Environmental Impact Statement (EIS)
for SpaceX Starship–Super Heavy Launch Vehicle
at Launch Complex 39A at the Kennedy Space Center, Florida

NATIONAL ENVIRONMENTAL POLICY ACT (NEPA)

What is NEPA?

NEPA is a U.S. law requiring all Federal agencies to consider the environmental impacts of their proposed action(s) prior to making decisions. Specifically, it requires Federal agencies to prepare detailed statements assessing the environmental impact of and alternatives to major federal actions significantly affecting the environment.

Issuance of a license or permit, including renewals and modifications, by the Federal Aviation Administration (FAA) is considered a major Federal action under NEPA. Thus, the FAA is analyzing the environmental impacts of the proposed issuance of a commercial launch Vehicle Operator License for SpaceX Starship-Super Heavy at Launch Complex 39A (LC-39A) at Kennedy Space Center (KSC), as well as temporary closure of associated airspace, in an Environmental Impact Statement (EIS). The FAA is the lead agency for this effort, with the National Aeronautics and Space Administration (NASA), the Department of the Air Force, the U.S. Coast Guard, the U.S. Fish and Wildlife Service, and the National Park Service all serving as Cooperating Agencies for this EIS.

What is an EIS?

An EIS is a detailed statement that is prepared by a Federal agency when the agency anticipates that a proposed action could result in significant impacts. An EIS:

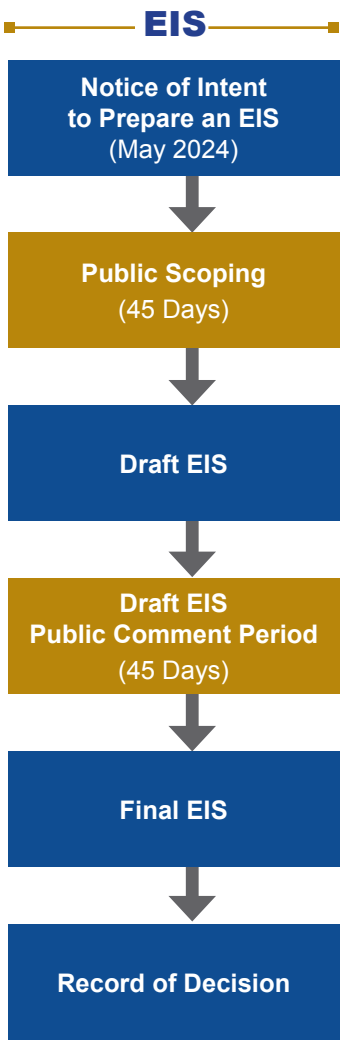
- Specifies the purpose and need for a proposed action
- Considers a range of reasonable alternatives
- Analyzes the potential impacts of the proposed action and alternatives
- Demonstrates compliance with other applicable laws (such as the Endangered Species Act and the National Historic Preservation Act)
- Contains measures that avoid, minimize, and/or mitigate environmental impacts when possible

The "EIS Process Chart" includes opportunities for public involvement as shown by the gold boxes.

The Record of Decision (ROD) is the final stage in the EIS process. The FAA will issue a ROD that states the decision, any mitigation plans, monitoring requirements, and other items. The ROD completes the environmental review, but it does not guarantee the FAA will issue a license. All safety and other reviews must be completed before the FAA can make a license determination.

What is Scoping?

Scoping occurs at the beginning of the EIS process to help understand community-specific concerns regarding the scope of analysis. It encourages the participation of other Federal, State, Tribal governments, local agencies, and other potentially affected or interested persons. Scoping helps the lead agency identify what environmental topics should be studied in the EIS and options or alternatives to the proposed action that should be analyzed.



How to get Involved

For the gold boxes shown in the "EIS Process Chart," there are opportunities for you to participate as described below.

During the "**Public Scoping**" step, your input helps identify resources and alternatives to be evaluated in the Draft EIS.

To ensure the FAA has sufficient time to consider issues identified during the public scoping period, comments should be submitted by one of the methods listed below no later than **June 24, 2024**. All comments will receive the same attention and consideration in the preparation of the EIS.

Comments, statements, or questions concerning scoping issues must be identified with the Docket Number **FAA-2024-1395** and may be provided to the FAA as follows:

Federal E-Rulemaking Portal: http://www.regulations.gov. Retrieve the docket by conducting a search for "FAA-2024-1395" and follow the online instructions for submitting comments. Please note that the FAA will post all comments on the Internet without changes, including any personal information provided.

By U.S. mail to:
Ms. Eva Long
FAA Environmental Protection Specialist
SpaceX LC-39A EIS
c/o Leidos
2877 Guardian Lane
Virginia Beach, VA 23452

We encourage you to submit comments electronically through the Federal E-Rulemaking Portal. If you submit your comments electronically, it is not necessary to also submit a hard copy. All comments received will be posted without change to http://www.regulations.gov. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, be advised that your entire comment—including any personal identifying information you provide—may be publicly available at any time. While you can request in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

If you would like to be added to the mailing list to receive updates on this project, please send an email to SpaceXStarship39AEIS@icf.com stating in the subject or message, "Subscribe to project list."
PLEASE NOTE: comments sent to the project email address will not be considered a formal public comment. Please use one of the methods described above to submit public comments.

Next Steps

Once the **Draft EIS** is released, the FAA will invite the public to review and comment on the analysis. The release of the Draft EIS and the opening of the Draft EIS comment period will be announced in a "Notice of Availability" (NOA) published in the Federal Register, by e-mail for those who request it, and in local newspapers of broad circulation. The FAA will hold additional public meetings to receive comments on the Draft EIS.

After consideration of public comments received on the Draft EIS, the FAA then will prepare the Final EIS. Once the Final EIS is complete, an NOA will be published in the Federal Register and local newspapers.

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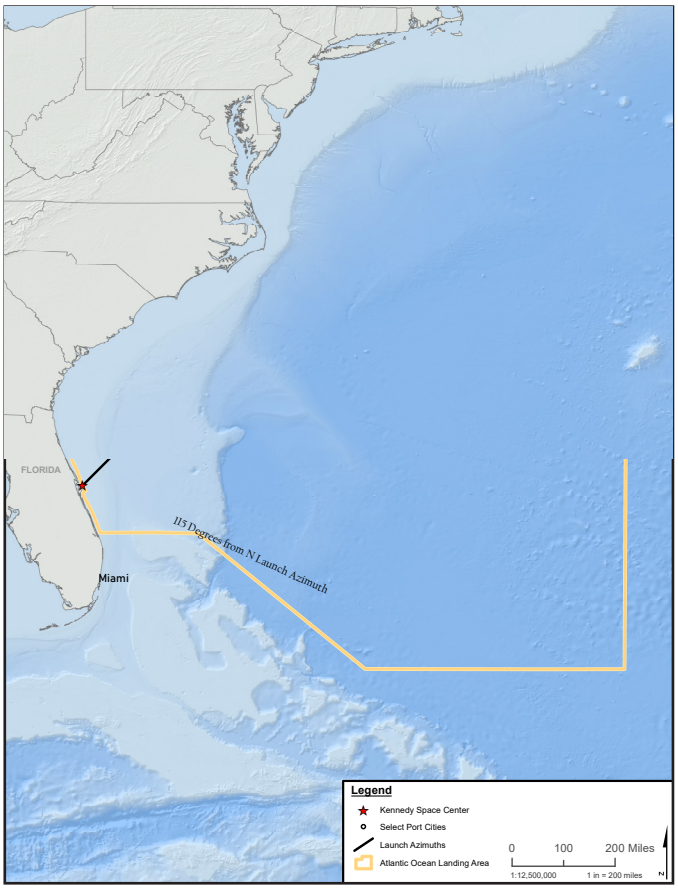
PROPOSED ACTION

The Federal Aviation Administration (FAA) is preparing an Environmental Impact Statement (EIS) to evaluate the potential environmental impacts of issuing a Vehicle Operator License to SpaceX for the Starship-Super Heavy launch vehicle at Launch Complex 39A (LC-39A), Kennedy Space Center (KSC), Florida. SpaceX proposes to construct launch, landing, and other associated infrastructure at and in proximity to LC-39A. The proposal also includes Starship-Super Heavy launches at LC-39A; recoverable Super Heavy booster and Starship landings at LC-39A or on a droneship; and expendable Super Heavy booster and Starship landings in the ocean.

- Landing the Super Heavy booster at LC-39A, or
- Landing the Super Heavy booster downrange in the Atlantic Ocean on a droneship, or
- Expending the Super Heavy booster in the Atlantic Ocean, no closer than 5 nautical miles off the coast or,
- Landing Starship at LC-39A or,
- Landing Starship on a droneship, or
- Expending Starship in the open ocean between 55 degrees south latitude and 55 degrees north latitude.



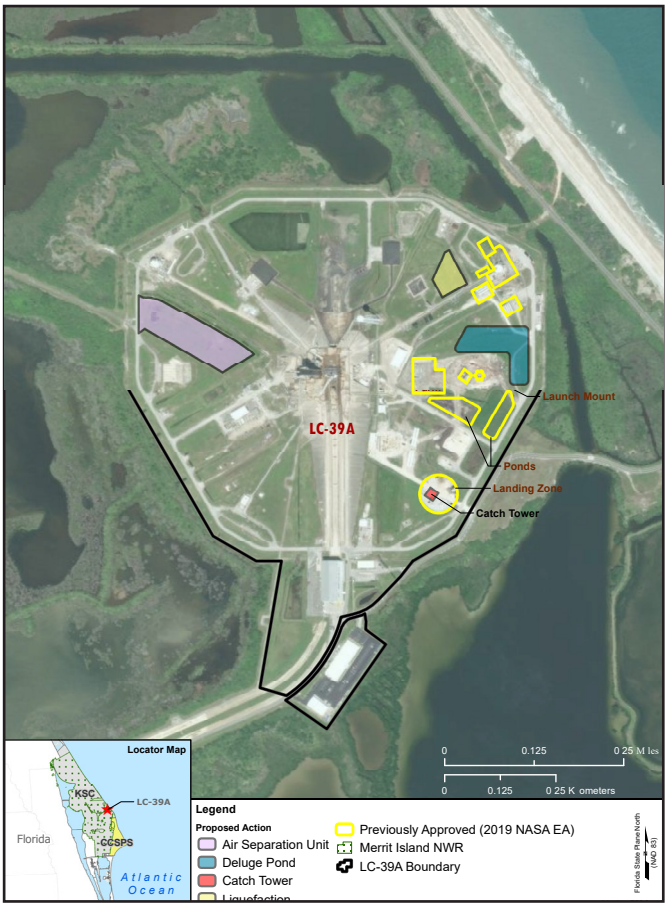
SpaceX has constructed some infrastructure at the site (as outlined in the “Background” section). SpaceX proposes to construct additional infrastructure improvements at LC-39A to support the Starship-Super Heavy operations. These include a Super Heavy catch tower; onsite facilities for propellant generation and propellant storage (e.g., natural gas pretreatment system and methane liquefier); cooling tower; air separation unit; and deluge system.

Background

In September 2019, National Aeronautics and Space Administration (NASA) completed the Final Environmental Assessment for the SpaceX Starship and Super Heavy Launch Vehicle at Kennedy Space Center (KSC) (“2019 EA”) to evaluate the potential environmental impacts resulting from construction and operations at LC-39A for the SpaceX Starship-Super Heavy launch vehicle. NASA issued a Finding of No Significant Impact on September 19, 2019, concluding the environmental impacts associated with Starship-Super Heavy infrastructure development and operations would not significantly impact the environment.

Since 2019, SpaceX has begun development at LC-39A (e.g., construction of a launch mount) consistent with the scope of the 2019 EA. However, the Starship-Super Heavy concept of operations has evolved from the original 2019 EA scope. SpaceX now proposes to construct additional launch infrastructure, launch an advanced design of the Starship-Super Heavy vehicle, operate at a projected higher launch tempo, and land the Super Heavy booster at LC-39A in support of its reusability concept.

SpaceX would continue to launch Falcon 9 and Falcon Heavy missions at LC-39A while Starship-Super Heavy is operational.



LC-39A Improvements Map

Purpose and Need for the Proposed Action

The purpose and need for Starship-Super Heavy at KSC and LC-39A is to develop and implement formal agreements with SpaceX for use of NASA assets and to provide services and commodities to enable Starship-Super Heavy launches. The need for Starship-Super Heavy at KSC aligns with NASA's Commercial Space Launch Act, as amended, which is to support the United States' goal of encouraging activities by the private sector to strengthen and expand United States space transportation infrastructure.

SpaceX proposes that the Starship-Super Heavy at KSC serves to increase the company's operational portfolio diversity (i.e., the ability to support multiple customer missions at different locations) and capabilities through multiple Starship-Super Heavy launch sites, reduce space transportation costs (including NASA's Artemis and Human Landing System programs), enhance exploration, support national leadership in space, and make space access more affordable.

Alternatives

The Council on Environmental Quality defines "reasonable alternatives" as those "that are technically and economically feasible and meet the purpose and need for the proposed action" (40 CFR §1508.1(hh)). Through an alternative screening process based on Starship-Super Heavy requirements and the purpose and need, the 2019 EA identified LC-39A as the preferred location for Starship-Super Heavy operations, and SpaceX has constructed infrastructure as authorized by NASA's 2019 Finding of No Significant Impact and other approvals. LC-39A could provide time-critical mission capability to NASA for near-term lunar exploration on the NASA Artemis and Human Landing System programs. In addition to NASA's mission-critical requirements, LC-39A would provide launch site diversity for Starship-Super Heavy to serve commercial exploration interests. Therefore, the only alternative to the Proposed Action as described in this EIS is the No Action Alternative. Under the No Action Alternative, the FAA would not issue a Vehicle Operator License for Starship-Super Heavy operations at LC-39A. SpaceX would not implement further improvements or launch Starship-Super Heavy from LC-39A. As required by the National Environmental Policy Act, potential impacts associated with the No Action Alternative will be analyzed in this EIS.

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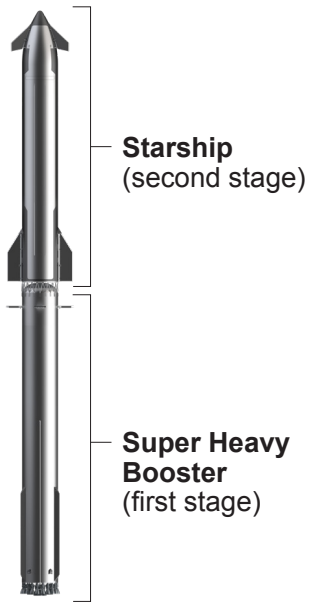
STARSHIP-SUPER HEAVY LAUNCH VEHICLE

Starship-Super Heavy is comprised of two stages: Super Heavy is the first stage (or booster), and Starship is the second stage. The fully integrated Starship-Super Heavy launch vehicle is expected to be up to 492 feet (150 meters) tall depending on configuration and approximately 30 feet in diameter. As designed, both stages are reusable, with any potential refurbishment actions taking place at SpaceX facilities located at NASA's Kennedy Space Center (KSC). Both stages are expected to have minimal post-flight refurbishment requirements; however, they may require periodic maintenance and upgrades.

The planned configuration consists of 35 Raptor engines for Super Heavy and nine Raptor engines for Starship. The Raptor engine is powered by liquid oxygen and liquid methane. Super Heavy is expected to hold up to 4,100 metric tons of propellant and Starship up to 2,600 metric tons of propellant. Maximum lift-off thrust of the launch vehicle is anticipated at 103 meganewtons[1] (MN). Starship would have a maximum lift-off thrust of approximately 28 MN. Launch propellant and commodities include liquid nitrogen, water, gaseous oxygen, gaseous methane, gaseous nitrogen, helium, hydraulic fluid, liquid oxygen, and liquid methane.



Starship-Super Heavy Launch Vehicle Design

[1] MN is equal to 1,000,000 newtons, which are equal to the force needed to move 1 kilogram of mass at a rate of 1 meter per second squared.

Starship-Super Heavy Operations

Pre-Launch: SpaceX's pre-flight operations could include ground-testing activities, tanks testing, spin-prime tests, mission rehearsals (i.e., dry and wet dress rehearsals), and static fire engine tests. 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, but the vehicle is fueled. This test allows the launch team to practice timelines and procedures used for launch, and to identify potential issues. The goal of these operations is to verify that all vehicle and ground systems are functioning properly, as well as to validate that all procedures are properly written.

Launch: SpaceX proposes to launch Starship-Super Heavy from Launch Complex 39A (LC-39A) up to 44 times per year. These launches could occur at any time of day or night. During a launch, ignition of the Starship-Super Heavy Raptor engines would generate a heat plume. The plume would appear clear and consist of water vapor, carbon dioxide, carbon monoxide, hydrogen, methane, nitrogen oxides, and oxygen. The heat plumes and increased temperatures in this area would be temporary and would only occur during engine ignition and dissipate within minutes. A flame diverter or similar infrastructure (e.g., a water-cooled diverter) would be constructed to reduce potential impacts due to the plume. SpaceX is anticipating up to approximately 1 million gallons of deluge water would be used during launch.

Temporary airspace closures may be necessary to ensure public safety during the launch/landing operations.

- Notice to Air Missions (NOTAM) required for notice of unanticipated or temporary closures to components of, or hazards in, the National Airspace System.
- NOTAM issued 24-72 hours prior to launch/reentry.

Super Heavy Landing: Super Heavy could land at LC-39A or on a droneship (mobile vessel not attached to the sea floor) in the Atlantic Ocean. SpaceX could also expend Super Heavy in the Atlantic Ocean, no closer than 5 nautical miles off the coast. After releasing Starship, Super Heavy would then perform a controlled descent using atmospheric resistance to slow it down and guide it to its landing location. As Super Heavy slows down during its landing approach, a sonic boom would be generated. Once near the landing location, Super Heavy would ignite its engines to conduct a controlled landing and land vertically at the catch tower or at the landing location. If a landing occurred downrange in the Atlantic Ocean, it would be delivered by vessel to Port Canaveral, Hangar AF Wharf, or the KSC turn basin and transported the remaining distance to the proposed launch site and/or other SpaceX facilities over the roadways.

- No shipping lanes would be altered or closed.
- Temporary Ship Hazard Areas would be identified to ensure public safety.
- Notice to Mariners, published weekly or as needed by the U.S. Coast Guard, provides notification regarding Ship Hazard Areas.

Starship Landing: Starship could land at LC-39A or on a droneship in the open ocean between 55 degrees south latitude and 55 degrees north latitude. Starship would perform a controlled descent using atmospheric resistance to slow the vehicle down and guide it to its landing location. As Starship slows down during its landing approach, a sonic boom would be generated. Following a successful landing, Starship would go into an automatic safing sequence (i.e., put the vehicle in a safe state). If a landing occurred downrange in the broad ocean area, it would be delivered by vessel to Port Canaveral, Hangar AF Wharf, or the KSC turn basin and transported the remaining distance to the proposed launch site and/or other SpaceX facilities over the roadways. Following Starship landings at the launch site, it would be transported from the landing pad to the adjacent launch mount or to one of SpaceX's production locations over the roadways for refurbishment.

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ROLE OF THE FEDERAL AVIATION ADMINISTRATION (FAA)

FAA's Involvement

The FAA is the lead agency on the Environmental Impact Statement (EIS). The FAA licenses commercial launches/reentries and approves airspace closures.

FAA's Federal Action

Upon acceptance of SpaceX's application for a Vehicle Operator License (VOL), the FAA will evaluate the proposal and determine whether to issue a VOL to SpaceX for Starship-Super Heavy commercial operations at Launch Complex 39A at the Kennedy Space Center, Florida.

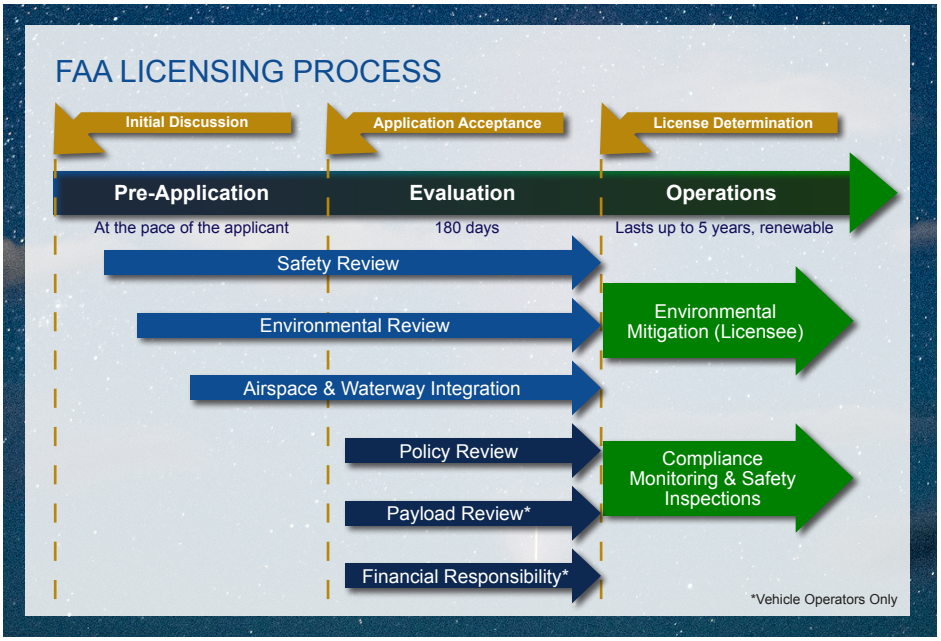
For approved launch activities, the FAA would be responsible for approval of airspace closures for launch and landing operations to ensure public safety.

FAA License Determination

As shown in the figure below, the FAA VOL application evaluation includes four reviews: safety, environmental, policy, and payload. The applicant must show financial responsibility and obtain notification agreements for affected airspace and waterways. If the license applicant satisfies the regulatory requirements outlined in 14 Code of Federal Regulations Part 450, the FAA would issue a VOL that would allow SpaceX to conduct launches and/or reentries.

The EIS fulfills the environmental review portion of the license evaluation and determination. The environmental review must be completed before the FAA decides to issue a license or deny the application. Environmental mitigation requirements become a condition of the license. Completion of the environmental review does not guarantee that the FAA will issue a VOL.

The FAA performs safety inspections during operations associated with the VOL.



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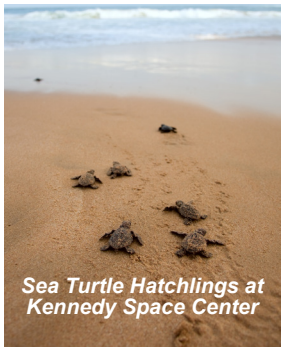
RESOURCES TO BE STUDIED IN THE ENVIRONMENTAL IMPACT STATEMENT (EIS)

Impacts to resources from the Proposed Action have not yet been identified, as the FAA is in the preliminary stage of the analysis. The potential environmental impacts of proposed construction and operational activities, including those from launch and landing, will be analyzed in the EIS.

Air Quality – defined as the concentration of pollutants in the atmosphere. A region's air quality is influenced by the type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing meteorological conditions.


Sea Turtle Hatchlings at Kennedy Space Center

Biological Resources – comprises the plant and animal species, and ecological relationships of the land, water, and coastal areas within the study area. Several Federal and State laws apply to the Proposed Action.

Climate – describes the weather characteristics and patterns in a region over time. Greenhouse gases are emissions that trap heat in the atmosphere. These emissions occur from natural sources and human activities.

CONSULTATIONS:

- The Federal Aviation Administration (FAA) is initiating consultation with the United States Fish and Wildlife Service under Section 7 of the Endangered Species Act, and the Migratory Bird Treaty Act, regarding potential impacts to federally listed threatened and endangered species, critical habitat, and migratory birds.
- The FAA is initiating consultation with the National Marine Fisheries Service under Section 7 of the Endangered Species Act, and the Marine Mammal Protection Act, for potential impacts to protected marine species.
- The FAA is initiating National Historic Preservation Act (NHPA) Section 106 Consultation to determine the potential effects of the Proposed Action on historic properties.

Coastal Resources – the Florida Coastal Management Program is managed by nine State agencies and five water management districts. A Federal agency must determine consistency with 24 statutes that protect and enhance the State's natural, cultural, and economic coastal resources. The statutes apply to beach and shore preservation, emergency management, State lands, State parks and preserves, trails, historic resources, water resources, outdoor recreation, fish and wildlife conservation, and public health to name a few.

U.S. Department of Transportation (DOT) Act, Section 4(f) – refers to the original section of the 1966 Act and applies to projects that require approval by an agency of the Department of Transportation, including the FAA.

Section 4(f) properties include significant publicly owned public parks, recreation areas, and wildlife or waterfowl refuges, or any publicly or privately owned historic site listed or eligible for listing on the National Register of Historic Places.

Hazardous Materials, Solid Waste, and Pollution Prevention – describes the use and management of hazardous materials and solid/hazardous wastes in accordance with regulatory requirements and measures to protect health and safety and to prevent or respond to spills.

Historical, Architectural, Archaeological, and Cultural Resources – includes historic properties, architectural resources, archaeological resources, cultural items, Native American sacred sites, and other properties of cultural significance subject to the NHPA. NASA is leading the consultation with the Florida State Historic Preservation Office to assess potential impacts to protected historic/cultural resources. In addition to the NHPA, Native American Tribal resources are protected by multiple Federal laws and executive orders, including the Native American Graves Protection and Repatriation Act.

Merritt Island National Wildlife Refuge

Land Use – evaluates the current and planned uses of land and the compatibility of the Proposed Action with the regulations, policies, or zoning that control land use.

Natural Resources and Energy Supply – addresses the use of natural resources such as water, metal, asphalt, etc., and sources of energy including electricity, heating and cooling, and fuels.

Noise – discusses the types or sources of noise and the associated sensitive receptors in the human environment. Sound is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air or water, and are sensed by the human ear. Noise analysis will also address potential impacts to ecological and cultural resources.

Socioeconomics, Environmental Justice, and Children's Environmental Health and Safety Risks – describes the elements of the human environment (e.g., population, employment, income, housing, and public services). Environmental justice is defined by the U.S. Environmental Protection Agency as "the just treatment and meaningful involvement of all people regardless of income, race, color, national origin, Tribal affiliation, or disability, in agency decision-making and other federal activities that affect human health and the environment." The FAA must also identify and assess environmental health and safety risks that may disproportionately affect children.

Commercial Fishing in the Atlantic Ocean

Launch at Kennedy Space Center

Visual Effects – includes the natural and built features of the landscape visible from public views that contribute to the visual quality of an area. Visual perception is an important component of environmental quality that could be changed by implementing the Proposed Action. Visual impacts occur as a result of the relationship between people and the physical environment.

Water Resources – includes wetlands, floodplains, surface waters, groundwater, and wild and scenic rivers. Analysis will address potential impacts under the Clean Water Act, Wild and Scenic Rivers Act, and other water resource-related regulations.

Cumulative Impacts – This analysis will consist of an evaluaiton of potential direct and indirect impacts of the Proposed Action when added to other past, present, and reasonably foreseeable relevant actions in the affected area.

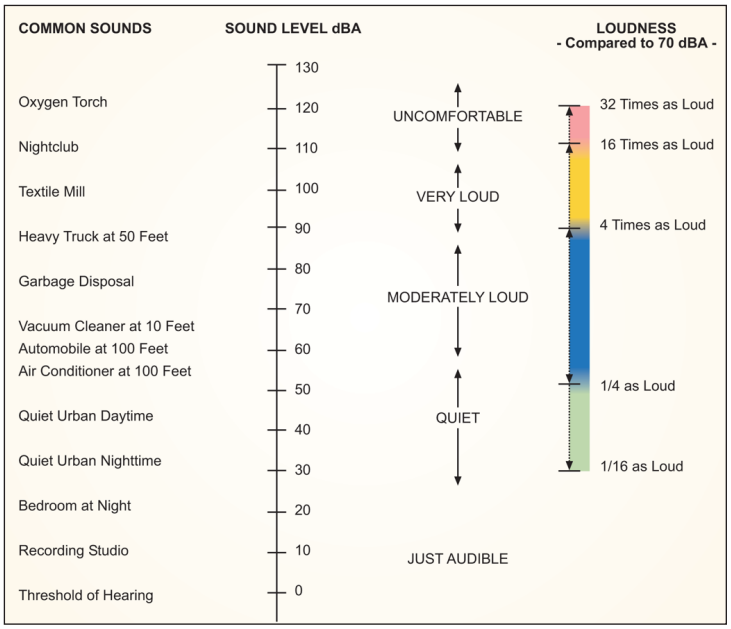
NOISE BASICS

What is Noise?

Noise is considered unwanted, extraneous, or annoying sound that interferes with or disrupts normal human activities. The response of different individuals to similar noise events is diverse and is influenced by the type of noise, perceived importance of the noise, its appropriateness in the setting, time of day, type of activity during which the noise occurs, and sensitivity of the individual. Sound is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air or water, and are sensed by the human ear. Sound is all around us. The perception and evaluation of sound involves three basic physical characteristics:

- **Duration** – the length of time the sound can be detected
- **Magnitude** – the acoustic energy, which is expressed in terms of sound pressure, in decibels (dB)
- **Frequency** – the number of cycles per second the air vibrates, in hertz

The duration of a noise source can be continuous (constant), transient (short duration), or impulsive (typically less than 1 second). Launch noise and sonic booms (i.e., shock waves created from supersonic flight when a launch vehicle travels faster than the speed of sound) are classified as transient noise events. A transient noise event has a beginning and an end where the sound temporarily rises above the background and then fades away. Transient sounds are typically associated with a sound source that moves, such as, an aircraft overflight.



Typical A-Weighted Levels of Common Sounds

The dB is a logarithmic unit used to represent the magnitude of a sound, also referred to as the sound level. Environmental noise measurements are usually on an "A-weighted" scale that filters out very low and very high frequencies to replicate human sensitivity. It is common to add the "A" to the measurement unit (dB) to identify that the measurement has been made with this filtering process (dBA). The figure above provides a chart of A-weighted sound levels from typical noise sources.

Noise Analysis

Noise criteria have been developed to protect the public health and welfare of surrounding communities. The following describe noise criteria that will be used in the noise analysis that address human annoyance, hearing conservation, and structural damage.

Human Annoyance. The "Day-Night Average Sound Level" (DNL) metric has been found to correlate well with the human annoyance for regularly occurring transportation noise. The FAA considers DNL to be the best available metric for prediction of long-term human annoyance. FAA Order 1050.1F states that, in most locations, a significant noise impact would occur if the Proposed Action would cause noise-sensitive areas to experience a 1.5 dBA DNL increase when compared to the No Action Alternative during the same timeframe and the end-state noise level would be at or above 65 dBA DNL. FAA Order 1050.1F notes that the 65 dBA DNL threshold does not fully address the effects of noise on visitors to areas such as national parks or designated wilderness areas where a quiet setting is a generally recognized purpose and attribute. Supplemental noise metrics are used in the evaluation of the significance of noise impacts within national parks, national wildlife refuges, and historic sites including traditional cultural properties.

Structural Damage. FAA Order 1050.1F does not give specific instructions on the assessment of potential structural damage caused by noise. In this EIS, potential impacts will be assessed by comparing calculated noise-induced structural vibration levels at sensitive locations against widely used structural impact criteria. The likelihood of damage is unique to the characteristics of the sound experienced (e.g., magnitude , duration, and frequency), the materials of which the structure is built, and the condition of the structure.

Sonic booms are also commonly associated with structural damage. A large degree of variability exists in the possible effects of a sonic boom. For example, the probability of a window breaking when exposed to a sonic boom of 1 pound per square foot (psf) ranges from one in a billion to one in a million with much of the variability depending on the condition of the glass. At 10 psf, the probability of glass breaking is between 1 in 100 and 1 in 1,000. Laboratory tests involving glass have shown that properly installed glass will not break at overpressures below 10 psf, even when exposed to repeated sonic booms. Damage to plaster has the potential to occur in the same range of overpressures as damage to glass. In general, for well-maintained structures, the threshold for damage from sonic booms is 2 psf, below which damage is unlikely.

Land Use Compatibility. FAA Order 1050.1F states that special consideration needs to be given to noise-sensitive areas within Section 4(f) properties where the land use compatibility guidelines in 14 Code of Federal Regulations Part 150 are not relevant to the value, significance, and enjoyment of the area in question. Noise analysis for this Proposed Action will recognize areas in which a quiet setting is a recognized attribute and part of the purpose of the area.

Hearing Conservation. Multiple Federal government agencies have provided guidelines on permissible noise exposure limits to protect human hearing. The most conservative workplace noise level limit has been set by the Occupational Safety and Health Administration at 115 dBA for non-impulsive noise over an allowable exposure duration of 15 minutes. The National Institute for Occupational Safety and Health limits for non-impulsive noise are less conservative. For impulsive noise, such as sonic booms, the Occupational Safety and Health Administration and National Institute for Occupational Safety and Health have both established maximum allowable peak noise levels of 140 dB, which equates to an overpressure of about 4 psf. Workplace noise level recommendations are designed such that, even with steady near-daily exposures over the course of an entire career, the excess risk of developing occupational noise-induced hearing loss is minimized.

NOISE METRICS

Different noise metrics help to quantify the noise environment and describe impacts from noise.

Overall sound pressure level (OASPL). Provides a measure of the sound level at any given time.

Maximum OASPL. Indicates the highest OASPL over the duration of the noise event; a single-event metric useful for analyzing short-term responses to noise exposure.

Maximum A-weighted OASPL. Represents the maximum A-weighted OASPL during the noise event; used for the analysis of noise impacts to humans and wildlife.

Sound Exposure Level. Provides a measure of the cumulative noise exposure of the entire acoustic event.

Time Above A-weighted OASPL Threshold. During times when OASPL is above 66 dBA, normal conversation becomes difficult.

DNL. Represents an average sound level over the course of an average annual day. To account for increased human sensitivity to noise at night, a 10-dB penalty is applied to events occurring between the hours of 10:00 p.m. and 7:00 a.m.

Peak Particle Velocity. Measured in millimeters per second, PPV the metric for noise-induced vibration and is calculated for specific structure categories in specific frequency bands.

Sonic Boom Overpressure. The magnitude of the changes in air pressure associated with a sonic boom is typically expressed in pounds per square foot.

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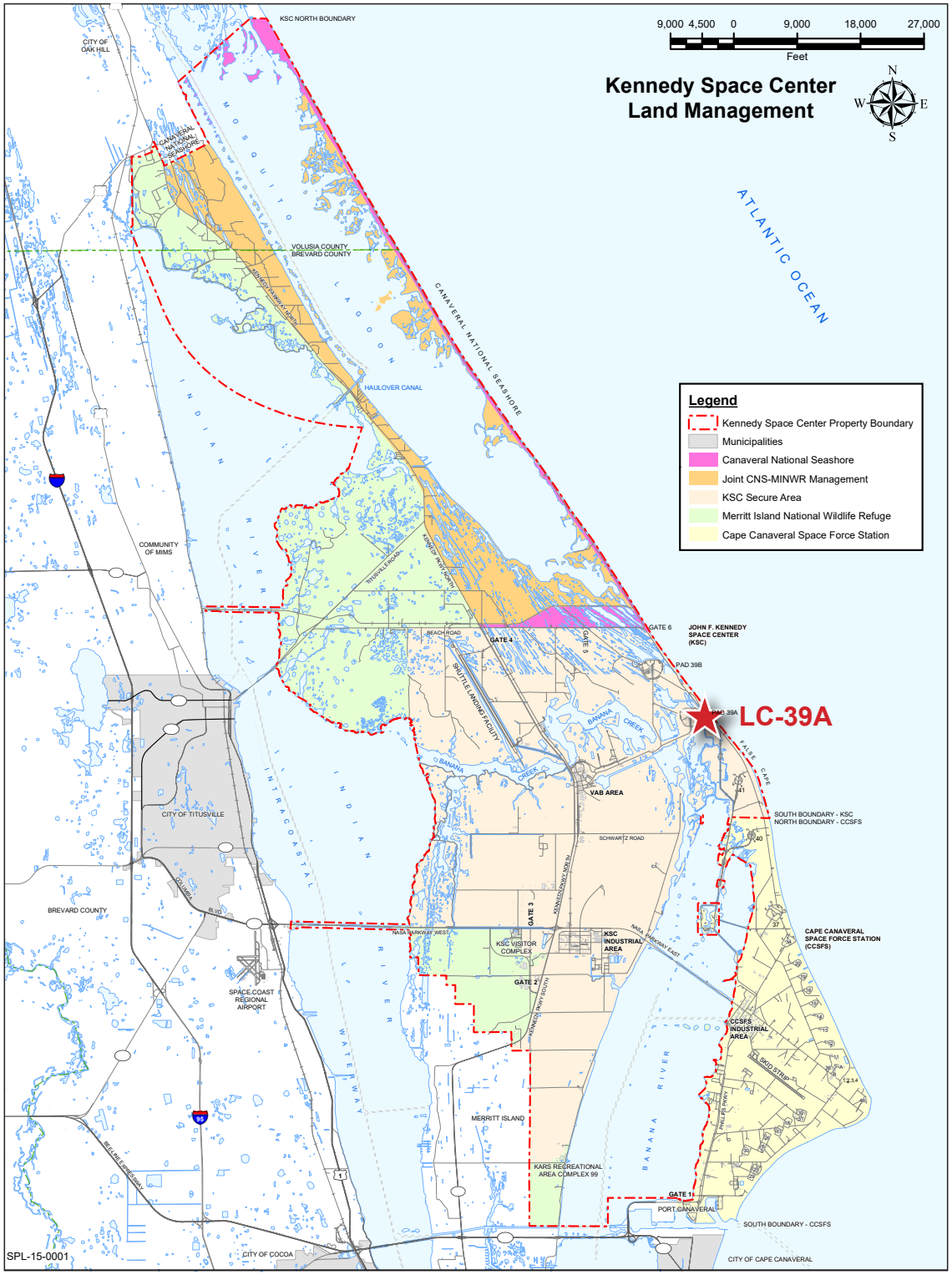
LOCATION OF LC-39A AT KENNEDY SPACE CENTER



https://www.faa.gov/space/stakeholder_engagement/spacex_starship_ksc