowing for greater flexibility during historically restrictive periods. While acknowledging potential uncertainties introduced by additional programs, the USSF emphasizes a proactive approach to planning. The USSF actively seeks information from launch service providers to understand and adequately plan for the evolving demands on the spaceport. This collaborative approach, combined with the SCCC and continued refinement of access procedures, aims to ensure efficient operations for all launch service providers, even with the increased launch tempo and associated access restrictions.

While the Proposed Action could cause a loss of burn days due to an increased cadence of launch and landing operations, SpaceX would continue efforts through interagency coordination to ensure current fire management program activities would not be significantly impacted and SLD 45, KSC, and MINWR can continue to meet burn requirements and goals **(Biology Mitigation-11)**.

The StarGate web system was designed to streamline scheduling and operational management across the full spectrum of spaceport activities, including daily range operations, pre-launch milestones, and launch execution. As part of the broader range enterprise system, it integrates planning, asset scheduling, and utilization tracking to enhance operational readiness and resource alignment. By enabling real-time coordination among mission stakeholders and improving visibility into asset usage, StarGate would be expected to reduce scheduling conflicts, minimize impacts on Range Management, and promote access to the Eastern Range for all users **(Land Use Mitigation-2)**.

Operations would have a **potential for significant impact** on Range Management if mitigations are not successful in deconflicting range usage to accommodate 76 annual Starship-Super Heavy launches **(Land Use Impact-7)**.

3.13.2.1.2.4 Coastal Resources

Potential effects on coastal uses and resources were analyzed through a consistency determination under the CZMA and the Proposed Action would have no impact on coastal use or resources. (Appendix 3.13A). Operations would have **no impact** on coastal resources **(Land Use Impact-8)**.

3.13.2.2 No Action Alternative

Under the No Action Alternative, the DAF would not enter into a real property agreement with SpaceX and SpaceX would not develop a new launch site for Starship-Super Heavy operations at CCSFS. The No Action Alternative does not align with the Range of the Future District Plan (USSF 2022a); however, it is assumed that SLC-37 would continue to be used as a launch complex. The No Action Alternative would have **no significant impact** on land use, **no significant impact** on public recreation, and **no impact** on range use and coastal resources.

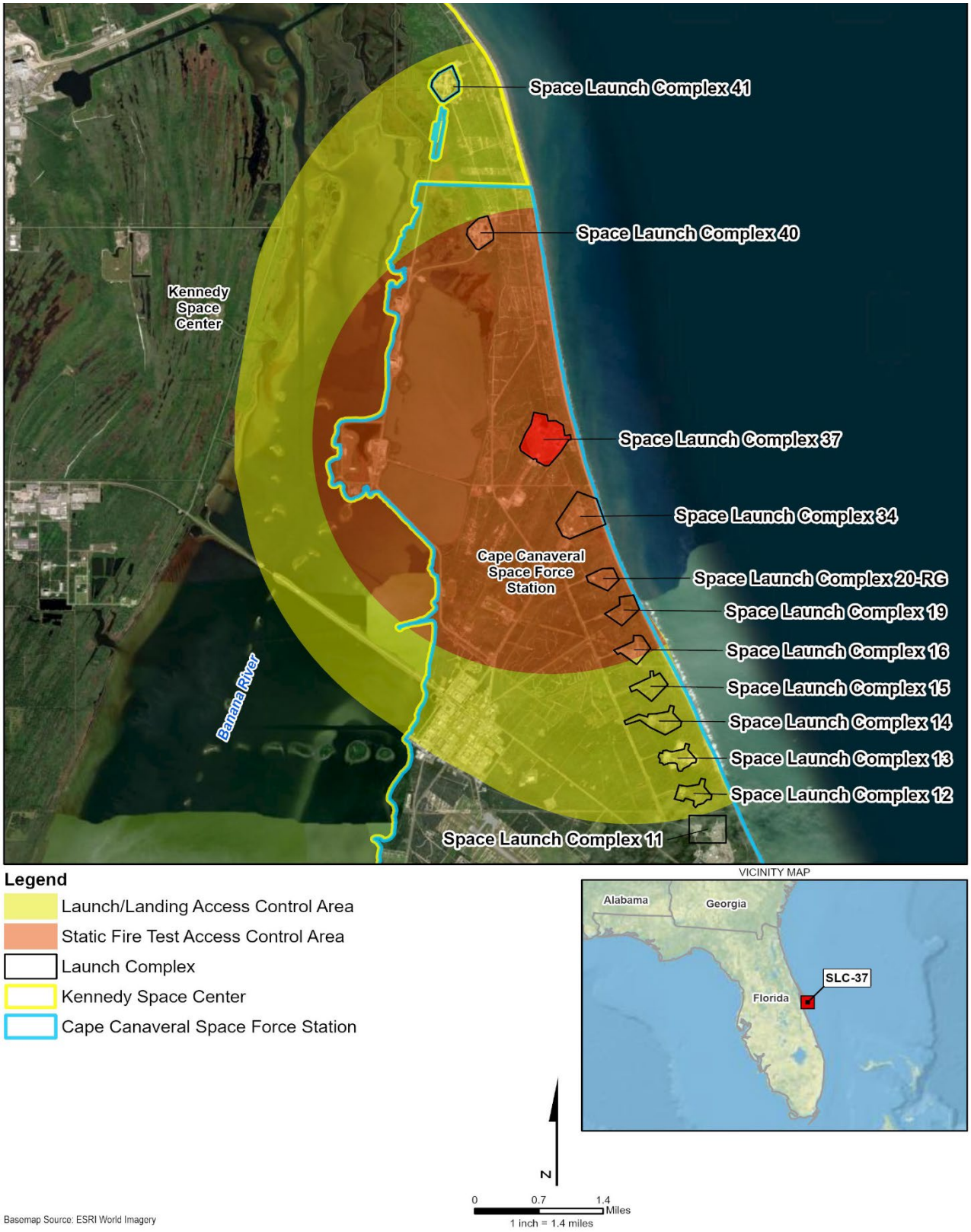


Figure 3.13-2. Notional Access Restriction Areas

3.13.3 Summary of Mitigation Measures and Impacts

This section provides a summary of the mitigation measures and impacts for this resource.

3.13.3.1 Summary of Mitigation Measures

The following additional mitigation measures would be implemented:

- **Land Use Mitigation-1**: CCSFS would coordinate with MINWR and CANA (USFWS and NPS, respectively) regarding scheduled launches and landing operations and potential restrictions.
- **Land Use Mitigation-2**: The new StarGate Web system would be expected to reduce scheduling conflicts, minimize impacts on Range Management, and promote access to the Eastern Range for all users.

3.13.3.2 Summary of Impacts

Table 3.13-1 provides a summary of the impacts on land use and coastal resources, as described in this section.

Table 3.13-1. Summary of Impacts on Land Use and Coastal Resources

Impacts	Proposed Action SLC-37	No Action Alternative
Land Use Impact-1: Impact on land use from construction	No impact	No additional impact
Land Use Impact-2: Impact on public recreation from construction	No impact	No additional impact
Land Use Impact-3: Impact on range management from construction	No impact	No additional impact
Land Use Impact-4: Impact on coastal resources from construction	No impact	No additional impact
Land Use Impact-5: Impact on land use from operations	No significant impact	Not significant
Land Use Impact-6: Impact on public recreation from operations	No significant impact	Not significant
Land Use Impact-7: Impact on range management from operations	**Potential significant impact**	No additional impact
Land Use Impact-8: Impact on coastal resources from operations	No impact	No additional impact

3.14 Foreseeable Environmental Effects

This section describes the effects of the Proposed Action when combined with the potential effects that are factually foreseeable, relevant to the DAF's decision-making process, and for which it is reasonable to hold the DAF responsible for those effects.

The impact analysis for each resource involved the following process:

- Identifying past, present, and other reasonably foreseeable actions that might occur in the same area and time frame as the Proposed Action and Alternative 1 (Section 2.1).
- Identifying the associated impacts that could combine with other activities to result in a noticeable increased impact. These were determined to be the adverse impacts identified in the previous analysis of the affected environment section for each resource area in Sections 3.1 through 3.14).
- Identifying the overall potential impacts of these activities when considered together with the project-related impacts.

The ROI for most resources consists of CCSFS, the areas immediately surrounding CCSFS and KSC, and portions of the Atlantic Ocean and Banana River. A broader assessment was taken of resources that have effects on a larger scale, such as air quality.

3.14.1 Reasonably Foreseeable Activities

This section identifies any past, present, or reasonably foreseeable activities that could interact with the Proposed Action. The temporal boundary for past actions is 5 years for most resource areas. The future temporal boundary is from 2025 through completion of the Proposed Action.

Table 3.14-1 lists launches, landings, and static-fire tests under the No Action Alternative for approved space launch operations at CCSFS and KSC with completed environmental reviews. The proposed annual launches represent the upper limits of the number of launches that could be approved. However, future launches from CCSFS would be closely scheduled and coordinated by SLD 45 and could be fewer than indicated.

Table 3.14-1. No Action Alternative for Launch, Landing, and Static Fire Test Operations at KSC and CCSFS

Event	Facility	Complex	Vehicle/Program	Day	Night	Total
Launch	KSC	LC-39A	SpaceX Falcon 9	0	36	36
Launch	KSC	LC-39A	SpaceX Falcon Heavy	0	5	5
Launch	KSC	LC-39B	NASA Space Launch System	0.6	0.4	1
Launch	KSC	LC-48N	NASA SCLV	32.5	19.5	52
Launch	KSC	LC-48S	NASA SCLV	32.5	19.5	52
Launch	CCSFS	SLC-16	Relativity Terran R	18	6	24
Launch	CCSFS	SLC-36	Blue Origin New Glenn	10	2	12
Launch	CCSFS	SLC-40	SpaceX Falcon 9	0	70	70
Launch	CCSFS	SLC-41	ULA Atlas V 551 (5 SRBs)	6.25	3.75	10
Launch	CCSFS	SLC-41	ULA Vulcan VC6S	13	7	20

Event	Facility	Complex	Vehicle/Program	Day	Night	Total
Launch	CCSFS	SLC-46	Liquid Propellant Vehicle	7.5	4.5	12
Launch	CCSFS	SLC-46	Solid Propellant Vehicle	7.5	4.5	12
Total Launch				127.8	178.2	306
Landing	CCSFS	LZ-1/2	SpaceX Falcon Booster	0	54	54
Landing	CCSFS	LZ-1/2	SpaceX Falcon Heavy Booster	0	10	10
Total Landing				0	64	64
Static Fire	KSC	LC-39A	SpaceX Falcon 9	0	36	36
Static Fire	KSC	LC-39A	SpaceX Falcon Heavy	0	5	5
Static Fire	KSC	LC-48N	NASA SCLV	32.5	19.5	52
Static Fire	KSC	LC-48S	NASA SCLV	32.5	19.5	52
Static Fire	CCSFS	SLC-11	Blue Origin BE-4 Engine Testing	108	0	108
Static Fire	CCSFS	SLC-16	Relativity Terran R Static Fire	18	6	24
Static Fire	CCSFS	SLC-16	Relativity Terran R Stage MDC Hot Fire	10	4	14
Static Fire	CCSFS	SLC-36	Blue Origin New Glenn Static Fire	10	2	12
Static Fire	CCSFS	SLC-40	SpaceX Falcon 9 Static Fire	0	70	70
Total Static Fire				211	162	373

Table 3.14-2. Past Vehicle Launches at CCSFS and KSC

Year	Total Launches
2018	20
2019	15
2020	31
2021	31
2022	57
2023	72
2024	93
Total Launches	319

Note:

Data provided by SLD 45.

Table 3.14-3. Planned Future and Potential Launch Actions at CCSFS and KSC[12]

Year	Total Potential Planned Launches
2025	135
2026	165
2027	120
2028	115
Total Launches	535

Note:

Data provided by SLD 45 as projections based on scheduling, the launch manifest, and other known information; therefore, these numbers are subject to change.

The following plans and documents were reviewed for present or reasonably foreseeable future actions within the ROI that could result in resource impacts when combined with the Proposed Action:

- Brevard County *Operating and Capital Budget Capital Improvement Program from 2022–2027* (Brevard County 2022)
- *Canaveral Port Authority 30-Year Strategic Vision Plan 2017-2047* (Canaveral Port Authority 2017)
- *Resilient Cape Canaveral Action Plan (2021)* (City of Cape Canaveral 2021)
- Cape Canaveral 2063 Program – Sustainability and Resilience (City of Cape Canaveral n.d.)
- *Approved Annual Budget 2023/2024* (City of Cocoa Beach 2023)
- Record of Decision for Launch Operator Licenses for Evolved Expendable Launch Vehicle Program Atlas V and Delta IV Vehicles (FAA 2011)
- *The Annual Compendium of Commercial Space Transportation: 2018* (FAA 2018)
- Five Year Work Program (FDOT 2024)
- *Center Master Plan Final Programmatic Environmental Impact Statement, Kennedy Space Center, Florida* (NASA 2016)
- *Environmental Assessment for Exploration Park North at the John F. Kennedy Space Center, Kennedy Space Center, Florida* (NASA 2021)
- Kennedy Space Center Master Plan (NASA 2023a)
- *Draft Supplemental Environmental Assessment for the Roberts Road SpaceX Operations Area Expansion and Supporting Infrastructure on Kennedy Space Center* (NASA 2023b)
- *2045 Long Range Transportation Plan and Amendments for Space Coast Transportation Planning Organization* (SCTPO 2023a)
- *Space Coast Transportation Planning Organization FY24–FY28 Transportation Improvement Program* (SCTPO 2023b)
- *Cape Canaveral Spaceport Complex Master Plan* (Space Florida 2017)

[12] The totals in Table 3.14-3 represent the total maximum potential for launches planned in the future at CCSFS and KSC.

- *Department of the Air Force Integrated Natural Resources Management Plan: Cape Canaveral Air Force Station, Patrick Air Force Base, Malabar Transmitter Annex, Jonathan Dickinson Missile Tracking Annex.* 45th Space Wing (DAF 2023a)
- *Department of the Air Force Integrated Cultural Resource Management Plan, 45th Space Wing* (DAF 2023b)
- *Environmental Assessment for the Relativity Terran 1 Program Launch Complex 16, Cape Canaveral Space Force Station, FL* (USSF 2020)
- *Range of the Future: Cape Canaveral Space Force Station District Plans* (USSF 2022a)
- *Environmental Assessment for Eastern Range Planning and Infrastructure Development, Cape Canaveral Space Force Station, Florida* (USSF 2024a)
- *Environmental Assessment for the Replacement of the Administrative Building Complex and Construction of the Next Big Thing Experience at KSC, Florida* (NASA 2024)
- *Environmental Assessment for Retail Warehouse at John F. Kennedy Space Center, Kennedy Space Center, Florida* (NASA 2023c)
- *Florida Spaceport System Maritime Intermodal Transportation Study Feasibility Phase*, Port Canaveral, Florida (Space Florida 2024)

Table 3.14-5. Past, Present, and Reasonably Foreseeable Future Actions

Project (Document)	Project Summary	Location	Relevance to Proposed Action
SpaceX Falcon Program at LC-39A and SLC-40 (FAA 2020b)	Construction and launch operations at LC-39A at KSC and SLC-40 at CCSFS for SpaceX's Falcon launch vehicle.	KSC/CCSFS	Existing conditions/activity would be in proximity to the Proposed Action.
Refurbish LC-39B at KSC (NASA)	Refurbishment of LC-39B, which supports NASA's Space Launch System. Completed in 2022.	KSC	Existing conditions/activity would be in proximity to the Proposed Action.
Launch operations at SLC-46 (Space Florida) (FAA 2008)	Launch operations at SLC-46.	CCSFS	Existing conditions/activity would be in proximity to the Proposed Action.
Construct Cruise Terminal Three (Canaveral Port Authority 2017)	Construction and operation of the largest terminal (185,000 square feet) at Port Canaveral with parking garage. Completed in 2021.	Port Canaveral	Existing conditions/activity would be in proximity to the Proposed Action.
Repair Cruise Terminals Five, Eight, & Ten (Canaveral Port Authority 2017)	Repairs/upgrades to moorings and facilities to accommodate larger cruise ships. Completed in 2021.	Port Canaveral	Existing conditions/activity would be in proximity to the Proposed Action.
Reconstruct Port Canaveral North Cargo Berth 3 Reconstruction (Canaveral Port Authority 2017)	Reconstruction of berthing space to support cargo and space mission requirements. Completed in 2023.	Port Canaveral	Existing conditions/activity would be in proximity to the Proposed Action.
Construct Florida Power and Light Solar Farm (NASA)	Construction of a 500-acre solar farm north of the KSC Visitor Center. Completed in 2021.	KSC	Activity would be in proximity to the Proposed Action.
Refurbish and reuse SLC-11 and SLC-36 at CCSFS (USAF 2016)	Construction and launch operations at SLC-11 and SLC-36 for Blue Origin operations. Completed in 2021.	CCSFS	Existing conditions/activity would be in proximity to the Proposed Action.

Project (Document)	Project Summary	Location	Relevance to Proposed Action
Develop Exploration Park (NASA 2021)	Construction of facilities at Exploration Park.	KSC	Existing conditions/activity would be in proximity to the Proposed Action.
Construct and Operations LC-48 at KSC (NASA 2019)	Construction and launch operations at SLC-48 for small-lift vehicles.	KSC	Existing conditions/activity would be in proximity to the Proposed Action.
Develop Naval Ordnance Test Unit Campus (USSF 2023)	Development of the Naval Ordnance Test Unit campus on CCSFS.	CCSFS	Existing conditions/activity would be in proximity to the Proposed Action.
Upgrade SLC-41 at CCSFS (USAF 2019c)	Construction and launch operations at SLC-41 for ULA's Vulcan Centaur launch program.	CCSFS	Existing conditions/activity would be in proximity to the Proposed Action.
Roberts Road Operations Area (NASA 2023b)	Site development of approximately 100 acres of land for SpaceX operations, and paving Roberts Road and A Avenue.	KSC	Existing conditions/activity would be in proximity to the Proposed Action.
Space Commerce Way Widening (FDOT 2024)	Widening 2.7 miles of Space Commerce Way to four lanes to support future growth at KSC.	KSC	Activity would be in proximity to the Proposed Action. Construction is ongoing and timing could overlap with Proposed Action construction.
Refurbish and Enhance SLC-20 (Space Florida 2020)	Construction of multi-user launch pad at SLC-20, roadways, and utilities needed to support future customers. Current cadence is 24 launches per year, and a supplemental document is being prepared to develop Pad C for a total cadence of 48 launches per year.	CCSFS	Activity would be in proximity to the Proposed Action. Construction is ongoing and timing could overlap with Proposed Action construction.
Refurbish SLC-16 at CCSFS (USSF 2024b)	Refurbish SLC-16 for Terran R launch program. Anticipating 24 launches per year.	CCSFS	Activity would be in proximity to the Proposed Action. Construction period could overlap with Proposed Action construction.
Repair and Construct Skid Strip Infrastructure (USSF 2022a)	Repairs and new construction at Skid Strip, including paved overruns, administrative facility, hangar, and apron for future DOD mission.	CCSFS	Activity would be in proximity to the Proposed Action. Construction period could overlap with Proposed Action construction.
Range of the Future Infrastructure Improvements (USSF 2024a)	Various improvements to infrastructure, including utility corridor expansion and increased utility resiliency and redundancy; facilities to relocate nonessential personnel and equipment out of Launch Exclusionary Safety Zones; establish haul routes and improve traffic flow; and construct new launch support, research, and testing facilities.	CCSFS	Activity would be in proximity to the Proposed Action. Construction period could overlap with Proposed Action construction.
SpaceX Starship-Super Heavy Construction and Operations at KSC	Construction and launch operations of Starship-Super Heavy at SLC-39A. SpaceX proposes to construct launch, landing, and other associated infrastructure at, and in proximity to LC-39A. NEPA completion in 2025. Anticipating 44 launches and 88 landings per year.	KSC	Activity could be in proximity to the Proposed Action.

Project (Document)	Project Summary	Location	Relevance to Proposed Action
Reactivation of SLC-13 at CCSFS	Refurbishment of existing inactive SLC-13 for Phantom and Vaya Space Launch operations. Anticipating 52 launches per year.	CCSFS	Activity and construction could be in proximity to the Proposed Action, with potential overlap along ICBM Road. Construction period could overlap with Proposed Action implementation.
Reactivation of SLC-15 at CCSFS	Refurbishment of existing inactive SLC for commercial launch service provider launch operations.	CCSFS	Activity would be in proximity to the Proposed Action. Construction period could overlap with Proposed Action construction.
Construct New LC at KSC	Construction of a new LC-49 at KSC to support future launch operations.	KSC	Activity could be in proximity to the Proposed Action. Construction period could overlap with Proposed Action construction.
Shuttle Landing Facility Improvements (NASA/Space Florida)	Construction at the shuttle landing facility to support commercial spaceflight and aviation testing, research, development, and training.	KSC	Activity would be in proximity to the Proposed Action. Construction period could overlap with Proposed Action construction.
Natural Gas Pipeline Construction at KSC	Construction of a natural gas pipeline operated by Florida City Gas that would provide natural gas to KSC.	KSC	Activity would be in proximity to the Proposed Action. Construction period could overlap with Proposed Action construction.
State Route 401 Drawbridge Replacement (FDOT 2024)	Replace the drawbridge on State Route 401 over the Canaveral Barge Canal. Project currently on hold.	Port Canaveral	Activity would be in proximity to the Proposed Action. Construction period could overlap with Proposed Action construction.
Expansion of Middle Turning Basin at Port Canaveral (Space Florida 2024)	Enlarge the central turning area within the port by creating more wharf space and allowing larger vessels. This expansion is needed to accommodate the growing needs of the space industry. Project currently in the feasibility planning stage. Timeline for construction is underdetermined.	Port Canaveral	Activity could be in proximity to the Proposed Action.
Stoke's Nova Space Launch Program Implementation of Phase 1 (USSF 2024d)	Reactivate and redevelop SLC-14 for Stoke's future Nova, a medium-class two-stage launch vehicle. Construction planned for 2024 through 2025 (12 to 18 months). Operations would occur in 2025.	CCSFS	Activity would be in proximity to the Proposed Action. Construction period could overlap with Proposed Action construction. Closure areas could overlap with Proposed Action closure areas.
Stoke's Nova Space Launch Program implementation of Phase 2	Develop landing operations, which may include the construction of landing pads.	CCSFS	Activity would be in proximity to the Proposed Action. Operations could overlap on ICBM Road and SLC-14. Construction could overlap with the Proposed Action operations.

Project (Document)	Project Summary	Location	Relevance to Proposed Action
Falcon at KSC (FAA 2020)	20 launches (10 Falcon 9 and 10 Falcon Heavy).	KSC	Activity could be in proximity to the Proposed Action.
Falcon Operations at SLC-40	Construction of a new landing zone at SLC-40 for up to 34 landings per year and 120 launches annually.	CCSFS	Activity could be in proximity to the Proposed Action.

3.14.2 Reasonably Foreseeable Combined Impacts on Individual Resources

The following sections provide a combined impact assessment for the resources considered in this EIS. The Proposed Action would result in a combined significant impact if the impacts of all identified past, present, and reasonably foreseeable actions, including the Proposed Action, are significant. The No Action Alternative includes only authorized projects with signed NEPA decision documents; therefore, an assessment of combined effects under the No Action Alternative is not necessary.

The DAF relied upon the best available and most reliable data at the time the DAF initiated the noise analysis (Appendix 3.5A). Therefore, the noise analysis in this EIS analyzed 70 annual launches of Falcon 9 at SLC-40, among other operations. In August 2025, after this noise analysis was completed, the FAA issued a FONSI increasing Falcon 9 launches at SLC-40 to 120 launches per year. The DAF concluded the additional time required to conduct new noise modeling to incorporate this change is unreasonable because it is not essential for evaluating alternatives and would result in failure to meet the statutorily mandated timeline for this EIS.

3.14.2.1 Air Quality and Weather-related Resiliency

Brevard County is in an attainment area for all criteria pollutants. Criteria pollutant emissions related to the construction and operation of the Proposed Action would not change Brevard County's attainment status. While the combined activities would result in increased emissions of NAAQS criteria pollutants, these increases would not change the attainment status of Brevard County.

GHG emissions during construction and operation would not meaningfully contribute to an increase in global GHG concentrations.

The Proposed Action would **not contribute to a significant combined impact** on air quality or weather-related resiliency.

3.14.2.2 Airspace and Maritime Management

Launches would become more frequent at CCSFS and KSC. As shown in Table 3.14-3, launches at CCSFS and KSC have been increasing over the past 5 years and are expected to continue to increase, with a total of 645 planned potential launches over the next 5 years. All future launches and launch service providers would abide by similar advance notice procedures, as discussed in Section 3.2 and would not result in a substantial closure of the navigable waterways around CCSFS and KSC. However, required airspace closures are currently not known.

The Proposed Action would **not contribute to a significant combined impact** on maritime management, though airspace impacts are currently not known.

3.14.2.3 Infrastructure

3.14.2.3.1 Roadways

Changes to traffic patterns from the Proposed Action during construction would be temporary, local, and minimized through coordination with SLD 45 and the implementation of construction traffic management mitigation measures. These efforts would prevent simultaneous and overlapping construction activities from multiple future projects and other reasonably foreseeable activities.

The planned launch activities and other reasonably foreseeable activities would contribute incrementally to impacts on roadways. The transportation of large loads would contribute to an increased frequency of delays on CCSFS roadways. However, the Range of the Future 2028 initiative (USSF 2022b) was developed to address the infrastructure needs for the projected increase in launches. Additionally, the CCSFS District Plans (USSF 2022b) and Eastern Range Planning and Infrastructure Development Environmental Assessment (USSF 2024b) identify improvements, including multiple infrastructure projects that would support more efficient operations at CCSFS, with a focus on optimizing haul routes and traffic flow for oversized vehicle movement. Additionally, the improvements would relocate nonessential personnel and functions outside the Launch Exclusionary Safety Zones to minimize the impacts of launch mission traffic closure for CCSFS personnel. These improvements would be beneficial to transportation at CCSFS.

The Proposed Action would **not contribute to a significant combined impact** on roadways at CCSFS or KSC.

3.14.2.3.2 Utilities

Reasonably foreseeable actions, including planned launch activities, would incrementally increase water needs at CCSFS and KSC. The amount of water required by launch service providers is unknown and would be unique to each provider. Utility improvements would be constructed as part of installation plans to improve potable water resiliency and decrease pressure variations within the distribution system at the installations (USSF 2022b), ultimately reducing the impacts on water supply at CCSFS at KSC.

Similar to the increased demand for water, wastewater supply would increase incrementally because of increased activity at CCSFS and KSC. The installation plans include improvements to wastewater infrastructure and treatment capabilities, reducing impacts on the wastewater infrastructure at CCSFS and KSC.

Some of the identified reasonably foreseeable future activities include projects to upgrade the electrical systems, utility infrastructure, and fuel commodities at CCSFS and KSC. These projects are aimed at increasing power distribution resiliency and redundancy, resulting in a beneficial effect on electrical infrastructure at CCSFS and KSC.

The Proposed Action would **not contribute to a significant combined impact** on the utilities at CCSFS or KSC.

3.14.2.4 Socioeconomics

The Proposed Action and other launch programs at CCSFS and KSC would benefit the regional economy through increased construction and commercial space industry employment, along with a potential increase in tourism. The overall increase in the number of launch and landing activities at CCSFS and KSC could cause changes to local tourism patterns and recreational uses at CANA and MINWR that may require temporary closures of these areas.

The Proposed Action and other launch service provider launch activities would result in an increased frequency of launch-related closures and restrictions to some maritime areas, potentially impacting some commercial and recreational fishermen. However, SpaceX would limit maritime restrictions and use the established notification procedures (NOTMAR and NOTAM) that allow for advanced planning to minimize interruptions to commercial and recreational fishing industries.

Other launch service providers may experience disruptions to operations given the need for safety closures on CCSFS during launch operations; however, SLD 45 would manage the launch schedule to minimize conflicts between launch service providers, and in certain circumstances, exemptions may be provided for essential personnel to be present within restricted areas. Overall, the presence of launch service providers operating from CCSFS and KSC would result in economic benefits.

The Proposed Action would **contribute to a combined beneficial impact** on socioeconomics.

3.14.2.5 Noise and Vibration

The number of launches at CCSFS and KSC are anticipated to increase in future years. Coordinating the schedules of launch and landing activities would mean that launches would not occur simultaneously, which would eliminate the potential for an additive single event noise impact. Therefore, the metrics for determining a significant combined noise effect are DNL for launch noise and CDNL for sonic booms, as these metrics best demonstrate community annoyance based on repetitive noise exposures. Figure 3.14-1 shows the DNL 65-dBA contours for operations at CCSFS and KSC, both with and without Starship-Super Heavy activities in the future. Future actions without the Starship-Super Heavy are depicted by the No Action Alternative in Table 3.14-1 and on Figures 3.14-1 and 3.14-2. Because the DNL 65-dBA contours remain on the installations under all reasonably foreseeable launch scenarios, there would be no significant combined effect from launch noise. Figure 3.14-2 shows the CDNL 60-dBC contours for operations at CCSFS and KSC, both with and without Starship-Super Heavy. The residential area exposed to the CDNL 60-dBC contour is larger with the addition of the Proposed Action.

The Proposed Action would **contribute to a significant combined impact** on human annoyance from noise.

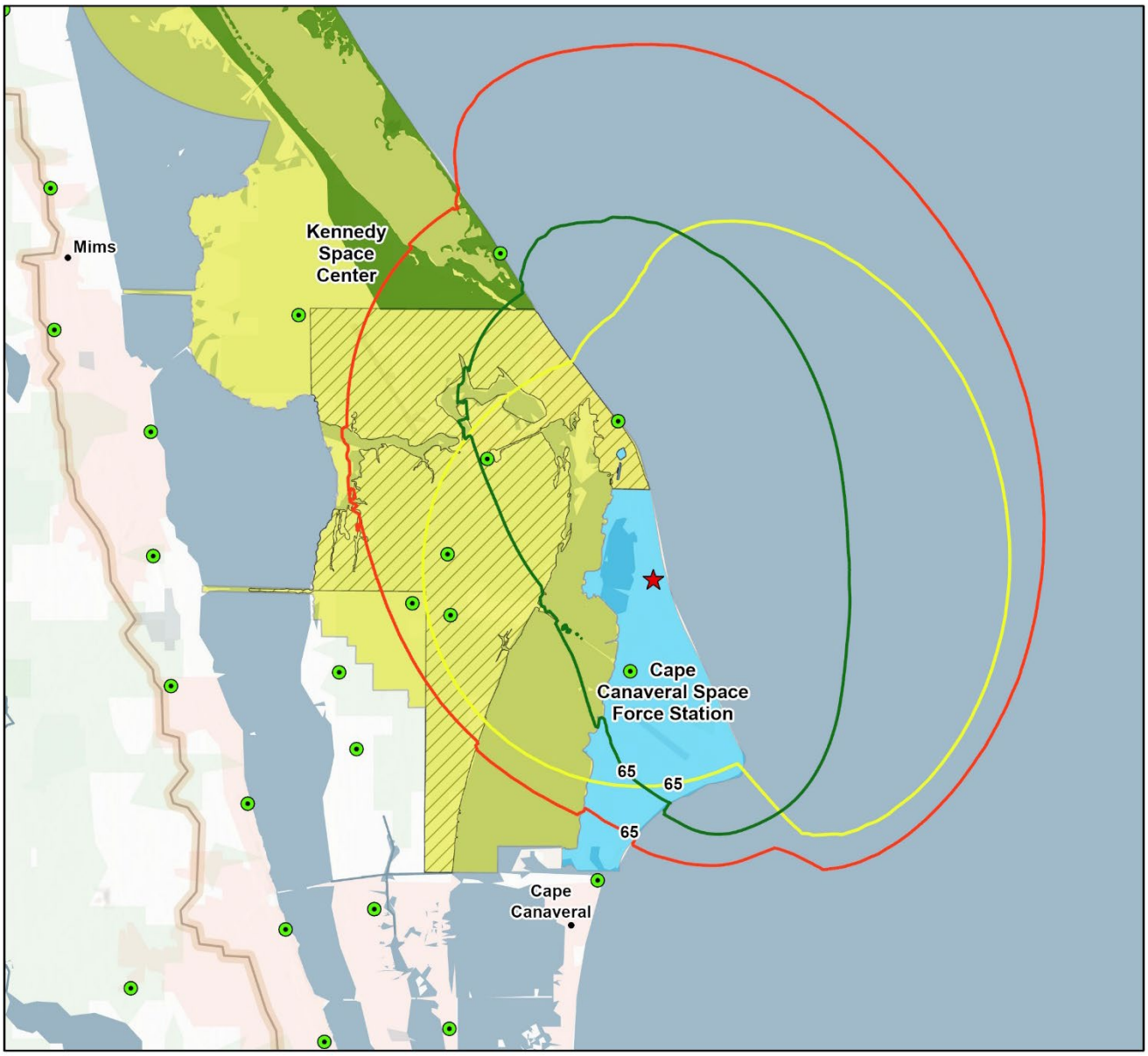


Figure 3.14-1. Cumulative DNL

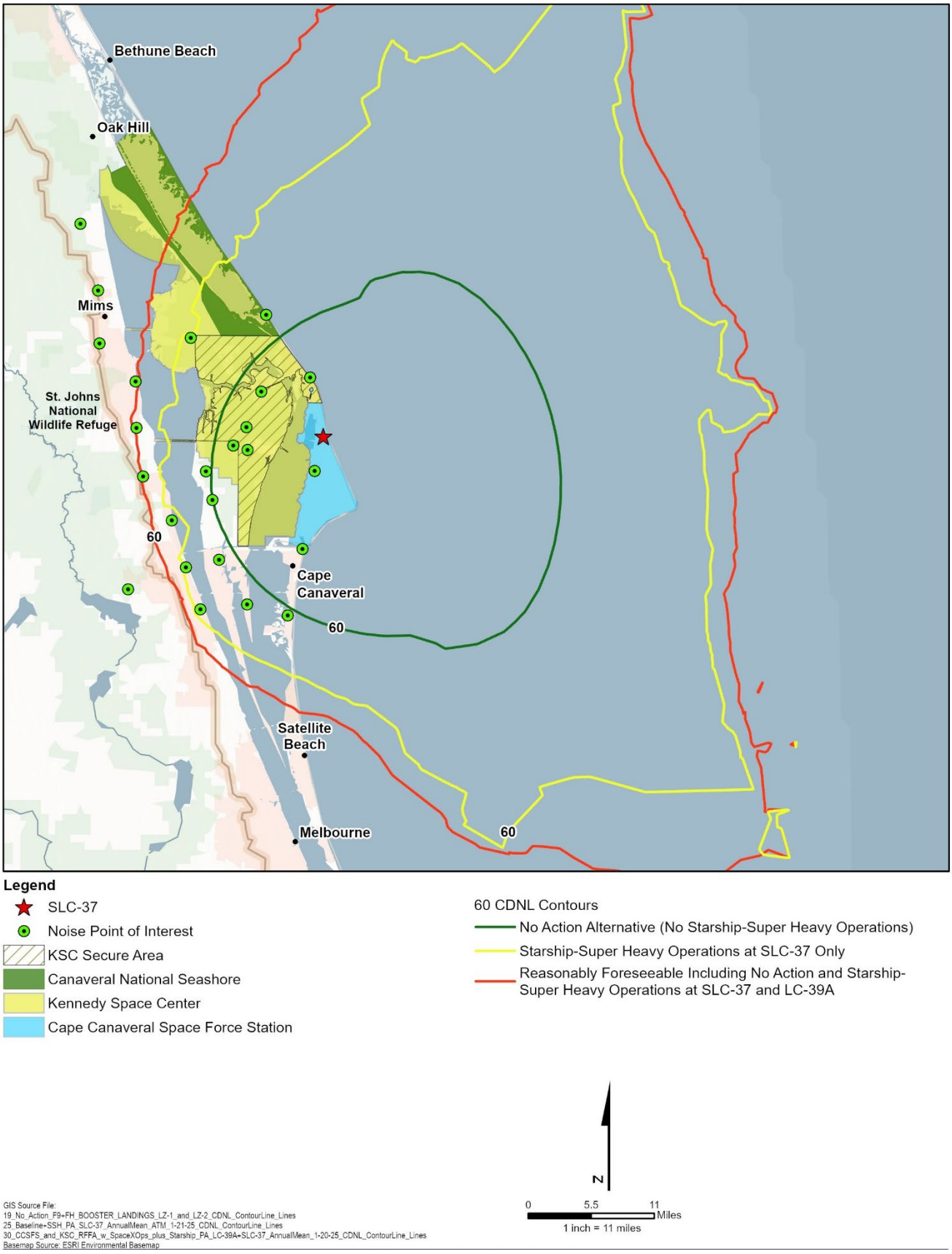


Figure 3.14-2. Cumulative CDNL

3.14.2.6 Health and Safety

The Proposed Action would adhere to established safety requirements, safety procedures, regulations, and federal law, including CCSFS safety regulations, Air Force regulations, SSCM safety regulations, and OSHA-prescribed standards. Launch operations would be scheduled by SLD 45 to prevent conflicts between launch operations at neighboring SLCs, which protects worker safety.

The Proposed Action would **not contribute to a significant combined impact** on health and safety.

3.14.2.7 Cultural Resources

While historic properties and important cultural resources could be exposed to sonic boom overpressures from operations, the probability of damage is extremely unlikely but is currently unknown. If there are any adverse effects on these resources from launch and landing operations, the impacts would be resolved through avoidance, minimization, or mitigation reached through consultation as stipulated in the PA. The likelihood of a combined effect on cultural resources is limited.

The Proposed Action would **not contribute to a significant combined impact** on cultural resources.

3.14.2.8 Visual Resources

Under the Proposed Action, SLC-37 would continue to be used as a launch complex, and no newly built features would be introduced into a previously undeveloped natural setting.

The Proposed Action would introduce new lighting at CCSFS that could affect dark sky viewing; however, operations would be consistent with the existing visual environment, and SpaceX would develop and implement an LMP to control light pollution to the maximum degree possible. Other launch service providers and construction projects are expected to implement similar LMPs.

The Proposed Action would **not contribute to a significant combined impact** on visual resources.

3.14.2.9 Biological Resources

3.14.2.9.1 Vegetation and Wildlife

Habitat removal during construction and other disturbances from reasonably foreseeable activities would be likely. Increased vehicle activity on roadways could result in an increase in impacts on wildlife from vehicle strikes. These activities would be managed in accordance with the DAF INRMP (DAF 2023a), which aims to minimize the loss of vegetation and impacts on wildlife. The Proposed Action would **not contribute to a significant combined impact** on vegetation and wildlife.

3.14.2.9.2 Protected Species

Protected species would be exposed to increased light, vehicle traffic, noise (including sonic boom overpressures), vibration, and heat during operations of Starship-Super Heavy at CCSFS as well as from other reasonably foreseeable activities. These activities, particularly launches and landings, would increase the frequency at which protected species would be exposed to these stressors. Exposure to increased noise and vibration could result in behavioral and physiological reactions, though habituation could also occur. Species may avoid areas associated with repeated disturbance and lighting may disorient birds and nesting sea turtles

and hatchlings. Increased vehicle activity on roadways could result in an increase in impacts on wildlife from vehicle strikes. However, these activities on CCSFS would comply with Section 7 of the ESA and would be conducted in compliance with the DAF INRMP (DAF 2023a) and KSC INRMP. Mitigation measures would be developed during USFWS consultation on a project-by-project basis and these measures would minimize potential impacts on biological resources.

The Proposed Action would **not contribute to a significant combined impact** on protected species.

3.14.2.10 Geology

Any potential impact on soil would be within the construction areas. Erosion-control mitigation measures would be implemented to lessen soil erosion. It is assumed that the reasonably foreseeable activities would abide by similar mitigation measures.

The Proposed Action would **not contribute to a significant combined impact** on geology and soil.

3.14.2.11 Water Resources

Combined impacts on water resources would occur if the Proposed Action and reasonably foreseeable activities inadequately addressed water resource issues. Compliance with state, federal, and local requirements for proper management of materials would minimize impacts on water resources. Construction projects requiring CWA permits must demonstrate that there would be no significant adverse effects on function, quality, or quantity of water resources before the issuance of the permits and the commitment of resources. Proper coordination and mitigation measures required by federal, state, and local agencies would be implemented for the Proposed Action and other planned launches and reasonably foreseeable activities.

The Proposed Action would **not contribute to a significant combined impact** on water resources at CCSFS.

3.14.2.12 Hazardous Materials and Solid Waste

The management of hazardous materials, solid waste, and hazardous waste at CCSFS is regulated by applicable regulations, policy, and guidance. All launch operators would develop and implement a hazardous waste management plan to ensure the proper handling of all hazardous materials and would obtain permits as required. Safeguards, management plans, and emergency response plans would be in place for all launch operators to minimize impacts from the use of hazardous materials. Therefore, a substantial combined impact from hazardous material spills or contamination associated with reasonably foreseeable activities and planned launches is not expected.

The Proposed Action would **not contribute to a significant combined impact** from hazardous materials, solid waste, and hazardous waste.

3.14.2.13 Land Use

The CCSFS District Plan considers land use compatibility, consolidation of facilities, mission sustainability, safety, and security. The reasonably foreseeable future projects are consistent with the reviewed comprehensive and land use plans. Although the Proposed Action would require redesignation of the launch complexes to super-heavy lift, these changes align with the District Plan's goals of maximizing development and reuse of SLCs, and it fits within the launch operations area of the Gateway Planning District, which is primarily used for vertical launch operations.

All reasonably foreseeable activities would undergo Coastal Zone Consistency Determinations to preserve, protect, develop, and, where possible, restore or enhance valuable natural coastal resources.

The Proposed Action would **not contribute to a significant combined impact** on land use.

Table 3.14-6 provides a summary of the combined impacts by resource.

Table 3.14-6. Summary of Combined Impacts

Resource	Combined Impact
Air Quality and Weather-related Resiliency	No significant impact
Maritime Management	No significant impact
Infrastructure–Roadways	No significant impact
Infrastructure–Utilities	No significant impact
Socioeconomic	No significant impact
Noise and Vibration	Significant impact
Health and Safety	No significant impact
Cultural Resources	No significant impact
Visual Resources	No significant impact
Biological Resources–Vegetation and Wildlife	No significant impact
Biological Resources–Protected Species	No significant impact
Geology	No significant impact
Water Resources	No significant impact
Land Use	No significant impact

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4 Other Required Analyses

This section discusses two mandatory subsections of NEPA analysis:

- The Relationship between Local Short-Term Use of the Human Environment and the Maintenance and Enhancement of Long-Term Productivity, which addresses possible conflicts with the objectives of federal, state, tribal, and local land use plans and policies or private party plans for the affected area.
- Irreversible and Irretrievable Commitments of Resources, which addresses the use of nonrenewable energy resources, natural and depletable resources, and scarce materials and the conservation potential of the action under evaluation, including associated mitigation measures.

This section also discusses incomplete and unavailable information that is pertinent to the analysis of specific environmental issues but is not available or has yet to reach the stage where it can be used.

4.1 Relationship between Local Short-term Use of the Human Environment and the Maintenance and Enhancement of Long-term Productivity

During construction, short-term uses of the environment associated with the Proposed Action would occur, causing increased soil erosion, temporary increases in noise, and temporary increases in air emissions from dust and vehicle emissions. However, the following mitigation measures would be implemented to reduce these effects:

- Implementation of design features, mitigation measures, and standard construction practices.
- Adherence to management plans and programs.
- Compliance with federal, state, and local regulations.

There would be a beneficial impact associated with increased employment opportunities during the construction period. The Proposed Action would be consistent with the designated future land use for the site and does not conflict with federal, state, or local land use plans.

4.2 Irreversible and Irretrievable Commitments of Resources

NEPA requires that a lead agency analyze the extent to which the Proposed Action and alternatives could commit non-renewable resources to uses that would be irreversible or irretrievable to future generations. A commitment would be irreversible if an impact limits the future options for a resource. A commitment would be irretrievable if it used resources that are not renewable or recoverable for future use.

Construction, demolition, paving, and vegetation clearing would use electricity, hydrocarbon fuels, and water. Construction and paving would use construction materials, such as concrete and steel. Construction and paving materials would be recycled and reused to the extent practicable; however, some irreversible or irretrievable resource loss would result. The hydrocarbon-based energy required to conduct these activities or procure the finished materials would be permanently lost. SLC-37 would be designed and operated to meet DOD policies and certification goals for energy planning, use, and management.

Construction, demolition, paving, and vegetation clearing would result in some loss of vegetated areas. Many of the areas have been previously disturbed but construction may affect vegetation or habitat in areas that support biological resources. The loss of vegetation and wildlife habitat would not be significant, and all temporarily disturbed areas would be revegetated with native plant species. Clearing vegetation would not result in an irreversible or irretrievable commitment of resources.

Construction and demolition would not result in the removal or alteration of historic properties or important cultural resources.

5 List of Preparers

The primary persons responsible for preparing and reviewing this EIS are listed in Table 5-1.

Table 5-1. List of Preparers and Reviewers

Name	Role	Experience
Michelle Rau, PMP	Project Manager; NEPA Lead, Senior Review	M.S., Business Administration; B.S., Ecology and Evolutionary Biology; 28 years of experience
Emily Gulick	Assistant Project Manager, Socioeconomics	B.A., Environmental Studies; B.A., Geography; 7 years of experience
Christina McDonough, P.E.	Senior Support, Noise	M.S., Environmental Engineering; B.S., Civil Engineering; 31 years of experience
Laura Dreher	Senior Support, Land Use, and Transportation	B.S., Civil Engineering; 24 years of experience
Lori Price	Senior Support, Cultural	M.F.A., Historic Preservation; B.A., English and Political Science; 28 years of experience
Sara Jackson, PMP	Senior Support	B.S., Environmental Studies; 23 years of experience
Fatuma Yusuf	Socioeconomics Expert	B.S., Range Management; M.A., Agricultural Economics; M.S., Statistics; Ph.D., Agricultural Economics; 22 years of experience
Mark Bastasch P.E. (OR), INCE Bd. Cert.	Noise Expert	B.S., Environmental Engineering; M.S., Environmental Engineering; 25 years of experience
Robbie Gray	Air Quality and Weather-related Resiliency Expert	B.S., Chemical Engineering; 29 years of experience
Mark McMillan	Cultural Resources Expert	M.S., Historic Preservation; B.A., Fine Art and Psychology; 20 years of experience
Joe Meyer	Cultural Resources Expert	M.S., Interdisciplinary Humanities; B.A., Anthropology; 27 years of experience
Steven Eakin	Biology Expert	M.S., Aquatic Ecology; B.S., Environmental Science; 26 years of experience
Carla Mykytiuk	Public Engagement Expert	B.S., Psychology/Sociology; 21 years of experience
Caitlin Santinelli	Air Quality and Weather-related Resiliency	B.S., Atmospheric Science; 16 years of experience
Bridget Ellis	Health and Safety and Combined Effects	B.S., Landscape Architecture; 18 years of experience
Jessica Wobig	Cultural and Visual Resources	M.A., Historic Preservation; 15 years of experience
Elizabeth Blackwell	Cultural and Visual Resources	M.S., Historic Preservation; 19 years of experience
Victoria Stoodley	Land Use, CZMA, Infrastructure, Utilities, Roadways, and Public Engagement	M.S., Wildlife Conservation; B.S., Environmental Science; 5 years of experience
Sarah Jarzombek	Geology and Water Resources	B.S., Wildlife and Fisheries; 2 years of experience

Name	Role	Experience
Ursula Rodgers	Hazardous Materials and Solid Waste	B.S., Biology, 15 years of experience
Karen Sanders	Lead Editor	JD, Law; B.A., Anthropology; 29 years of experience

Table 5-2. Independent Government Evaluation

Name	Agency
Molly Thrash	DAF
John Clark	DAF
Maj Charlton Hedden	DAF
Col Robert Liu	DAF
Jacqueline Hamburger	DAF
Karla Meyer	DAF
James Jacobsen	DAF
Robin Divine	DAF
James Cannizzo	DAF
Camille Garcia	DAF
Kelly Russell	DAF
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