WRITTEN RE-EVALUATION OF THE 2020 FINAL ENVIRONMENTAL ASSESSMENT FOR SPACEX FALCON LAUNCHES AT KENNEDY SPACE CENTER AND CAPE CANAVERAL AIR FORCE STATION

SpaceX Falcon 9 Annual Launch Number Increase for SLC-40 in 2023

Introduction and Background

Introduction

In this written re-evaluation (WR), the Federal Aviation Administration (FAA) Office of Commercial Space Transportation is evaluating whether supplemental environmental analysis is needed due to new information provided by Space Exploration Technologies Corporation (SpaceX) associated with the annual number of launches that would occur in 2023 under launch license LLO 18-105. The launch license authorizes SpaceX to conduct Falcon 9 pre-flight ground operations and launches from Cape Canaveral Space Force Station (CCSFS), Space Launch Complex-40 (SLC-40). The affected environment and environmental impacts of those Falcon 9 launch activities from CCSFS and connected marine and on-land booster landings, among other activities, were documented in the *2020 Final Environmental Assessment for SpaceX Falcon Launches at Kennedy Space Center and Cape Canaveral Air Force Station* (2020 EA; FAA 2020). The FAA issued a Finding of No Significant Impact (FONSI) based on the 2020 EA on July 8, 2020.

The number of launches authorized under an FAA license is bounded by the maximum number of launches analyzed in the associated environmental review. The 2020 EA analyzed an annual maximum of 50 Falcon 9 vehicle launches from LC-40. SpaceX has presented FAA a manifest showing an additional six (6) FAA-licensed missions from LC-40 in December 2023, for a total of 56 launches in calendar year 2023.[1] Therefore, before further FAA approval is granted (e.g. LLO 18-105 is modified to include the six (6) additional launches, as well as the corresponding airspace closures for the launches), the impacts of this change must be evaluated to determine whether it triggers the need for supplemental environmental analysis.

This WR provides the determination of whether the contents, analyses, and conditions of approval in the 2020 EA remain current and substantially valid when six (6) additional Falcon 9 missions at LC-40 above the maximum annual launch number for calendar year 2023 are considered.

Modification of a license is a major federal action subject to the requirements of the National Environmental Policy Act of 1969 (NEPA). As such, the FAA must assess the potential environmental impacts of increasing the annual launch cadence of Falcon associated with issuing a SpaceX launch license. The FAA's environmental policies and procedures for implementing NEPA (FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*) provide that the FAA may prepare a WR to determine

[1] While the 2020 EA also analyzed Falcon 9 and Falcon Heavy launches from Kennedy Space Center LC-39A (which are licensed under LLO 19-110), launches from a separate site with different environmental considerations are not transferable for the purpose of calculating the maximum number of launches for license LLO 18-105.

whether the contents of previously prepared environmental documents remain substantially valid or whether significant changes to a previously analyzed proposed action require the preparation of a supplemental EA or Environmental Impact Statement (EIS).

In accordance with Paragraph 9-2.c of FAA Order 1050.1F, the preparation of a new or supplemental EA or EIS is not necessary when the following can be documented:

1. The proposed action conforms to plans or projects for which a prior EA and FONSI have been issued or a prior EIS has been filed and there are no substantial changes in the action that are relevant to environmental concerns;
2. Data and analyses contained in the previous EA and FONSI or EIS are still substantially valid and there are no significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts; and
3. Pertinent conditions and requirements of the prior approval have been, or will be, met in the current action.

This WR provides documentation for the above three factors as well as the FAA's conclusion that the contents of the 2020 EA remain current and substantially valid and the decision to issue a modification which includes a higher number of launches for 2023 only at SLC-40, but no increase in the annual launch cadence from KSC, does not require the preparation of a new or supplemental EA.

Background

The FAA prepared the 2020 EA to perform a comprehensive analysis of the potential environmental impacts of issuing licenses to SpaceX to conduct Falcon 9 and Falcon Heavy launches from KSC LC-39A and CCSFS (formerly Cape Canaveral Air Force Station) SLC-40. The scope of the Proposed Action in the 2020 EA included pre-flight ground and launch operations from the respective pads, as well as h SpaceX's typical launch trajectories from CCSFS and KSC, including a southern launch trajectory to support missions with payloads requiring polar orbits. The 2020 EA also analyzed, among other things, first stage booster landings at CCSFS, and drone ship landings in the Atlantic Ocean. The 2020 EA evaluated up to 50 Falcon 9 launches per year from SLC-40, up to 10 Falcon 9 launches per year from LC-39A, and up to 10 Falcon Heavy Launches per year from LC-39A.

As discussed in the 2020 EA, following a nominal launch from LC-39A or SLC-40, the first stage booster could land downrange on a drone ship in the Atlantic Ocean. The drone ship would be no closer than ten nautical miles from shore. The 2020 EA referred to the area in the Atlantic Ocean where drone ship landings could occur as the "superbox" (Figure 1). Downrange first stage booster landings were also analyzed in the recovery area for southern launch trajectories (Figure 2). SpaceX would also attempt to recover the payload fairings. On May 24, 2022, FAA prepared a WR that analyzed jettisoning MVac skirt rings in the Atlantic Ocean during Falcon 9 licensed launches from KSC and

CCSFS and concluded that the data and findings contained in the 2020 EA remained valid for the action.

Figure 1. Atlantic Ocean Recovery Area – Superbox

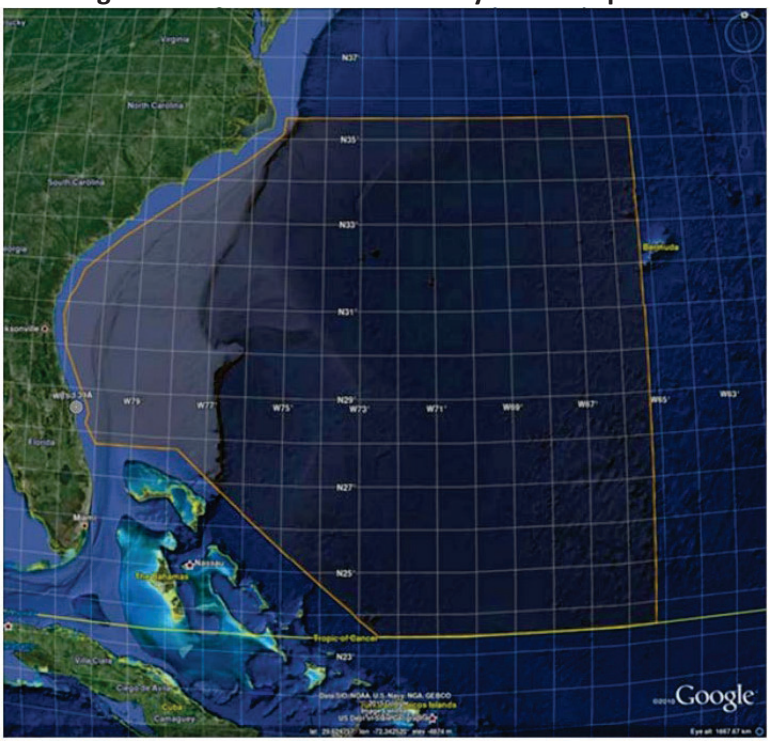
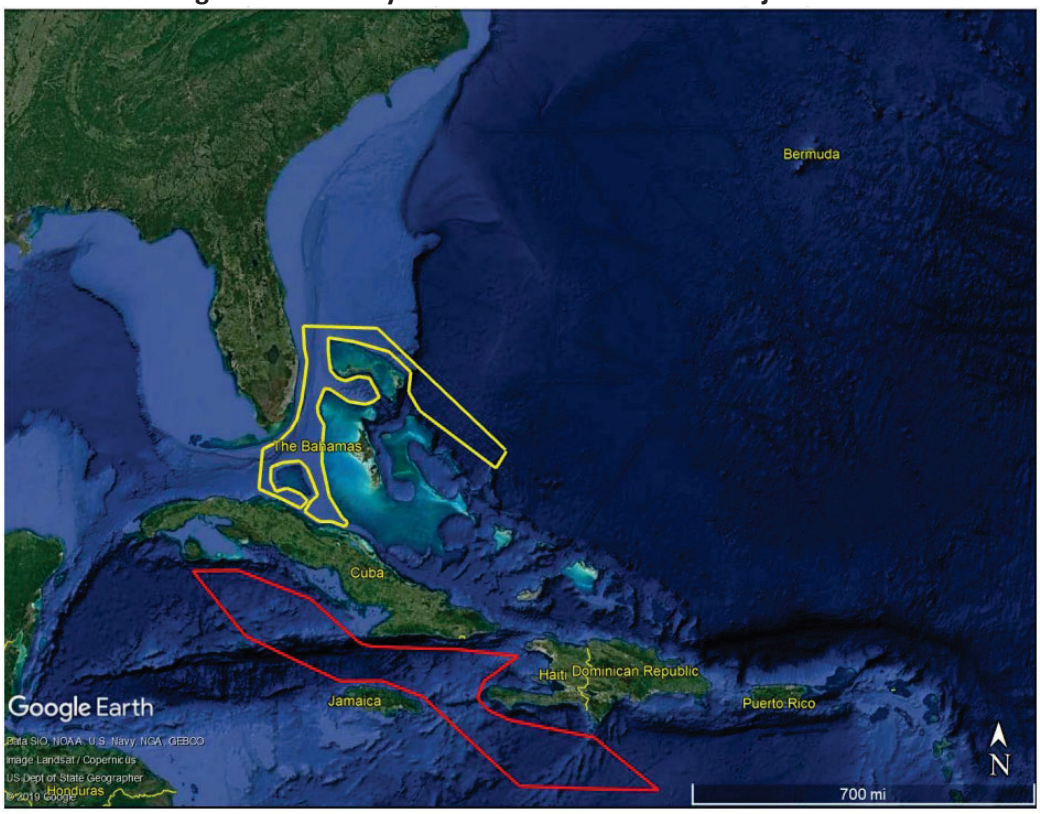


Figure 2. Recovery Area for Southern Launch Trajectories



Yellow = area for first stage booster and fairing recovery for polar missions
Red = fairing recovery only for polar missions

As discussed in the 2020 EA, following a drone ship landing, automated and remotely operated systems are initiated to ensure the booster completes its landing and safing operations. Commands are transmitted through a satellite-based communication system that provides feedback and pertinent data about the systems to SpaceX controllers. The safing steps include venting pressure of stored helium and nitrogen, purging a very small amount of residual hazardous ignition fluid (triethylaluminum-triethylborane [TEA-TEB]) on the drone ship deck, and emptying remaining liquid oxygen (LOX) from the booster; no TEA-TEB or LOX is expected to be discharged into the ocean as both commodities evaporate or burn in ambient conditions. In some cases, the booster may fail to make a successful landing due to a number of variables (e.g., lack of fuel or hydraulic fluid, wind shear, etc.). In the case of an unsuccessful landing, any remaining fuel would ignite and burn off, and the wreckage would sink similar to the fate of traditional non-reusable first stage boosters.

A remote-controlled robot device is used to secure the booster. Once the booster is remotely safed, SpaceX personnel board the drone ship to service the fluids system to further remove hazards and protect against corrosion. Operations are optimized to require a small amount of time with a small number of personnel on the drone ship. After safing and securing operations are complete, the drone ship is placed under tow and all vessels return to shore.

As the drone ship approaches shore, automated systems ensure the booster is in a safe state to proceed into port. SpaceX personnel are mobilized at the port to receive and off-load the booster. The booster is then placed into processing fixtures on-shore that allow any residual fuel to be offloaded into storage tanks, landing gear removed, ordnance removed, and to ultimately facilitate on-road transport to a SpaceX facility for further processing.

As discussed in the 2020 EA, SpaceX would also attempt to recover and reuse the payload fairings. Following re-entry of the fairing into Earth's atmosphere, the drogue parachutes deploy at a high altitude (approximately 50,000 feet) to begin the initial slow down and to extract the parafoil. The drogue parachute (and the attached deployment bag) cuts away following the successful deployment of the parafoil. The parachute system slows the descent of the fairing to enable a soft splashdown so that the fairing remains intact. SpaceX would attempt to recover all parafoils; however, recovery of the drogue parachutes is unlikely. The drogue parachute assembly is deployed at a high altitude, so it can be difficult to locate, but if the recovery team can get a visual fix, the team attempts to recover the drogue parachute. The drogue parachute becomes saturated with seawater quickly and begins to sink, which also makes recovery of the drogue parachute difficult.

Since completion of the 2020 EA, SpaceX has worked with the FAA Air Traffic Organization to reduce the size and duration of airspace closures associated with Falcon missions. This work has included improved modeling for airspace closures and the implementation of "critical decision windows" to release airspace back to the National Airspace System in the case of a scrubbed or delayed launch. SpaceX continues to work with the FAA to explore opportunities to reduce airspace closures.

Proposed Action

The FAA's Federal Action is to modify the existing SpaceX license LLO 18105 to allow for an increased number of FAA-licensed Falcon 9 launches at SLC-40 for calendar year 2023. Likewise, SpaceX's Proposed Action is to increase the number of FAA-licensed Falcon 9 vehicle launches at SLC-40 from

50 to 56 launches in 2023. The six (6) additional booster landings would all be drone ship landings. The majority of the additional launches would occur at night. SpaceX is not proposing any operational changes to its Falcon 9 launches at SLC-40 other than increasing the number of times it may launch in calendar year 2023.

Affected Environment

The environmental impact categories assessed in detail in the 2020 EA include air quality; biological resources; climate; coastal resources; Department of Transportation Act Section 4(f); farmlands; hazardous materials, solid waste, and pollution prevention; land use; natural resources and energy supply; noise and noise-compatible land use; environmental justice; children's environmental health and safety socioeconomics; visual effects (including light emissions); and water resources (surface waters and groundwater). Farmlands, floodplains, wetlands, environmental justice, children's environmental health and safety, and wild and scenic rivers were dismissed from detailed review in the 2020 EA and are not discussed further here.

With the exception of biological resources, the affected environment under the Proposed Action remains the same as discussed in the 2020 EA.

The U.S. Fish and Wildlife Service's (USFWS) Information for Planning and Consultation system (IPaC; USFWS 2023) was consulted for changes in listing statuses since publication of the 2020 EA and associated Endangered Species Act (ESA) Section 7 Consultation.

Updates are summarized below:

- The eastern black rail (*Laterallus jamaicensis sub species Jamaicensis*) was considered in the 2020 EA and ESA Section 7 consultation; it was previously proposed as threatened but was listed as threatened on November 9, 2020, after the 2020 EA (85 *Federal Register* [FR] 63764). The FAA made a determination of "no effect" for the species due to the fact that there were no documented occurrences of the species at or near the launch and recovery sites evaluated in the 2020 EA and ESA Section 7 consultation. The Proposed Action does not change that determination.
- The USFWS proposed delisting the ivory billed woodpecker (*Campephilus principalis*) on September 30, 2021 (86 FR 54298). The species was considered in the 2020 EA and ESA Section 7 consultation. The Proposed Action does not change the FAA's conclusion or effects determination for the species.
- The threatened (in Florida only) American crocodile (*Crocodylus acutus*) was not considered in the 2020 EA/ESA Section 7 consultation but was identified by IPaC in the action area (the species was listed in 1975, so it is not a newly listed species). However, the American crocodile in Florida predominantly occurs within the southern tip of mainland Florida and the upper Florida Keys (FR 70 15052) and has not been documented at KSC or CCSFS (NASA 2020; IMSS 2018). Therefore, the Proposed Action would have "no effect" on this species.
- The monarch butterfly (*Danaus plexippus*) was listed as a candidate species on December 17, 2020 (85 FR 81813). The USFWS determined that listing the monarch butterfly as an endangered or threatened species is warranted but precluded by higher priority listing

actions. Candidate species have no statutory protection under ESA, and therefore, ESA Section 7 consultation is not required; however, were the species to become listed as threatened or endangered, the Proposed Action would have "no effect" on this species as the Proposed Action would not impact monarch butterfly habitat.

- The 2020 EA and ESA Section 7 consultation only considered listed plants occurring in Brevard County that had potential to be affected by the 2020 EA's proposed action. FAA made a "no effect" determination for these plants. Based on the IPaC results, no plants have been newly listed as proposed, threatened, or endangered in Brevard County. Therefore, The Proposed Action does not change the FAA's effects determinations for federally listed plants.
- Critical habitat has been proposed and/or designated in the action area (as defined in the 2020 ESA consultation) for two listed species. Critical habitat for the Florida bonneted bat (*Eumops floridanus*) was proposed on June 10, 2020 (85 FR 35510) and critical habitat for the piping plover (*Charadrius melodus*) was designated on July 10, 2001 (66 FR 36038). The Proposed Action would not impact any proposed or designated critical habitat because the Proposed Action does not include construction activities, and the proposed and designated critical habitats for both species are outside of Brevard County and not in the action area.
- On September 14, 2022, the USFWS proposed to list the tricolored bat (Perimyotis subflavus) as an endangered species under ESA. While this species does not show up in the IPaC results, the proposed rule indicates the species' range to include Florida. However, the tricolored bat is rarely encountered and considered uncommon in the state of Florida (University of Florida 2021) and has not been documented at CCSFS (NASA 2020). Further, as identified by USFWS, tricolored bat habitat consists of a dense growth of trees and underbrush covering a large tract; this habitat is not present at SLC-40 (USFWS, 2022a). Under ESA Section 7, a conference consultation is required for a proposed species if the federal agency's action is likely to jeopardize the continued existence of the proposed species. However, due to the rarity of the species in Florida, that absence of habitat at the launch locations, and no construction being proposed, the Proposed Action would not jeopardize the existence of the tricolored bat. Therefore, no conference consultation is required, and FAA has concluded its obligation under ESA Section 7.

No other substantial changes or alterations have occurred to the environmental impact categories or the study area. The 2020 EA remains a valid discussion of the affected environment for the Proposed Action for all other resource categories.

Re-evaluation of Environmental Consequences

Air Quality

Air Quality impacts under the Proposed Action would be comparable to those described in the 2020 EA. Since the 2020 EA, there has been no change in attainment status for any criteria pollutants in Brevard County under the National Ambient Air Quality Standards (EPA 2023). There would be no increase in emissions due to Dragon or Falcon Heavy recovery operations, as the total number of Dragon and Falcon Heavy missions is not increasing. As discussed in the 2020 EA, launching and

landing emissions would result in combustion of rocket propellant (RP-1). Emissions from Falcon 9 launches include carbon dioxide, carbon monoxide, water vapor, nitrogen oxides, and carbon particulates.

Air quality impacts for the Falcon program as presented in the 2020 EA were a combined assessment for operations at both LC-39A and SLC-40 due to their proximity to each other. While launch and recovery emissions would increase in the immediate vicinity of SLC-40 and the Atlantic Ocean landing areas due to additional launches, fewer Falcon launch and recovery operations occurred at LC-39A in calendar year 2023, which would directly offset the air quality impacts for the additional launches and recoveries for SLC-40. Air emissions from the combined Falcon program operations in 2023 would still remain below *de minimis* thresholds and would therefore be expected to little or no impact on regional air quality. Additionally, most of the emissions are emitted above 3,000 feet altitude and thus do not affect ground-level ambient air quality.

As discussed in the 2020 EA, three vessels would be required for a Falcon 9 booster drone ship landing in the Atlantic Ocean: the drone ship, support vessel, and ocean tug. One vessel would be required for fairing recovery operations. The vessels would originate from Port Canaveral and travel to a position in the ocean to support drone ship landings. As described in the 2020 EA, emissions from operating the vessels would be below the major source threshold of 100 tons per year for all criteria pollutants and the additional vessels associated with the increase of six (6) launches would not cause the threshold to be exceeded.

Temporary airspace closures associated with commercial space operations would result in additional emissions due to aircraft rerouting and expending more fuel. However, the amount of time an aircraft would spend being rerouted would be short-term and emissions would occur above the mixing layer (3,000 feet), thus would not affect ambient air quality. Additionally, since a majority of the additional launches would occur at night, it is anticipated that fewer aircraft would be affected by rerouting. Accordingly, the data and analyses contained in the 2020 EA remain substantially valid, and the Proposed Action would not have a significant impact on air quality.

Biological Resources (including Fish, Wildlife, and Plants)

Impacts to biological resources under the Proposed Action would be similar to those described in the 2020 EA, as the same launch vehicle would be used, the same exhaust plume generated, and the same overall operations would occur at the launch site. Launch noise and related impact types and mechanisms that could affect wildlife would be similar to those described in the 2020 EA, with additional launch noise at SLC-40 due to the six (6) additional Falcon 9 launches. The number of sonic booms due to boosters landing at CCSFS would be the same as analyzed in the 2020 EA as no additional land landings are proposed.

As described in the 2020 EA, wildlife within the vicinity of the CCSFS and KSC would be temporarily disturbed by vehicle-related noise. Wildlife responses to noise can be physiological or behavioral. Physiological responses can range from mild, such as an increase in heart rate, to more damaging effects on metabolism and hormone balance. Behavioral responses to man-made noise include attraction, tolerance, and aversion. Each has the potential for negative and positive effects, which vary among species and among individuals of a particular species due to temperament, sex, age, and

prior experience with noise. Responses to noise are species-specific; therefore, it is not possible to make exact predictions about hearing thresholds of a particular species based on data from another species, even those with similar hearing patterns. Given the short-term nature of operational noise (including a sonic boom), no significant impacts to general wildlife species are anticipated. The additional annual missions at SLC-40 would not substantially change noise impacts on wildlife compared to the 2020 EA.

Impacts to prescribed burning would be similar to those described in the 2020 EA. KSC, CCSFS, and Merritt Island National Wildlife Refuge conduct prescribed burns under the conditions outlined in the 2019 Prescribed Burn Memorandum of Understanding. The Proposed Action would not create new operational smoke buffers or smoke sensitive areas. Notification of prescribed burns would continue to occur as described in the 2020 EA. Through adherence to existing protocols and the 2019 Memorandum of Understanding, the increase in annual missions at SLC-40 would not have a significant impact on the prescribed burning regime at KSC/CCSFS.

As part of the 2020 EA and in accordance with Section 7 of the Endangered Species Act, the FAA conducted consultation with the USFWS and the National Marine Fisheries Service (NMFS). The USFWS and NMFS concurred with the FAA's determination that the Proposed Action is not likely to adversely affect ESA-listed species or designated critical habitat.

Additionally, the FAA completed a programmatic ESA consultation with NMFS for launch and reentry operations in the marine environment (NMFS 2022). This programmatic consultation supersedes the consultation conducted with NMFS during preparation of the 2020 EA. This programmatic consultation includes Falcon 9 booster landings on drone ships and recovery of fairings in the Atlantic Ocean (see Figures 1 and 2 above). NMFS concurred with the FAA's determination that the space launch and reentry activities presented in the programmatic consultation are not likely to adversely affect ESA-listed species or designated critical habitat and issued a programmatic Letter of Concurrence (LOC) (NMFS 2022). The LOC includes protection and monitoring measures that must be followed during and after launch activity. As stated in the LOC, booster landing failures are not included in the consultation. If a failure were to occur in the marine environment, the FAA may be required to reinitiate consultation. The FAA will collaborate with SpaceX to collect and report on the annual reporting information required by the LOC. The additional six (6) Falcon 9 launches by SpaceX would involve six (6) marine booster landings on droneships. The NMFS PLOC covered an annual total of up to 70 marine booster recovery operations across all space launches affecting the Atlantic Ocean. An additional six (6) Falcon 9 droneship landings would not cause an exceedance of that annual number; and, therefore, would be within the scope of that consultation.

In the unlikely circumstance of an off-nominal marine landing event, given the low frequency of launch operations and the fact that marine wildlife spends the majority of their time submerged as opposed to on the surface, potential adverse impacts are unlikely. As stated in the 2020 EA, the FAA is aware that recovery efforts could extend beyond the U.S. border. The same types of impacts on biological resources described in the 2020 EA would occur in the areas beyond the U.S. border that are exposed to launch noise (engine noise and sonic booms). No adverse effects on any marine wildlife species are anticipated.

The increase in annual missions at SLC-40 would not substantially change impacts on biological resources. Accordingly, the data and analysis contained in the 2020 EA remain substantially valid, and the Proposed Action would not result in significant impacts on biological resources.

Climate

Climate impacts under the Proposed Action would be comparable to those described in the 2020 EA. As described in the 2020 EA, greenhouse gas emissions include those associated with Falcon 9 takeoff and landing and, in the case of drone ship landing, the vessels transiting between Port Canaveral and the landing location. Mobile source activities would be limited, and their incremental contributions to global emissions would not be of such magnitude to result in significant climate impacts, just as the 2020 EA concluded.

Temporary airspace closures associated with commercial space operations could result in additional emissions due to aircraft rerouting and expending more fuel. However, the amount of time an aircraft would spend being rerouted would be short-term, and the number of aircraft that would be impacted per launch would not be expected to produce additional emissions that would have a notable effect on climate. Additionally, since a majority of the additional launches would occur at night, it is anticipated that fewer aircraft would be affected by rerouting. Accordingly, the data and analyses contained in the 2020 EA remain substantially valid, and the Proposed Action would not result in a significant climate-related impact.

Coastal Resources

Impacts to coastal resources would be similar to those described in the 2020 EA. The Proposed Action does not involve any coastal construction or seafloor-disturbing activities. Falcon 9 droneship landings would occur off the coast Florida at least ten nautical miles offshore. Payload fairing landing and recovery would take place no closer than five nautical miles offshore. Landing and recovery operations would operate as they currently do. Accordingly, the data and analyses contained in the 2020 EA remain substantially valid, and the Proposed Action would not have a significant impact on coastal resources.

Department of Transportation Act Section 4(f)

Impacts to Section 4(f) resources would be similar to those described in the 2020 EA, as the additional six (6) launches do not involve a change in launch vehicle or its operation, and no ground disturbance is proposed. As stated in the 2020 EA, the FAA determined that the Proposed Action would not result in a physical use, direct taking, or temporary occupancy of any Section 4(f) resource. Also, the FAA determined that the noise associated with Falcon 9 launches and landings would not result in a constructive use of any Section 4(f) property. The Florida coast near CCSFS has been experiencing launch noise (engine noise and sonic booms) for many years from launch operations at CCSFS, including government and commercial launches, Shuttle landings, and SpaceX Falcon 9 booster landings. Although some of the Section 4(f) properties are natural areas with typically quiet settings, the additional missions from SLC-40 would not diminish the significance and enjoyment of these properties. Additionally, since a majority of the additional launches would occur at night when fewer

recreational activities occur or are available, it is anticipated that they would not have a substantial effect on recreational opportunities. Accordingly, the data and analyses contained in the 2020 EA remain substantially valid, and the Proposed Action would not have a significant impact on Section 4(f) properties.

Hazardous Materials, Solid Waste, and Pollution Prevention

Impacts related to hazardous materials, solid waste, and pollution prevention under the Proposed Action would be the same as those described in the 2020 EA. The Proposed Action would not change the existing management of hazardous materials, solid waste, and pollution prevention at CCSFS. Potential adverse impacts on the environment associated with hazardous materials and waste management would continue to be minimized through strict compliance with all applicable federal, state, and local laws and regulations. The additional launches at SLC-40 would not substantially change hazardous materials, solid waste, and pollution prevention impacts as launch and recovery procedures would remain as they do today. Accordingly, the data and analyses contained in the 2020 EA remain substantially valid, and the Proposed Action would not result in a significant impact related to hazardous materials, solid waste, and pollution prevention.

Historical, Architectural, Archeological, and Cultural Resources

Historical, architectural, archeological, and cultural resource impacts under the Proposed Action would be the same as those impacts described in the 2020 EA. The Proposed Action would not require any construction or ground-disturbing activities. As part of Section 106 consultation conducted during preparation of the 2020 EA, the Florida State Historic Preservation Officer concurred with the FAA's definition of the Area of Potential Effects (APE) and determination that the Proposed Action would not adversely affect historic properties. The APE was defined as the areas predicted to experience sonic booms during launches, including landings. An increase in annual launches from SLC-40 would not change the areas that could experience sonic booms, as the same launch vehicle and range of trajectories would be flown. A review of the National Register of Historic Places found one new listed property, the Imperial Towers in Titusville, FL (listed on April 19, 2023), located approximately 20 miles west of SLC-40, and within the area of potential effects evaluated in the 2020 EA (National Parks Service 2023). Effects to this property would be limited to launch noise and sonic booms below two pounds per square foot. As discussed in the EA, potential damage from sonic booms below two pounds per square foot is very unlikely. Additionally, these effects are the consistent with ongoing effects as the structure has experienced from existing launches at KSC and CCSFS. Accordingly, there would be no adverse effect on Imperial Towers and the data and analyses contained in the 2020 EA remain substantially valid, and the Proposed Action would not have a significant impact on historical, architectural, archeological, and cultural resources.

Land Use

Land use impacts under the Proposed Action would the same as those impacts described in the 2020 EA. The Proposed Action would not involve any land-disturbing activities. Port Canaveral would continue to be used for the transport and offloading of the Falcon 9 booster. This action would be

consistent with the ongoing vessel movement and cargo offloading at these facilities, and the increase of six (6) launches would not cause a substantive increase in vessel traffic. The transport of the booster by truck to a SpaceX facility would be consistent with ongoing cargo transport on highways/roadways. Accordingly, the data and analyses contained in the 2020 EA remain substantially valid, and the Proposed Action would not have a significant impact on land use.

Natural Resources and Energy Supply

Impacts related to natural resources and energy supply under the Proposed Action would be similar to impacts described in the 2020 EA. The additional launches would not require the use of scarce or unusual materials and would not measurably increase demand on local supplies of energy or natural resources beyond what would already be used for Falcon 9 launches at CCSFS. The additional missions at SLC-40 would not substantially change impacts on natural resources and energy supply, as these commodities are readily available at CCSFS, and six (6) additional launches would not result in a substantive increase in resources used. Accordingly, the data and analysis contained in the 2020 EA remain substantially valid, and the Proposed Action would not result in a significant impact related to natural resources and energy supply.

Noise and Noise-Compatible Land Use

Impacts related to noise and noise-compatible land use under the proposed action would be comparable to those impacts described in the 2020 EA. The same launch vehicle would be used as analyzed in the 2020 EA. A DNL was modeled in the 2020 EA using an estimated breakdown of launches at SLC-40. The increase in annual missions at SLC-40 would not extend the DNL contour above 65 dBA outside of the bounds of CCSFS and KSC, and therefore no additional impacts are expected. No additional sonic booms on land are expected as the Proposed Action does not include additional land landings of first-stage boosters. Engine noise levels generated during launches would be the same under the Proposed Action because the same rocket was analyzed in the 2020 EA.

As stated in the 2020 EA, sonic booms would be generated during descent. The majority of Florida within the sonic boom footprint is expected to experience overpressures of 0.25 to 0.5 psf, which is similar to distant thunder. The sparsely populated land areas located within the descent sonic boom footprint for a downrange first stage booster landing would experience overpressures less than 0.5 psf.

As stated in the 2020 EA, sonic booms overland would be experienced intermittently and, in the majority of the overland area, would be perceived as a distant thunderclap. Engine noise levels associated with proposed landing activities would last less than 1 minute and occur infrequently, and no significant noise impacts are expected. The increase of six (6) launches would not cause a substantive increase in noise impacts. Accordingly, the data and analyses contained in the 2020 EA remain substantially valid, and the Proposed Action would not result in significant impacts related to noise and noise-compatible land use.

Accordingly, the data and analyses contained in the 2020 EA remain substantially valid, and the Proposed Action would not have a significant impact on noise and noise-compatible land use.

Socioeconomics

Impacts related to socioeconomics would be similar to those described in the 2020 EA. Launch operations might have moderate economic benefits, including increased demand in the workforce, higher revenues, and increased per capita income. SpaceX would continue to use its existing workforce for launch operations, which would not change with the addition of six (6) launches from SLC-40. The Proposed Action would not significantly affect the local housing market and would not negatively affect the local economy.

Temporary access restrictions on navigable waters would be necessary to ensure public safety during launch and recovery operations. Advance notice via Notices to Mariners would assist mariners in scheduling around any temporary disruption of flight, shipping, or boating activities in the area of operation. Launch and landing operations would be of short duration and scheduled in advance to minimize interruption to waterways. For these reasons, temporary waterway access restrictions would not result in significant marine, commercial, or recreational impacts.

On April 13, 2023, the FAA issued a *Notice of Updated Factors for Optimizing Use of the National Airspace System*. To mitigate the impacts of increased commercial space operations on other aircraft flight operations without impeding commercial space operations, the FAA updated factors to inform decisions to optimize the National Airspace System. The factors include, among other things, limiting launches during times of high NAS congestion (such as holidays), encouraging commercial launches during nighttime hours when other flight operations tend to be reduced, and minimizing launch windows. The anticipated impact from implementation of these factors was to minimize disruptions to and reroutes of other airspace users.

Based on the above, the data and analyses contained in the 2020 EA remain substantially valid, and the Proposed Action would not result in a significant impact related to socioeconomics.

Visual Effects (including Light Emissions)

Impacts to visual effects (including light emissions) would be similar to those described in the 2020 EA. Facilities at CCSFS continue to operate under Light Management Plans (LMPs) to mitigate potential wildlife impacts from nighttime lighting. Falcon 9 launches and landings would result in light emissions and visual impacts. The subject additional missions at SLC-40 in December would occur outside of sea turtle nesting season, and exterior lights associated with those missions would have no effect on protected marine sea turtles. Mission lighting would not substantially degrade the existing visual character or quality of the site and its surroundings, as launches regularly occur at KSC and CCSFS. Accordingly, the data and analyses contained in the 2020 EA remain substantially valid, and the Proposed Action would not have a significant impact on visual effects.

Water Resources (including Surface Waters and Groundwater)

Impacts to water resources would be similar to those described in the 2020 EA. No ground disturbance is proposed. As described in the 2020 EA, minimal impacts to groundwater, if any, would occur. Potential impacts on surface water quality during an unsuccessful offshore drone ship landing would be the same as described in the 2020 EA. Similarly, potential impacts on surface waters from an off-

nominal landing scenario would be similar to those discussed in the 2020 EA for a failed landing attempt. While a successful barge landing would not affect water quality, an unlikely, off-nominal landing would result in some RP-1 being released into the ocean, as well as any unrecovered debris. Light oils, including RP-1, are highly volatile, which means they evaporate quickly when exposed to the air, and are usually completely dissipated within one to two days after a spill. Clean-up following a spill is usually not necessary, or possible, with spills of light oil, particularly with such a small quantity of oil. Therefore, no attempt would be made to boom or recover RP-1 if any of the fuel is released directly into the ocean. Any RP-1 remaining on the barge from an unsuccessful landing attempt would be recovered, contained, and handled in accordance with applicable requirements. SpaceX would not attempt to recover launch vehicle debris, as any unrecovered debris is expected to sink. Launch and ground operations would continue to be conducted under existing Stormwater Pollution Prevention Plans and National Pollutant Discharge Elimination System permits. Accordingly, the data and analyses contained in the 2020 EA remain substantially valid, and the Proposed Action would not have a significant impact on water resources.

Cumulative Effects

The Proposed Action is to increase the annual number of Falcon 9 launches at SLC-40 in 2023 from 50 to 56. However, with regard to the other actions also analyzed in the scope of the 2020 EA, in 2023, there have been ten (10) FAA-licensed Falcon 9 launches at LC-39A, much fewer than the maximum number of landings (54) at LZ-1 and LZ-2, and no south-trajectory polar missions from either LC-39A or SLC-40. The Proposed Action does not increase the number of Falcon Heavy or Dragon missions, number of boosters returning to land, number of annual polar missions, expand the recovery area, or involve any ground disturbing activities.

The 2020 EA considered current and planned launch operations and reasonably foreseeable future development projects at KSC and CCSFS in the cumulative impact analysis. One reasonably foreseeable future development project that was not considered in the 2020 EA is the Dragon crew tower at SLC-40. The crew tower is approximately 300 feet tall and similar to the existing tower at LC-39A. Tower construction was confined within the SLC-40 launch pad boundary. Lighting at the crew tower is designed in compliance with the CCSFS Light Management Plan to minimize nighttime lighting impacts on the environment. The FAA is currently conducting an environmental review of future Crew Dragon missions at SLC-40. SpaceX does not plan to increase the annual number of Crew Dragon missions beyond what was analyzed in the 2020 EA but plans to divide the launches between LC-39A and SLC-40 in the future.

The Proposed Action would not result in cumulative impacts which would be substantially different from those analyzed in the 2020 EA, as the increase in Falcon 9 launches would be relatively small (8.6% additional launches) compared to the total Falcon 9 and Falcon Heavy launches previously analyzed. Since the completion of the 2020 EA, two new small-lift class vehicles have launched from CCSFS a total of three times. The National Aeronautics and Space Administration also launched its Space Launch System vehicle in 2022. In 2023, the United States Space Force (USSF) allocated historic launch complexes to commercial operators at CCSFS. However, it may be a number of years before these programs have matured and reached their operational cadence. Upcoming launch programs considered in the 2020 EA have also experienced delays, and it is unclear when these programs will

become operational. Each launch program is required to undergo a review under NEPA prior to obtaining an FAA license or conduct a mission for the Department of Defense, and each would have its own cumulative effects assessment. Finally, the USSF manages the range-wide annual launch cadence and retains the authority to prohibit launches. Accordingly, the cumulative impact analysis contained in the 2020 EA remains substantially valid, and the Proposed Action would not result in significant cumulative impacts to any environmental impact category.

Conclusion

The 2020 EA examined the potential for significant environmental impacts and defined the regulatory setting for impacts associated with the consolidated Falcon program launch operations from KSC and CCSFS. The areas evaluated for environmental impacts in this WR include air quality; biological resources; climate; coastal resources; Department of Transportation Act Section 4(f); hazardous materials, solid waste, and pollution prevention; land use; natural resources and energy supply; noise and noise-compatible land use; socioeconomics; visual effects (including light emissions); and water resources (surface waters, groundwater).

Based on the above review and in conformity with FAA Order 1050.1F, Paragraph 9-2.c, the FAA has concluded that the impacts associated with adding six (6) additional Falcon 9 missions at SLC-40 for 2023 is consistent with the prior environmental analysis documentation, that the data contained in the 2020 EA remain substantially valid, that there are no other substantial changes in the action or significant new circumstances or information relevant to environmental concerns, and that all pertinent conditions and requirements of the prior approval have been met or will be met in the current action. Therefore, the preparation of a supplemental or new environmental document is not necessary.

STACEY MOLINICH ZEE

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Date Issued: _____

References

EPA (U.S. Environmental Protection Agency). 2022. Current Nonattainment Counties for All Criteria Pollutants. Available at: https://www3.epa.gov/airquality/greenbook/ancl.html. Accessed on December 8, 2023.

FAA (Federal Aviation Administration). 2020. Final Environmental Assessment and Finding of No Significant Impact for SpaceX Falcon Launches at Kennedy Space Center and Cape Canaveral Air Force Station. Available at: https://www.faa.gov/space/environmental/nepa_docs/media/SpaceX_Falcon_Program_Final_EA_and_FONSI.pdf.

National Parks Service. 2023. National Register of Historic Places Listed Properties. Available at: https://www.nps.gov/subjects/nationalregister/data-downloads.htm. Access December 8, 2023.

NMFS (National Marine Fisheries Service). 2022. Programmatic Concurrence Letter for Launch and Reentry Vehicle Operations in the Marine Environment and Starship/Super Heavy Launch Vehicle Operations at SpaceX's Boca Chica Launch Site, Cameron County, TX. January.

USFWS. 2022a. Tricolored Bat. Available at: https://www.fws.gov/species/tricolored-bat-perimyotis-subflavus.

USFWS. 2023. IPaC: Information for Planning and Consultation. Available at: https://ipac.ecosphere.fws.gov/. Accessed on December 8, 2023.