



Federal Aviation  
Administration

# **Draft Supplemental Environmental Assessment to the September 2008 Environmental Assessment for Space Florida Launch Site** Operator License

March 2010



**Supplemental Environmental Assessment to the September 2008 Environmental  
Assessment for Space Florida Launch Site Operator License**

**AGENCY:** Federal Aviation Administration (FAA), lead agency and United States Air Force, cooperating agency

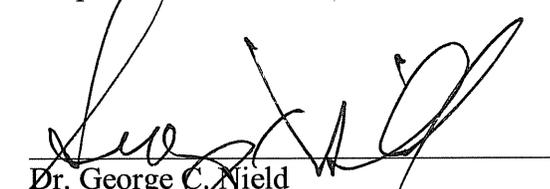
**ABSTRACT:** This Supplemental Environmental Assessment (SEA) to the September 2008 Environmental Assessment for Space Florida Launch Site Operator License (the 2008 EA) addresses the potential environmental impacts of the Proposed Action, where the FAA would issue a Launch Site Operator License to Space Florida to operate a commercial space launch site at Launch Complex 36 (LC-36) and LC-46 at Cape Canaveral Air Force Station (CCAFS) in Brevard County, Florida. The 2008 EA analyzed the potential environmental impacts of the FAA issuing a Launch Site Operator License to Space Florida to operate a commercial space launch site at LC-46. This SEA expands on the analysis in the 2008 EA to include an analysis of the potential environmental impacts of the proposed construction and operation activities associated with the redevelopment of LC-36 into a commercial space launch site. The Proposed Action includes a maximum of 12 annual launches of a conceptual Generic Launch Vehicle (GLV) at LC-36.

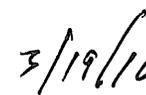
This SEA analyzes the potential environmental impacts of the Proposed Action, and the No Action Alternative, on air quality; biological resources (terrestrial vegetation and wildlife, marine species, and protected species); compatible land use (land use, light emissions, visual resources, and coastal resources); cultural resources and Section 4(f) properties; hazardous materials, solid waste, and pollution prevention; noise; socioeconomic resources; and water resources (surface water, groundwater, floodplains, and wetlands). Potential cumulative impacts of the Proposed Action are also addressed in this SEA.

**CONTACT INFORMATION:** Questions regarding the Proposed Action and SEA can be addressed to Mr. Daniel Czelusniak, Environmental Specialist, Federal Aviation Administration, 800 Independence Ave., SW, Suite 331, Washington, DC 20591; e-mail Daniel.Czelusniak@faa.gov; or phone (202) 267-5924.

This SEA becomes a Federal document when evaluated, signed, and dated by the responsible FAA official.

Responsible FAA Official:

  
\_\_\_\_\_  
Dr. George C. Nield  
Associate Administrator for  
Commercial Space Transportation

  
\_\_\_\_\_  
Date



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## **ACRONYMS AND ABBREVIATIONS**

AFB	Air Force Base
Al	Aluminum
Al <sub>2</sub> O <sub>3</sub>	Aluminum Oxide
AP	Ammonium Perchlorate
Catex	Categorical Exclusion
CCAFS	Cape Canaveral Air Force Station
CCP	Comprehensive Conservation Plan
CDNL	C-weighted Day-Night Average Sound Level
CFR	Code of Federal Regulations
CEQ	Council on Environmental Quality
Cl <sub>2</sub>	Chlorine
CO	Carbon Monoxide
CO <sub>2</sub>	Carbon Dioxide
CZMA	Coastal Zone Management Act
dB	Decibel
dBA	A-weighted Sound Level
DOT	Department of Transportation
DNL	Day-Night Average Sound Level
EA	Environmental Assessment
EBS	Environmental Baseline Survey
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FDEP	Florida Department of Environmental Protection
FEMA	Federal Emergency Management Agency
FONSI	Finding of No Significant Impact
FWC	Florida Fish and Wildlife Conservation Commission
GEM	Graphite-Epoxy Motor
GHG	Greenhouse Gas
GLV	Generic Launch Vehicle
H <sub>2</sub>	Hydrogen

## **ACRONYMS AND ABBREVIATIONS (Continued)**

H <sub>2</sub> O	Water
HCl	Hydrogen Chloride
HTPB	Hydroxyl-Terminated Polybutadiene
IPCC	Intergovernmental Panel on Climate Change
KSC	Kennedy Space Center
LC-36	Launch Complex 36
LC-46	Launch Complex 46
LOX	Liquid Oxygen
MOA	Memorandum of Agreement
N <sub>2</sub>	Nitrogen
N <sub>2</sub> H <sub>2</sub>	Hydrazine
N <sub>2</sub> O <sub>4</sub>	Nitrogen Tetroxide
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NO <sub>2</sub>	Nitrogen Dioxide
NO <sub>x</sub>	Nitrogen Oxides
O <sub>3</sub>	Ozone
ODS	Ozone Depleting Substances
OSHA	United States Occupational Safety and Health Administration
PCB	Polychlorinated Biphenyls
pH	Potential Hydrogen
PM	Particulate Matter
PM <sub>2.5</sub>	Particulate Matter 2.5 microns or less in diameter
PM <sub>10</sub>	Particulate Matter 10 microns or less in diameter
ppm	Parts per Million
psf	Pounds per Square Foot
RP-1	Rocket Propellant
ROD	Record of Decision
SEA	Supplemental Environmental Assessment
SHPO	State Historic Preservation Officer

**ACRONYMS AND ABBREVIATIONS (Continued)**

SO <sub>2</sub>	Sulfur Dioxide
SO <sub>x</sub>	Sulfur Oxides
SpaceX	Space Exploration Technologies
SRM	Solid Rocket Motor
TCE	Trichloroethylene
THC	Total Hydrocarbon
USAF	United States Air Force
U.S.C.	United States Code
USFWS	United States Fish and Wildlife Service
USGCRP	United States Global Change Research Program
µg/m <sup>3</sup>	Microgram per Cubic Meter



## **1. INTRODUCTION AND BACKGROUND**

In May 1997, the Federal Aviation Administration (FAA) issued a Launch Site Operator License (LSO-02-006) to Space Florida to operate a commercial launch site at Launch Complex 46 (LC-46) at the Cape Canaveral Air Force Station (CCAFS) in Brevard County, Florida. The license was renewed in 2002 and expired on May 22, 2007. Space Florida submitted a new application to the FAA for a Launch Site Operator License to include the operation of a commercial space launch site at Launch Complex 36 (LC-36) at CCAFS in addition to LC-46. This Supplemental Environmental Assessment (SEA) supports the FAA's decision to issue a Launch Site Operator License to Space Florida to operate LC-36 and LC-46 as a commercial space launch site at CCAFS.

Licensing the operation of a launch site is a major Federal action subject to environmental review under the National Environmental Policy Act of 1969, as amended (NEPA; 42 United States Code (U.S.C.) 4231, et seq.). The FAA prepared this SEA, in accordance with NEPA, Council on Environmental Quality (CEQ) NEPA implementing regulations (40 Code of Federal Regulations [CFR Parts 1500 to 1508], and FAA Order 1050.1E, Change 1, *Environmental Impacts: Policies and Procedures*, dated March 20, 2006, to evaluate the potential environmental impacts of activities associated with issuing Space Florida a Launch Site Operator License.

As part of the environmental review for the initial license application in 1997, the FAA issued a Finding of No Significant Impact (FONSI) that adopted the U.S. Air Force's (USAF) October 1994 *Finding of No Significant Impact and Environmental Assessment of the Proposed Space Florida Authority Commercial Launch Program at Launch Complex-46 at the Cape Canaveral Air Force Station, Florida*. In July 2007, Space Florida re-applied for a Launch Site Operator License to operate LC-46. In September 2008, the FAA issued a *Finding of No Significant Impact and Environmental Assessment for Space Florida Launch Site Operator License at Launch Complex-46* (2008 EA) to support the environmental review of the application. In July 2009, Space Florida updated their application to include the operation of LC-36 in the Launch Site Operator License.

The 2008 EA analyzed the potential environmental impacts of operating LC-46 as a commercial space launch site for solid and liquid propellant vertical launch vehicles. The FAA determined that issuing a Launch Site Operator License to Space Florida for the operation of LC-46 would not significantly affect the quality of the human environment pursuant to Section 102 (2)(c) of NEPA (42 U.S.C. 4321, et seq.). This SEA expands on the analysis provided in the 2008 EA to include an analysis of the potential environmental impacts of the construction and operation activities associated with the redevelopment of LC-36 into a commercial space launch site.

Many of the conclusions in this SEA are supported by the April 2009 *U.S. Air Force Categorical Exclusion (Catex) Space Florida Complex 36, CCAFS* (2009 USAF Catex) and the July 2009 *Environmental Baseline Survey (EBS) - Entry Proposed Space Florida License for Commercial Redevelopment of LC-36 Cape Canaveral Air Force Station, Florida* (2009 EBS). The USAF developed the 2009 USAF Catex to analyze the potential environmental impacts associated with the redevelopment of LC-36 into a commercial space launch site. The USAF determined that the proposed action of redeveloping LC-36 into a commercial space launch site qualified for a Catex

pursuant to A2.3.11 defined in 32 CFR Part 989, Environmental Impact Analysis Process, Appendix B as “actions similar to other actions which have been determined to have an insignificant impact in a similar setting as established in an environmental impact statement (EIS) or an environmental assessment (EA) resulting in a FONSI.”<sup>1</sup> The 2009 EBS was prepared in support of the proposed licensing and leasing agreement of CCAFS LC-36 between the USAF and Space Florida.

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<sup>1</sup> *The following documents were provided as a reference in the 2009 USAF Catex Space Florida Complex 36, CCAFS: Environmental Assessment for Commercial Atlas II AS, FONSI signed August 2, 1991; Environmental Assessment for Atlas II AR FONSI signed December 2, 1997; Environmental Assessment of Delta III Vehicle FONSI signed May 16, 1996; Environmental Impact Statement for the Evolved Expendable Launch Vehicle, Record of Decision (ROD) June, 1998; Environmental Assessment for the Falcon Program, FONSI signed December 21, 2007.*

## **2. PURPOSE AND NEED FOR THE PROPOSED ACTION**

The purpose and need for the Proposed Action have not changed from the 2008 EA. In summary, the ***purpose*** of the action is to fulfill the FAA Office of Commercial Space Transportation's responsibility, under the Commercial Space Launch Amendments Act and Executive Order 12465, for oversight of commercial space launch activities, including licensing of launch sites. The FAA will review the license application and make a decision on whether to issue a Launch Site Operator License to Space Florida for the operation of a commercial space launch site at LC-36 and LC-46 at CCAFS.

The ***need*** for action results from the statutory direction from Congress to encourage, facilitate, and promote commercial space launches and reentries by the private sector and facilitate the strengthening and expansion of the U.S. space transportation infrastructure, in accordance with the applicable requirements.<sup>2</sup>

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<sup>2</sup> *The Commercial Space Launch Amendments Act of 2004 (Public Law 108-492), the Commercial Space Transportation Competitiveness Act of 2000 (Public Law 106-405); Executive Order 12465, Commercial Expendable Launch Vehicle Activities (February 24, 1984); CFR Title 14, Aeronautics and Space, Parts 400-450, Commercial Space Transportation, Federal Aviation Administration, Department of Transportation; the Commercial Space Act of 1998 (Public Law 105-303); the U.S. Space Transportation Policy of 2004; and the National Space Policy of 1996 and 2006.*



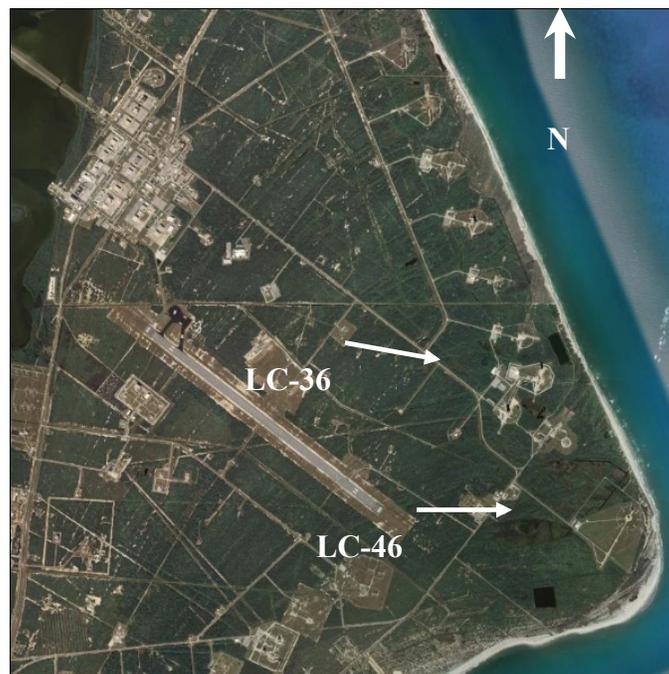
### **3. DESCRIPTION OF PROPOSED ACTION AND NO ACTION ALTERNATIVE**

#### **3.1 Proposed Action**

The Proposed Action is for the FAA to issue a Launch Site Operator License to Space Florida to operate LC-36 and LC-46 as a commercial space launch site. Under the license, Space Florida would support vertical launches of both solid and liquid propellant launch vehicles from LC-36 and LC-46. The proposed activities at LC-46 remain consistent with those analyzed in the 2008 EA, and are incorporated by reference.

In summary, the 2008 EA analyzed the potential environmental impacts of the FAA issuing a Launch Site Operator License to Space Florida to operate a commercial space launch site at LC-46, which is the easternmost launch complex at CCAFS, located at the tip of Cape Canaveral (see Exhibit 3-1).

**Exhibit 3-1. Aerial Map of Cape Canaveral LC-36 and LC-46**



Source: Google Earth 2009

The 2008 EA analyzed the operation of several types of vertical launch vehicles from LC-46, including Athena-1 and Athena-2, Minotaur, Taurus, Falcon 1, Alliant Techsystems small launch vehicles, and other Castor<sup>®</sup> 120-based or Minuteman-derivative booster vehicles. The 2008 EA analyzed the potential environmental impacts of a maximum of 24 launches per year including 12 solid propellant launches and 12 liquid propellant launches for the 5 year period of the Launch Site Operator License. The 2008 EA assumed all launches would be conducted using existing infrastructure and considered no construction or modification activities.

This SEA expands on the analysis provided in the 2008 EA to include an analysis of the potential environmental impacts of the construction and operation activities associated with the redevelopment of LC-36 into a commercial space launch site. Redeveloping LC-36 into a multi-use commercial space launch site involves construction of facilities to launch a Generic Launch Vehicle (GLV), which is a conceptual (or “surrogate”) launch vehicle used for the purposes of this environmental review.

LC-36 is located in the east-central portion of CCAFS (see Exhibit 3-1) and consists of two launch pads 36A and 36B, which the USAF deactivated in 2006. Throughout the nearly 43 years of operation of LC-36, the facility launched a combination of commercial and government missions, including those for the USAF and National Aeronautics and Space Administration (NASA). Since NASA’s first launch in 1962 of an Atlas/Centaur rocket, LC-36 has hosted 145 rocket launches from its two pads (68 from LC-36A and 77 from LC-36B). The last launch from LC-36A was an Atlas IIAS in 2004, and the last launch from LC-36B was an Atlas IIIB in 2005. In 2005 and 2006, much of LC-36 and its associated infrastructure were demolished. Impacts associated with the demolition activities were addressed in the 2009 USAF Catex. The site continues to support wetland and dense vegetated areas, and areas of mowed and maintained grass surrounding facilities and roadways. Densely vegetated, undeveloped land immediately surrounds LC-36. A paved road provides access to the site.

Redevelopment activities at LC-36 would include building access roads; erecting a security fence; reconstituting several existing facilities; constructing an elevated launch deck, associated flame ducts, water storage tank, and water deluge containment pool; and installing electrical, communication, and air systems. Redevelopment would occur in phases dictated by costs and schedule, and facility construction or modifications would take place only on previously disturbed ground. There are no plans to develop the complex outside the LC-36 boundary. The processing facility to support operations at LC-36 would be located off LC-36 at a location to be identified at a later time.

All launch vehicles operated from LC-36 under the Proposed Action would be expected to fall within the design and propellant type and quantity parameters of the GLV. The GLV is a liquid propellant medium class launch vehicle with a solid propellant second stage, and a bipropellant third stage. Four strap-on Graphite-Epoxy Motor (GEM) 40 solid rocket motors (SRM) could also comprise the GLV, and are analyzed to account for possible future launch vehicle development. The key dimensions of the GLV include a core height of approximately 140 feet, a core diameter of approximately 12.8 feet, with the SRM height at 42.5 feet and the SRM diameter at 3.34 feet. The total liftoff weight of the GLV is about 754,204 pounds, and the total liftoff thrust is approximately 1,256,056 pound-force. Exhibit 3-2 summarizes the propellant types and quantities associated with each stage of the GLV. The GLV surrogate was designed to encompass the largest vehicles that may launch from LC-36 and is based on a combination of the attributes of six different vehicles, some of which were launched during LC-36’s active period.<sup>3</sup> Licensing the operation of a launch vehicle that does not fall within the parameters of the GLV could be subject to separate environmental review and documentation, as appropriate.

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<sup>3</sup> Vehicles include Atlas IIAS, Delta II L, Falcon 1e, Minotaur V, SLV-B, and Taurus II.

**Exhibit 3-2. Summary of GLV Propellant Type and Quantity<sup>a</sup>**

<b>Component</b>	<b>Propellant Type<sup>b</sup></b>	<b>Propellant Quantity</b>
GLV 1st Stage Propellant	Refined Kerosene (RP-1)	23,110 gallons
GLV 1st Stage Oxidizer	Liquid Oxygen (LOX)	42,170 gallons
GEM SRMs (4)	12% HTPB, 19% Al, 68% AP	103,204 pounds (25,801 pounds each)
GLV 2nd Stage	12% HTPB, 19% Al, 68% AP	28,300 pounds
GLV 3rd Stage	N <sub>2</sub> H <sub>2</sub>	1,000 pounds
GLV 3rd Stage	N <sub>2</sub> O <sub>4</sub>	1,500 pounds
GLV Payload Orbital Maneuvering System	Hypergolic (assumed to be N <sub>2</sub> H <sub>2</sub> and N <sub>2</sub> O <sub>4</sub> for purposes of impact analysis)	5,400 pounds

a. Source: USAF, 2009; SAIC, 2009

b. HTPB = Hydroxyl-Terminated Polybutadiene, RP-1 = Rocket Propellant, AP = Ammonium Perchlorate, Al = Aluminum

This SEA evaluates up to 12 annual launches of the GLV from LC-36A or LC-36B for the 5-year period of the Launch Site Operator License. Similar to launches from LC-46, all potential launch vehicles and associated payloads would be launched from LC-36 into low earth orbit or geostationary orbit. Potential launch vehicles would be expected to carry a variety of communication and experimental payloads for a variety of missions. All payloads would be non-radioactive, but may contain small amounts of hazardous pollutants to fuel on-board maneuvering. Acceptable launch azimuths for launches from LC-36 range from 35 to 120 degrees. Vehicle processing and launch operations at LC-36 would be expected to be similar to the activities described in Section 2.1.2 of the 2008 EA. All activities at LC-36 would comply with CCAFS environmental and safety standards as outlined in Section 2.1.2 of the 2008 EA.

In the event that the launch varies from the planned trajectory, all potential vehicles would contain termination systems similar to the systems described in Section 2.1.1.1 of the 2008 EA. Upon activation of the flight thrust termination system, the vehicle would return to the surface intact but could break apart upon impact. Upon activation of the destructive termination system, the vehicle tanks would rupture when commanded to destruct, causing the vehicle to break apart. During a nominal launch, spent stages and associated flight hardware of the potential launch vehicles would be jettisoned downrange and fall several hundred miles off the Florida coastline in the open ocean. The first stage may be recovered as described in Section 2.1.2.2 of the 2008 EA. Non-recoverable stages and hardware would sink to the ocean floor. All jettisoned stages and hardware would fall within a downrange area similar to previous launches from LC-36.

### **3.2 No Action Alternative**

The only alternative to the Proposed Action is the No Action Alternative. Under this alternative, the FAA would not issue Space Florida a Launch Site Operator License and there would be no commercial launches from LC-36 or LC-46 at CCAFS. Existing USAF activities could continue at LC-36 and LC-46.

### **3.3 Impacts and Resources Not Analyzed in Detail**

This SEA did not analyze potential impacts to the following environmental resource areas in detail, as explained below.

- Farmland Resources – The Proposed Action would not convert farmland to non-agricultural use.
- Natural Resources and Energy Supply – The Proposed Action would not result in any measurable effect on local supplies of energy or natural resources.
- Secondary Impacts – The Proposed Action would not involve the potential for induced or secondary impacts to surrounding communities, such as shifts in population movement and growth, public service demands, and economic activity. The resources analyzed would incur negligible impacts; therefore the potential for secondary (induced) impacts would also be expected to be negligible.
- Environmental Justice and Children’s Environmental Health and Safety – The Proposed Action would not impact surrounding populations including minorities, low-income, or children.
- Wild and Scenic Rivers – There are no wild and scenic rivers as designated by the Wild and Scenic Rivers Act of 1968 (16 U.S.C. 1271 et seq.) located on or near the CCAFS.

## **4. AFFECTED ENVIRONMENT**

Exhibit 4-1 summarizes the affected environment for the resource areas analyzed in detail in this SEA. To minimize redundancy, Exhibit 4-1 incorporates by reference environmental documentation from the 2008 EA, 2009 USAF Catex, and 2009 EBS. Although updates to the affected environment are noted, no substantive changes or alterations have occurred in the resource areas or the region of influence. Thus, the 2008 EA, 2009 USAF Catex, and 2009 EBS are incorporated by reference and considered valid discussions of the affected environment for this Proposed Action.

A Proposed Rule published in the Federal Register on March 16, 2010, announced the joint determination of the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) that the Loggerhead sea turtle (*Caretta caretta*) globally comprises nine distinct population segments (DPSs) that qualify as “species” for listing as endangered or threatened under the Endangered Species Act (ESA), and that two DPSs should be proposed for listing as threatened and seven DPSs including the Northwest Atlantic Ocean should be proposed for listing as endangered (50 CFR Parts 223 and 224 Endangered and Threatened Species; Proposed Listing of Nine Distinct Population Segments of Loggerhead Sea Turtles as Endangered or Threatened). Loggerhead sea turtles are currently listed as threatened throughout their range. The NMFS and USFWS have solicited public comments on this proposal be received by June 14, 2010.

**Exhibit 4-1. Summary of Affected Environment by Resource Area**

**Resource Area**

**Summary**

**Air Quality**

The air quality affected environment in the vicinity of LC-36 and LC-46 is the same as described for LC-46 in the 2008 EA. Since publication of the 2008 EA the applicable ambient air quality standards have changed. Exhibit 3-1 from the 2008 EA is reproduced below with the updates included.

**Florida and National Ambient Air Quality Standards (NAAQS)**

Pollutant	Averaging Time <sup>e</sup>	Florida Standards <sup>a,b</sup>	National Primary Standards <sup>a,b</sup>	National Secondary Standards <sup>a,b</sup>
Ozone (O <sub>3</sub> )	8 Hours	–	0.075 ppm (147 µg/m <sup>3</sup> ) <sup>d</sup>	0.075 ppm (147 µg/m <sup>3</sup> )
	1 Hour	0.12 ppm (235 µg/m <sup>3</sup> )	–	–
Carbon Monoxide (CO)	8 Hours	9.0 ppm (10,000 µg/m <sup>3</sup> )	9.0 ppm (10,000 µg/m <sup>3</sup> )	–
	1 Hour	35 ppm (40,000 µg/m <sup>3</sup> )	35 ppm (40,000 µg/m <sup>3</sup> )	–
Nitrogen Dioxide (NO <sub>2</sub> )	Annual Arithmetic Mean	0.05 ppm (100 µg/m <sup>3</sup> )	0.053 ppm (100 µg/m <sup>3</sup> )	0.053 ppm (100 µg/m <sup>3</sup> )
	1 Hour	–	0.100 ppm (200 µg/m <sup>3</sup> )	–
Sulfur Dioxide (SO <sub>2</sub> )	Annual Arithmetic Mean	0.02 ppm (60 µg/m <sup>3</sup> )	0.03 ppm (80 µg/m <sup>3</sup> ) <sup>e</sup>	–
	24 Hours	0.1 ppm (260 µg/m <sup>3</sup> )	0.14 ppm (365 µg/m <sup>3</sup> ) <sup>e</sup>	–
	3 Hours	0.5 ppm (1,300 µg/m <sup>3</sup> )	–	0.5 ppm (1300 µg/m <sup>3</sup> )
Particulate Matter <10 microns in diameter (PM <sub>10</sub> )	Annual	50 µg/m <sup>3</sup>	–	–
	24 Hours	150 µg/m <sup>3</sup>	150 µg/m <sup>3</sup>	150 µg/m <sup>3</sup>
Particulate Matter <2.5 microns in diameter (PM <sub>2.5</sub> )	Annual	–	15 µg/m <sup>3</sup>	15 µg/m <sup>3</sup>
	24 Hours	–	35 µg/m <sup>3</sup>	35 µg/m <sup>3</sup>
Lead	Rolling 3-Month Average	–	0.15 µg/m <sup>3</sup>	0.15 µg/m <sup>3</sup>
	Quarterly Average	1.5 µg/m <sup>3</sup>	1.5 µg/m <sup>3</sup>	1.5 µg/m <sup>3</sup>

<sup>a</sup> µg/m<sup>3</sup> = micrograms per cubic meter. ppm = parts per million.

<sup>b</sup> Florida standards for ozone, carbon monoxide, sulfur dioxide, nitrogen dioxide and PM<sub>10</sub> are values that are not to be exceeded. The lead value is not to be equaled or exceeded.

<sup>c</sup> National standards other than ozone and those based on annual averages or annual arithmetic means are not to be exceeded more than once a year. The ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above the standards, averaged over three years, is equal to or less than one. The 1-hour NO<sub>2</sub> standard is attained when the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area does not exceed 0.100 ppm. The 24-hour PM<sub>10</sub> standard is attained when the 24-hour concentrations does not exceed 150 µg/m<sup>3</sup>

**Exhibit 4-1. Summary of Affected Environment by Resource Area**

**Resource Area**

**Summary**

more than once per year on average over 3 years. The annual PM<sub>2.5</sub> standard is attained when the 3-year average of the weighted annual mean PM<sub>2.5</sub> concentrations from single or multiple community-oriented monitors does not exceed 15.0 µg/m<sup>3</sup>. The 24-hour PM<sub>2.5</sub> standard is attained when the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area does not exceed 35 µg/m<sup>3</sup>. The lead and annual sulfur dioxide standards are not to be exceeded in a calendar year.

- d EPA has proposed to reduce the 8-hour ozone standard to a value between 0.060 and 0.070 ppm. EPA intends to issue the final ozone standard by August 3, 2010.
- e EPA has proposed to revoke the national 24-hour and annual SO<sub>2</sub> standards and replace them with a 1-hour standard having a value between 0.050 ppm (130 µg/m<sup>3</sup>) and 0.100 ppm (260 µg/m<sup>3</sup>). EPA intends to issue the final SO<sub>2</sub> standard by June 2, 2010.

Source: National – 40 CFR 50. Florida – Florida Administrative Code, Rule 62-204.240.

Also, since publication of the 2008 EA, ambient air quality measurement data for the region have become available for 2008. Exhibit 3-2 from the 2008 EA is reproduced below with the data updated from 2005-2007 to 2006-2008. The updated table below shows that ground-level concentrations of criteria pollutants in the region around LC-36 and LC-46 are within the NAAQS and Florida standards.

**Measured Ambient Air Concentrations of Criteria Pollutants in the Region**

Pollutant	Averaging Time	Nearest Monitoring Station	Maximum Measured Concentration (ppm, except PM in µg/m <sup>3</sup> )		
			2006	2007	2008
O <sub>3</sub>	1 Hour	Cocoa Beach	0.081 (4 <sup>th</sup> max.) <sup>a</sup>	0.077 (4 <sup>th</sup> max.)	0.071 (4 <sup>th</sup> max.)
	8 Hours	Cocoa Beach	0.074 (4 <sup>th</sup> max.)	0.067 (4 <sup>th</sup> max.)	0.069 (4 <sup>th</sup> max.)
CO	8 Hours	Winter Park	1.7	1.0	1.0
	1 Hour	Winter Park	2.5	1.6	1.1
NO <sub>2</sub>	Annual	Winter Park	0.009	0.007	0.006
	1 Hour	Winter Park	0.053	0.058	0.043
SO <sub>2</sub>	Annual	Winter Park (2006), Cocoa (2007-2008)	0.001	0.001	0.001
	24 Hours	Winter Park (2006), Cocoa (2007-2008)	0.004	0.006	0.004
	3 Hours	Winter Park (2006), Cocoa (2007-2008)	0.010	0.029	0.013
	Annual	Cocoa Beach	14	16	17
PM <sub>10</sub>	24 Hours	Cocoa Beach	27	74	58

**Exhibit 4-1. Summary of Affected Environment by Resource Area**

Resource Area		Summary		
Pollutant	Averaging Time	Nearest Monitoring Station	Maximum Measured Concentration (ppm, except PM in $\mu\text{g}/\text{m}^3$ )	
PM <sub>2.5</sub>	Annual	Melbourne	2006	2008
	24 Hour <sup>b</sup>	Melbourne	9.0	8.03
Lead	Quarterly	No lead monitors are located within 100 miles of LC-36 and LC-46	36	21.3

<sup>a</sup> The ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above the standards, averaged over three consecutive years, is equal to or less than one. By this statistic, the standard is met when the fourth-highest average concentration in each of the three years is less than the value of the standard.

<sup>b</sup> The 24-hour PM<sub>2.5</sub> standard is attained when the standard value is not exceeded on more than an average of one day per year over a three-year period. By this statistic, the 24-hour PM<sub>2.5</sub> standard was attained in 2006-2008 despite maximum concentrations that exceeded the value of the standard (35  $\mu\text{g}/\text{m}^3$ ) in 2006.

Source: EPA, 2009a.

**Biological Resources**

**General Ecology**  
 CCAFS is situated on the eastern central coast of Florida on 15,800 acres of a barrier island that separates the Banana River from the Atlantic Ocean. CCAFS contains wetlands, estuaries, and lagoons and associated vegetation communities, such as the indigenous Florida coastal scrub, coastal and sea grasses, and xeric and maritime hammocks. The landscape at CCAFS contains a series of ridges and swales already fragmented by construction for previous launch activities.

**Terrestrial Wildlife**  
 More than 30 species of mammals inhabit CCAFS, including white-tailed deer, armadillos, bobcats, feral hogs, raccoons, long-tail weasels, the cotton rat and round-tail muskrats. CCAFS is also home to numerous migratory seabird species, which have been observed nesting on beaches adjacent to launch complexes and in the adjacent Canaveral National Seashore and Merritt Island National Wildlife Refuge. Other birds commonly occurring near LC-36 include gulls, red-winged blackbirds, mockingbirds, and southeast American kestrel. Several amphibian and reptile species also occur in the area, including the Florida pine snake and several protected species (see discussion below).

**Vegetation**  
 The primary vegetative communities surrounding LC-36 include coastal dunes, coastal strand, freshwater marsh, freshwater swamp, and developed/maintained areas dominated by terrestrial grasses and weeds. Dominant vegetation in coastal dune and strand communities includes sea oats and other grasses, small shrubs such as marsh elder and beach berry, palmetto, sea grape, wax myrtle, snowberry, and nakedwood. Dominant vegetation in freshwater marsh and swamp communities includes cattails, sand cordgrass, leather fern, saltbush, and willow vegetation. Invasive species also make up a portion of the herbaceous and woody vegetation, as discussed below. Most vegetative areas are highly

**Exhibit 4-1. Summary of Affected Environment by Resource Area**

**Resource Area**

**Summary**

fragmented due to existing infrastructure at CCAFS, such as roads, utility corridors, buildings, and launch complexes.

**Invasive Species**

CCAFS and the area surrounding LC-36 are highly disturbed areas, and a large portion of the vegetation in this area is inhabited by invasive species. They predominate invasive weed present at CCAFS is Brazilian pepper, with six other invasive weeds present in lower densities. Other common invasive species include Australian pine, cogon grass, metaleuca, mistletoe, and small populations of thistles and nettles are also present.

**Marine Wildlife**

CCAFS is in an aquatic transition zone between temperate and subtropical climates, resulting in diverse aquatic biota. Marine species that inhabit areas around CCAFS include fish, squids, sea turtles, and marine mammals such as bottlenose dolphins, spotted dolphins, and manatees. Benthic communities made up of marine organisms that live on or near the sea floor, such as bottom dwelling fish, shrimp, worms, snails, and starfish are also present. Essential Fish Habitat includes the waters and substrates necessary for marine species to reach all stages of their life cycle.

**Protected Species**

There are a variety of State and federally protected species potentially present in the vicinity of LC-36 (see table below).

Common Name	Scientific Name	Federal Status	State Status
<b>Bird Species</b>			
Wood stork	<i>Mycteria americana</i>	E	E
Florida scrub-jay	<i>Aphelocoma coerulescens coerulescens</i>	T	T
Piping plover	<i>Charadrius melodus</i>	T	T
Least tern	<i>Sterna antillarum</i>	-	T
<b>Reptiles and Amphibians</b>			
Eastern Indigo Snake	<i>Drymarchon corais couperi</i>	T	T
Gopher tortoise	<i>Gopherus polyphemus</i>	UR	T
American alligator	<i>Alligator mississippiensis</i>	T(S/A)	SC
Hawksbill sea turtle	<i>Eretmochelys imbricata imbricata</i>	E	E
Loggerhead turtle	<i>Caretta caretta</i>	T	T
Leatherback turtle	<i>Dermochelys coriacea</i>	E	E
Kemp's Ridley turtle	<i>Lepidochelys kempi</i>	E	E
Green sea turtle	<i>Chelonia mydas</i>	E	E
<b>Mammals</b>			
Southeastern beach mouse	<i>Peromyscus polionotus niveiventris</i>	T	T

**Exhibit 4-1. Summary of Affected Environment by Resource Area**

<b>Summary</b>		
<b>Resource Area</b>	<b>E</b>	<b>E</b>
<p style="text-align: center;"><b>West Indian (Florida) manatee</b>  <i>Trichechus manatus</i>                      Sources: USAF, 1998, 2007; FNAI, 2007; USFWS, 2009a; NMFS, 2009                      E=Endangered; T=Threatened; T(S/A)=Similarity of Appearance to a Threatened Taxon in the Entire Range; UR = Petition to list as Threatened in the State of Florida Under Review; SC=Species of Concern</p> <p>A Proposed Rule notice published in the Federal Register on March 16, 2010, announced the joint determination of the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) that the Loggerhead sea turtle globally comprises nine distinct population segments (DPSs) that qualify as “species” for listing as endangered or threatened under the Endangered Species Act (ESA), and that two DPSs should be proposed for listing as threatened and seven DSPs including the Northwest Atlantic Ocean should be proposed for listing as endangered (50 CFR Parts 223 and 224 Endangered and Threatened Species; Proposed Listing of Nine Distinct Population Segments of Loggerhead Sea Turtles as Endangered or Threatened). As stated in the table above, Loggerhead sea turtles are currently listed as threatened throughout their range. The NMFS and USFWS have solicited public comments on this proposal by June 14, 2010.</p> <p>In the vicinity of LC-36, the federally-threatened Florida scrub-jay occupies coastal strand vegetation adjacent to the site. The State-threatened least terns have been known to nest on gravel beaches near LC-36, and federally threatened piping plovers may occur on CCAFS beaches during the non-breeding season. The federally endangered wood stork has also been observed feeding in the CCAFS drainage canal system. Federally and State listed as a threatened species, the Eastern indigo snake has been identified throughout CCAFS and may occur around LC-36. These snakes are strongly associated with high, dry, well-drained sandy soils, closely paralleling the dune habitat preferred by gopher tortoises. The gopher tortoise, State-listed as threatened, is found in high densities on CCAFS, including the areas in and around LC-36. The gopher tortoise prefers open habitats that have herbaceous plants for forage, including disturbed areas such as recent burn areas, road shoulders, fence lines, and launch complexes. The American alligator is federally-listed as threatened because of its similarity in appearance to another endangered species, the American crocodile, which is not found in Brevard County. Several alligators have been observed in the drainage canals on CCAFS. Five species of federally protected sea turtles (Hawksbill, Loggerhead, Leatherback, Kemp’s Ridley and Green) have been observed in the waters offshore at CCAFS and all but the Hawksbill and Kemp’s Ridley are known to nest on beaches in and around LC-36. The federally threatened southeastern beach mouse is found along the entire reach of coastline on CCAFS, mostly within areas of coastal dune and coastal strand vegetation. The federally endangered West Indian manatee can also be found in the Banana River along the western boundary of CCAFS. Sections of the Upper Banana River are designated as State Manatee Protection Areas. Manatees inhabit salt-water lagoon systems, and the U.S. Fish and Wildlife Service has designated the Indian and Banana Rivers as critical manatee habitat. However, there is no designated critical habitat under Section 4 of the Endangered Species Act at LC-36. See the 2008 EA for a more detailed description of protected species present at CCAFS.</p>	<p><b>Compatible Land Use</b></p> <p>The area surrounding LC-36 is flat scrub with no unique natural landscape features. The area is already extensively developed with both active and inactive launch complexes, roads, and launch support facilities. There are also industrial</p>	

<b>Exhibit 4-1. Summary of Affected Environment by Resource Area</b>	
<b>Resource Area</b>	<b>Summary</b>
	<p>support facilities for CCAFS west of LC-36 along the Banana River. The area encompassing LC-36 has been designated by CCAFS for use as a launch complex. CCAFS is a relatively isolated facility, and as such there are no light-sensitive receptor areas near LC-36. The closest residential communities to CCAFS are approximately 7 miles from the launch site, and have low light sensitivity to launches due to the frequent rocket launches in the area. Current light sources at CCAFS include security lighting on the grounds of existing launch complexes and light generated from existing nighttime aircraft operations. The entire State of Florida is defined as being part of a coastal zone (NOAA, 2004); therefore, the Proposed Action is subject to the requirements of the Federal Coastal Zone Management Act.</p> <p>For past construction activities at LC-36, the USAF has consulted with the Florida Department of State, Division of Historic Resources to mitigate adverse effects to cultural resources and execute a memorandum of agreement (MOA). Per the MOA, USAF completed a Historic American Building Survey Level II Standards and other requirements. In 2005, the Florida Department of State, Division of Historical Resources requested the USAF document LC-36 on Florida Master Site File Resource Group Forms, which served as mitigation for 2006 demolition activities. Current records show that Building 05501 (the Blockhouse) is eligible for listing in the National Register of Historic Places due to its features that are of historic engineering importance.</p> <p>No designated 4(f) properties, including public parks, recreation areas, or wildlife refuges, exist within the boundaries of CCAFS. As detailed in the 2008 EA, numerous public parks, recreation areas, and wildlife refuges are located outside of CCAFS. The Merritt Island Wildlife Refuge overlaps the northwestern portion of the Kennedy Space Center (KSC). The refuge was established by an agreement between NASA and the U.S. Fish and Wildlife Service (USFWS) and is cooperatively managed. The Cape Canaveral National Seashore is adjacent to the Merritt Island Wildlife Refuge and is operated by the National Park Service.</p>
<b>Cultural Resources and Section 4(f) Properties</b>	<p>Numerous types of hazardous materials are currently used at CCAFS to support the various missions and general maintenance operations. Categories of hazardous materials used in support of current lift vehicle system activities include petroleum products, oils, lubricants, volatile organic compounds, corrosives, refrigerants, adhesives, sealants, epoxies, and propellants (USAF, 2000). Space Florida would be responsible for the collection and transport of hazardous wastes (including propellant waste) from the satellite accumulation areas to a 90-day hazardous waste accumulation area, then to an off-site permitted treatment, storage, and disposal facility (USAF, 2007; USAF, 2006). There are no sites at CCAFS listed or under consideration for listing on the National Priorities List (EPA, 2007). There are no underground storage tanks located at LC-36.</p>
<b>Noise</b>	<p>CCAFS is a relatively isolated facility, which reduces the potential for noise impacts on adjacent communities. The closest residential communities to LC-36 are the City of Merritt Island, located approximately 7 miles to the east-southeast and the City of Cape Canaveral, located approximately 7 miles to the south. Ambient noise levels in these communities are normally low, with higher noise levels occurring in the communities' industrial areas, and lower noise levels (normally about 45 to 55 A-weighted sound level (dBA)) in the residential areas and along the beaches. Infrequent aircraft fly-overs and rocket launches from CCAFS and KSC currently increase noise levels for short periods</p>

<b>Exhibit 4-1. Summary of Affected Environment by Resource Area</b>	
<b>Resource Area</b>	<b>Summary</b>
	<p>of time.</p> <p>Existing noise sources at CCAFS include aircraft noise associated with aircraft landing facilities and current rocket launch operations at CCAFS and KSC. Other noise sources resulting from industrial operations are present in the vicinity of LC-36, but these sources are considered minor in comparison to launch noise, which includes both engine noise and sonic booms produced as launch vehicles reach supersonic speeds.</p>
<b>Socioeconomics</b>	<p>CCAFS is located in eastern Brevard County, Florida which has an estimated population of about 536,500. The median household income for 2007 in Brevard County was \$50,261, and the unemployment rate was approximately 11.4 percent. Florida has a strong commitment to growing its already prominent aerospace industry which is ranked third among states with employment in the aerospace industry. In 2005, Florida employed 145,000 people in the industry and generated \$7.5 billion in earnings (U.S. Census Bureau, 2009; U.S. Bureau of Labor Statistics, 2009; Cape Canaveral, 2007).</p>
<b>Water Resources</b>	<p><b>Surface Water</b></p> <p>CCAFS is situated on a barrier island that separates the Banana River from the Atlantic Ocean. Three estuarine lagoons are in proximity to CCAFS: the Banana River located 4 miles to the west of LC-36, Mosquito Lagoon located 16 miles to the north, and the Indian River located 11.4 miles to the west, separated from the Banana River by Merritt Island. South of LC-36, four small waterbodies are present northeast of Lighthouse Road (RS&amp;H, 2009). No waterbodies exist near LC-36 that are listed under Section 303(d) of the Clean Water Act as waters which do not meet applicable water quality standards, and the nearest one is approximately 6 miles from the project site (EPA, 2009b). Several waterbodies in the Middle East Coast Basin have been designated as Outstanding Florida Waters in Chapter 62-3 of the Florida Administrative Code, including most of Mosquito Lagoon and the Banana River, Indian River Aquatic Preserve, Banana River State Aquatic Preserve, Pelican Island National Wildlife Refuge, and Canaveral National Seashore. These waterbodies are afforded the highest level of protection, and any compromise of ambient water is prohibited. In addition, the Indian River Lagoon system has been determined to be an Estuary of National Significance under the National Estuary Program (EPA, 2009c). The Environmental Protection Agency (EPA) established the National Estuary Program to improve the quality of estuaries of national importance by maintaining and restoring the water quality and biological resources of each estuarine system (FAA, 2009a). In the vicinity of LC-36, four small waterbodies are present northeast of Lighthouse Road. Inland surface waters west of LC-36 have generally good water quality, but have little to no tidal influences. Instead, these waterbodies rely on wind driven currents and are subject to thermal and oxygen stratification in deeper channel areas. See the 2008 EA for a more detailed description of surface waters on CCAFS.</p> <p><b>Groundwater</b></p> <p>Both the surficial and Floridian aquifer systems underlie CCAFS. Within the area surrounding LC-36, depth to groundwater in the surficial aquifer is typically not greater than three feet below land surface. Groundwater in the surficial aquifer flows to the east towards the Atlantic Ocean. Contamination of groundwater with residual by-products</p>

<b>Exhibit 4-1. Summary of Affected Environment by Resource Area</b>	
<b>Resource Area</b>	<b>Summary</b>
	<p>of an industrial solvent, trichloroethylene, occurred as a result of the cleaning process used at LC-36 prior to its decommissioning in 2006.</p> <p><b>Floodplains and Wetlands</b>                      LC-36 is surrounded by the 100-year floodplain; however, the developed areas of LC-36 are elevated and have been determined by the Federal Emergency Management Agency (FEMA) to be outside the 100-year floodplain (FEMA, 2010). Several small palustrine, emergent wetland areas are located in the vicinity of the LC-36. One wetland is located within the launch complex near Former Pad A. A cluster of additional wetland areas are located immediately south of LC-36, with the closest wetland approximately 110 feet from the launch complex.</p>



## **5. ENVIRONMENTAL CONSEQUENCES**

The environmental consequences analysis in this SEA focuses on the potential environmental impacts of the construction and operation activities associated with the redevelopment of LC-36 into a commercial space launch site. Where appropriate, the analysis references the potential environmental consequences associated with LC-46 that were analyzed in the 2008 EA. The analysis in this SEA identifies the total impacts (i.e., the original estimates in the 2008 EA and any additional impacts), where applicable.

### **5.1 Air Quality**

The Proposed Action would not be expected to significantly impact air quality around LC-36 and LC-46. The air quality data and analyses in the 2008 EA remain substantially valid, and the FAA used those data and analyses to support the conclusions in Section 5.1.1.

#### **5.1.1 Proposed Action**

##### **5.1.1.1 Emissions**

As described in the 2008 EA, The Falcon 1 uses RP (rocket propellant)-1 and liquid oxygen (LOX) as propellants. The primary emission products from RP-1/LOX engines are carbon dioxide (CO<sub>2</sub>), carbon monoxide (CO), water vapor (H<sub>2</sub>O), and small amounts of nitrogen oxides (NO<sub>x</sub>) and particulate matter (PM). The Athena-2 uses solid rocket propellant composed of 68 percent ammonium perchlorate, 18 percent powdered aluminum (Al), and 14 percent hydroxyl-terminated polybutadiene. The primary emission products from the Athena-2 are CO<sub>2</sub>, CO, water vapor, NO<sub>x</sub>, PM (as aluminum oxide, Al<sub>2</sub>O<sub>3</sub>), and gaseous hydrogen chloride (HCl). Nearly all the emitted CO oxidizes rapidly to CO<sub>2</sub>. Additionally, HCl is highly soluble in liquid water. HCl in the atmosphere can dissolve in water-containing aerosols or in precipitation, forming the aqueous solution of HCl known as hydrochloric acid.

The GLV uses both liquid and solid propellants depending on the stage. Stage 1 of the GLV uses RP-1 and LOX. The SRMs and Stage 2 use solid rocket propellant of the same or similar composition as the solid propellant used by the Athena-2 that was described in the 2008 EA. Stage 3 uses hydrazine (as H<sub>2</sub>N<sub>2</sub>) and nitrogen tetroxide (N<sub>2</sub>O<sub>4</sub>). The orbital maneuvering engine, which is not used with all payloads, uses hypergolic propellants that are assumed for the purposes of air quality analysis to be H<sub>2</sub>N<sub>2</sub> and N<sub>2</sub>O<sub>4</sub>.

Emissions were calculated based on the total burn time of each rocket stage and estimated time of rocket operation in each atmospheric layer. Using these data, the approximate percentage of propellant burned from each stage within each atmospheric layer was determined. Exhibit 5-1 presents the assumptions used to calculate the total emissions from the operation of the Falcon 1, Athena-2, and GLV vehicles. Using the mass of propellant in each rocket stage and the percentage of stage propellant burned in each atmospheric layer, the total propellant mass burned in each layer was determined. Emission factors were applied to the propellant mass burned in each layer to determine launch vehicle emissions associated with the Proposed Action. Exhibit 5-2 presents the emissions per launch for the Falcon 1, Athena-2, and GLV vehicles, and the total emissions for all 36 projected launches per year (up to 12 launches of each rocket) from the Proposed Action.

**Exhibit 5-1. Falcon 1, Athena-2, and GLV Estimated Flight Profiles and Propellant Consumption per Atmospheric Layer**

Atmospheric Layer	Operating Stage No.	Estimated Burn Time in Layer (seconds)	Approximate Percentage of Stage Propellant Burned <sup>a</sup>
<b>Falcon 1</b>			
Lower Troposphere	1	15	9
Upper Troposphere	1	60	36
Stratosphere	1	75	44
Mesosphere	1	19	11
Ionosphere	2	378	100
<b>Athena-2</b>			
Lower Troposphere	1	15	18
Upper Troposphere	1	45	54
Stratosphere	1	23	28
Stratosphere	2	83	100
Mesosphere	3	90	60
Ionosphere	3	60	40
<b>GLV</b>			
Lower Troposphere	1 (Static firing)	40 <sup>b</sup>	19 <sup>b</sup>
Lower Troposphere	1 (Launch)	15	7
Lower Troposphere	SRMs	15	24
Upper Troposphere	1	45	21
Upper Troposphere	SRMs	45	71
Stratosphere	1	106	50
Stratosphere	SRMs	3	5
Mesosphere	1	44	21
Mesosphere	2	90	63
Ionosphere	2	53	37
Ionosphere	3	150	100
Ionosphere	Orbital Maneuvering Engine	Up to 10,332	Up to 100

a. At average burn rate.

b. Assumes that liquid propellants are refilled after static firing and before launch.

**Exhibit 5-2. Total Potential Launch Vehicle Emissions from the Proposed Action<sup>a</sup>**

Vehicle	CO <sub>2</sub>	CO	H <sub>2</sub> <sup>c</sup>	H <sub>2</sub> O	N <sub>2</sub> <sup>c</sup>	NO <sub>x</sub>	THC <sup>c</sup>	SO <sub>x</sub>	PM	Cl <sub>2</sub> <sup>c</sup>	HCl
<b>Emissions per Launch (tons)</b>											
Falcon 1	14.4	5.9	0.1	8.8	0.0	( <sup>b</sup> )	0.0	0.0	( <sup>b</sup> )	0.0	0.0
Athena-2	54.6	0.0	0.0	32.1	0.0	3.0	0.0	0.0	45.1	0.2	24.9
GLV	193.2	66.5	1.4	118.9	2.7	1.6	0.0	0.0	25.0	0.1	13.8
<b>Total</b>	<b>262.2</b>	<b>72.4</b>	<b>1.5</b>	<b>159.8</b>	<b>2.7</b>	<b>4.6</b>	<b>0.0</b>	<b>0.0</b>	<b>70.1</b>	<b>0.3</b>	<b>38.7</b>
<b>Annual Emissions from All 36 Launches (tons/year)</b>											
Falcon 1	172.3	70.3	1.5	105.5	0.0	( <sup>a</sup> )	0.0	0.0	( <sup>a</sup> )	0.0	0.0
Athena-2	655.7	0.0	0.0	384.8	0.0	35.6	0.0	0.0	541.6	2.1	299.3
GLV	2,318.8	798.3	16.8	1,427.0	32.2	19.7	0.0	0.0	299.8	1.2	165.7
<b>Total</b>	<b>3,146.8</b>	<b>868.6</b>	<b>18.3</b>	<b>1,917.3</b>	<b>32.2</b>	<b>55.3</b>	<b>0.0</b>	<b>0.0</b>	<b>841.4</b>	<b>3.3</b>	<b>465.0</b>

a. Source for emission factors used to calculate emissions: FAA, 1996; FAA, 2001; USAF, 2007.

b. Minor emissions would be expected. Data are not available to quantify mass emissions.

c. H<sub>2</sub> = Hydrogen, N<sub>2</sub> = Nitrogen, THC = Total Hydrocarbon, SO<sub>x</sub> = Sulfur Oxides, Cl<sub>2</sub> = Chlorine

### 5.1.1.2 Impacts on the Atmosphere with the Proposed Action

#### 5.1.1.2.1 Lower Troposphere

Total potential annual emissions to the lower troposphere from the Proposed Action are shown in Exhibit 5-3.

**Exhibit 5-3. Total Potential Annual Emissions to the Lower Troposphere from the Proposed Action (tons/year)**

Vehicle	CO <sub>2</sub>	CO	H <sub>2</sub>	H <sub>2</sub> O	N <sub>2</sub>	NO <sub>x</sub>	THC	SO <sub>x</sub>	PM	Cl <sub>2</sub>	HCl
Falcon 1	13.1	5.3	0.1	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Athena-2	53.9	0.0	0.0	31.6	0.0	2.9	0.0	0.0	44.5	0.2	24.6
GLV	498.1	175.6	3.7	303.2	0.0	3.7	0.0	0.0	56.0	0.2	31.0
<b>Total</b>	<b>565.1</b>	<b>180.9</b>	<b>3.8</b>	<b>342.8</b>	<b>0.0</b>	<b>6.6</b>	<b>0.0</b>	<b>0.0</b>	<b>100.5</b>	<b>0.4</b>	<b>55.6</b>

Total potential emissions of any criteria pollutants under the Proposed Action would not be expected to cause exceedances of the NAAQS or the Florida Ambient Air Quality Standards. The emissions within the lower atmosphere would be of very short duration and would be rapidly dispersed due to the mechanical and thermal turbulence of the exhaust gases, the movement of the vehicle, and wind action. The flight path for all launches would be directly over the Atlantic Ocean. The prevailing wind patterns would tend to disperse launch exhaust over the ocean and away from population centers, minimizing the impact on the public and the environment. The annual emissions to the lower troposphere from the Proposed Action would have a negligible impact on air quality below 3,000 feet.

#### 5.1.1.2.2 Upper Troposphere and Upper Atmosphere

Total potential annual emissions to the upper troposphere and upper atmosphere from the Proposed Action are presented in Exhibit 5-4.

**Exhibit 5-4. Total Potential Annual Emissions to the Upper Troposphere and Upper Atmosphere from the Proposed Action (tons/year)**

Vehicle	CO <sub>2</sub>	CO	H <sub>2</sub>	H <sub>2</sub> O	N <sub>2</sub>	NO <sub>x</sub>	THC	SO <sub>x</sub>	PM	Cl <sub>2</sub>	HCl
<b>Upper Troposphere</b>											
Falcon 1	52.3	21.4	0.4	32.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Athena-2	161.6	0.0	0.0	94.9	0.0	8.8	0.0	0.0	133.5	0.5	73.8
GLV	555.5	143.7	3.0	335.0	0.0	11.1	0.0	0.0	168.1	0.7	92.9
Sum	769.4	165.1	3.4	461.9	0.0	19.9	0.0	0.0	301.6	1.2	166.7
<b>Stratosphere</b>											
Falcon 1	65.4	26.7	0.6	40.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Athena-2	380.7	0.0	0.0	223.4	0.0	20.7	0.0	0.0	314.5	1.2	173.8
GLV	842.8	338.5	7.1	515.7	0.0	0.7	0.0	0.0	11.2	0.0	6.2

**Exhibit 5-4. Total Potential Annual Emissions to the Upper Troposphere and Upper Atmosphere from the Proposed Action (tons/year)**

Vehicle	CO <sub>2</sub>	CO	H <sub>2</sub>	H <sub>2</sub> O	N <sub>2</sub>	NO <sub>x</sub>	THC	SO <sub>x</sub>	PM	Cl <sub>2</sub>	HCl
Sum	1,288.9	365.2	7.7	779.2	0.0	21.4	0.0	0.0	325.7	1.3	180.0
<b>Mesosphere</b>											
Falcon 1	16.6	6.8	0.1	10.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Athena-2	35.7	0.0	0.0	21.0	0.0	1.9	0.0	0.0	29.5	0.1	16.3
GLV	393.4	140.5	3.0	239.6	0.0	2.7	0.0	0.0	40.6	0.2	22.4
Sum	445.7	147.3	3.1	270.7	0.0	4.6	0.0	0.0	70.1	0.3	38.7
<b>Ionosphere</b>											
Falcon 1	24.9	10.1	0.2	15.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Athena-2	23.8	0.0	0.0	14.0	0.0	1.3	0.0	0.0	19.7	0.1	10.9
GLV	28.9	0.0	0.0	33.5	32.2	1.6	0.0	0.0	23.9	0.1	13.2
Sum	77.6	10.1	0.2	62.7	32.2	2.9	0.0	0.0	43.6	0.2	24.1

Total potential emissions of Greenhouse Gases (GHGs) and Ozone Depleting Substances (ODS) are of concern in the upper atmosphere. The potential emissions that may affect global climate change directly include CO<sub>2</sub>, H<sub>2</sub>O, and carbon particles, which are a component of PM. Under the Proposed Action, the total estimated annual emissions of CO<sub>2</sub> in the stratosphere would be 1,288.9 tons. By comparison, CO<sub>2</sub> emissions for the United States in 2003 totaled 6,305.78 million tons (WRI, 2008a). The incremental contribution of emissions under the Proposed Action would be extremely small and would result in a negligible impact on global climate change. Total potential emissions of H<sub>2</sub>O to the stratosphere under the Proposed Action would also have an insignificant effect on global climate change due to the large number of natural and anthropogenic sources of H<sub>2</sub>O. Carbon particle emissions are of concern because surfaces of individual particles enable important reactions that would not proceed otherwise, and because the properties of the particles in absorbing and reflecting sunlight and infrared radiation can have climate change effects. The Falcon 1 engine and the GLV stage 1 would produce very small amounts of carbon PM, but these emissions have not been detected in tests (USAF, 2007) and are not quantified in Exhibits 5-1 through 5-4. Because of their small quantities, any PM emissions from the Falcon 1 and the GLV stage 1 would have negligible climate change impacts.

The total potential PM emitted by the Athena-2 engine, the GLV SRMs, and the GLV stage 2 consists primarily of Al<sub>2</sub>O<sub>3</sub>, with only very small amounts of carbon particles. Aluminum oxide particles provide reactive surfaces for free radical formation and other chemical reactions that can increase the formation of ODS or other pollutants. Based on studies of the Space Shuttle and Titan-IV rockets (WMO, 1995, as cited in FAA, 1996), which have far greater emissions of Al<sub>2</sub>O<sub>3</sub>, impacts of the Athena-2 and GLV launches on ozone depletion would be negligible.

A small fraction of Athena-2, GLV SRM, and GLV stage 2 rocket engine emissions consists of HCl that can dissociate in the atmosphere to produce atomic chlorine and chlorine monoxide, which are part of a class of highly reactive radicals that attack and deplete ozone in the plume wake immediately following launch. However, under the Proposed Action, launches would

occur infrequently, with a maximum of one launch of the Athena-2 and one launch of the GLV per month. Therefore, negligible impacts on ozone would be anticipated.

Rockets launched under the Proposed Action would also emit CO and NO<sub>x</sub>, two important photochemical pollutants that can influence the creation and destruction of greenhouse gases. Under the Proposed Action, the total estimated annual emissions of CO and NO<sub>x</sub> to the stratosphere would be 365.2 and 21.4 tons, respectively. The contributions of these pollutants would be extremely small relative to U.S. annual emissions, which numbered approximately 85.66 million tons of CO and 21.37 million tons of NO<sub>x</sub> in 2000 (WRI, 2008b; WRI, 2008c). As a result, the presence of these chemicals in rocket emissions associated with the Proposed Action would have a negligible impact on global climate change.

### **5.1.2 Conclusion**

The addition of the redevelopment and operation activities at LC-36 would not result in a substantial increase in potential impacts to air quality or climate change. The Proposed Action would not be expected to have a significant impact on air quality or climate change.

### **5.1.3 No Action Alternative**

Under the No Action Alternative, the FAA would not issue a Launch Site Operator License to Space Florida for commercial launches from LC-36 and LC-46 at CCAFS and no additional impacts to air quality would occur. Existing USAF activities could continue at LC-36 and LC-46.

## **5.2 Biological Resources (Fish, Wildlife, and Plants)**

The Proposed Action would not be expected to significantly impact biological resources around LC-36 and LC-46. The biological resources data and analyses in the 2008 EA remain substantially valid, and the FAA used those data and analyses to support the conclusions in Section 5.2.1.

### **5.2.1 Proposed Action**

The redevelopment of LC-36 into a commercial space launch site could impact biological resources in the vicinity of the launch site through both the construction activities necessary to prepare the site for operation and the operational activities associated with commercial launches.

#### **5.2.1.1 Terrestrial Vegetation and Wildlife**

The majority of the property surrounding LC-36 consists of disturbed, mowed, and maintained vegetation, transitioning into dense native vegetation communities consisting of coastal strand, freshwater marsh, and freshwater swamp habitats only at the boundary of LC-36. As all construction activities for the redevelopment of LC-36 would occur on previously disturbed land, no direct impacts to vegetation or wildlife within these native habitats would be expected. Construction activities could increase the spread of invasive species such as Brazilian pepper that may be present near LC-36; however, invasive species management plans in place for CCAFS should minimize any potential impacts.

Operations impacts associated with the use of LC-36 as a commercial launch site would be similar to those associated with LC-46 and are analyzed in more detail in the 2008 EA. These impacts could include localized, temporary foliar scorching and spotting of vegetation due to rocket exhaust; defoliation and reduced survivorship of vegetation due to acid deposition from rocket exhaust; a low probability of bird strikes during launch events; and birds and terrestrial mammals suffering startle responses due to launch noise. As these effects would be temporary and because launch activities would occur infrequently (approximately once a month at LC-36 and twice per month at LC-46), the Proposed Action would not result in an adverse effect on terrestrial vegetation or wildlife.

#### **5.2.1.2 Marine Species**

Similar to LC-46, launch operations at LC-36 could result in acidification of surface waters in areas near the launch site as a result of acid deposition from rocket exhaust. Acid deposition can lead to harmful conditions for near-shore, shallow fisheries and aquatic vegetation. However, as this area is subject to wind-blown salt spray and mixing with the open ocean, little or no adverse effects would be expected.

Non-recoverable rocket components and hardware could be jettisoned by GLVs during rocket launches and would typically fall downrange of LC-36 several hundred miles off the Florida coastline into the open ocean. While these events may result in the release of small quantities of RP-1 propellant, this propellant would be expected to dissipate within hours (USAF, 2007). Due to the small volume of this release into the open ocean, no adverse impacts to marine species would be expected. Rocket components could also strike marine animals when entering the ocean after being jettisoned during launch operations or in the event of a launch failure should the launch vehicle fall into the ocean. However, the probability of such a strike occurring has been calculated (see the 2008 EA for more detail) to be fewer than one animal strike annually for all launch activity in both the Atlantic and Pacific Oceans. As the probability of such an event occurring is extremely low, no impacts to marine wildlife would be expected. Sonic booms created by launch activities could also adversely affect whales or other marine species in the vicinity of LC-36. However, as launch activities would occur infrequently and marine species are likely to be present in low densities within the range in which they would be affected by sonic booms, no adverse impacts to marine wildlife would be expected.

#### **5.2.1.3 Protected Species**

Redevelopment activities at LC-36 have the potential to impact species that are federally protected or protected under Florida State law. Of the wildlife present in the vicinity of LC-36, four protected bird species, six protected reptiles or amphibians, and two protected mammals could be affected by launch operations at LC-36 (see Exhibit 4-1).

As stated in the 2008 EA, noise and vibration produced by individual launches could disturb or startle wood storks, scrub-jays, piping plovers, or least terns due to excessive noise and vibration. However, as these launches would be infrequent (approximately once a month at LC-36 and twice per month at LC-46) and the noise would be temporary (less than a minute) adverse impacts on protected birds would not be expected.

The federally threatened Eastern indigo snake utilizes a range of habitat types at CCAFS, (including sandhill habitats with well-drained sandy soils favored by the gopher tortoise), and as a result, could be present in the vicinity of LC-36 (USFWS, 1999; FAA, 2009a). Construction activities at LC-36 could result in a temporary increase in vehicle traffic and an increased likelihood of vehicle strikes, the primary source of mortality for the Eastern indigo snake. Eastern indigo snakes could be startled during launch activities and experience temporary hearing loss if in close proximity to launch events but no lasting effects would be anticipated.

As construction activities at LC-36 would occur on previously disturbed land, no impacts to the federally protected American alligator would be expected. However, the American alligator could also be startled and experience temporary hearing loss if in close proximity to launch events.

The gopher tortoise is under review for listing as a federally threatened species in the State of Florida and has been listed as a state threatened species under State law (Chapter 68A-27, Florida Administrative Code). While no native habitat clearing is planned at LC-36, gopher tortoises could be affected by construction activities at the launch site, such as vehicle strikes or noise disturbance. In order to minimize potential impacts to the gopher tortoise, a survey and relocation effort would occur prior to any ground disturbance at LC-36. CCAFS has consulted with Florida Fish and Wildlife Conservation Commission (FWC) and determined that state permits are not required to relocate the gopher tortoise (Hawkins, 2009).

Beaches at CCAFS also serve as nesting habitat for four federally listed sea turtles: the Hawksbill sea turtle, Loggerhead turtle, Leatherback turtle, and Kemp's Ridley turtle. While no direct impacts to these species would be expected from construction or launch operations at LC-36, artificial facility lighting may disorient sea turtles and hatchlings, causing them to move towards the light source instead of back to the ocean. In order to minimize these impacts, all exterior lighting for redevelopment activities at LC-36 would be designed and installed in accordance with the 45<sup>th</sup> Space Wing Instruction 32-7001, *Exterior Lighting Management*, and a Construction and Operation Light Management Plan would be required prior to the installation of any exterior lighting.

The federally threatened southeastern beach mouse primarily inhabits coastal dune habitat on CCAFS. As construction and launch operations at LC-36 would occur inland and away from suitable habitat for the southeastern beach mouse, direct impacts to mice resulting from construction activities at LC-36 would not be expected. Launch events at LC-36 could produce temporary startle responses in southeastern beach mice, but such effects would be temporary and no lasting effects would be expected.

The federally endangered West Indian manatee is present in the Banana River to the west of CCAFS. Because of LC-36's distance from the Banana River, no impacts to manatees would be expected from construction activities at LC-36. Operations impacts associated with the use of LC-36 as a commercial launch site would be similar to those associated with LC-46 and are analyzed in more detail in the 2008 EA. In general, impacts to manatees from launch operations could include startling as a result of launch noise and potential boat-strikes with salvage boats. As manatees do not startle readily, and any salvage boat operations would occur approximately 540 nautical miles off the Atlantic coast, no adverse impacts to the West Indian manatee would be expected.

## **5.2.2 Conclusion**

The addition of the redevelopment and operation activities at LC-36 would not result in a substantial increase in potential impacts to terrestrial vegetation and wildlife, marine species, or protected species. The Proposed Action would not be expected to have a significant impact on terrestrial vegetation and wildlife, marine species, or protected species.

## **5.2.3 No Action Alternative**

Under the No Action Alternative, the FAA would not issue a Launch Site Operator License to Space Florida for commercial launches from LC-36 and LC-46 at CCAFS and no additional impacts to biological resources would occur. Existing USAF activities could continue at LC-36 and LC-46.

## **5.3 Compatible Land Use (Light Emissions and Visual Resources, Coastal Resources)**

The Proposed Action would not be expected to significantly impact compatible land use, visual resources, or coastal resources around LC-36 and LC-46. The compatible land use, visual resources, and coastal resources data and analyses in the 2008 EA remain substantially valid, and the FAA used those data and analyses to support the conclusions in Section 5.3.1.

### **5.3.1 Proposed Action**

No change in planned or existing land use would be expected as a result of redevelopment of LC-36. Redevelopment of LC-36 would be in conformance for its designated use at CCAFS, and would not change any planned or existing land use designations. All construction and launch activities at LC-36 would occur on previously disturbed land and would support launch activities similar to those that occurred at LC-36 from 1962 to 2005.

Redevelopment of launch facilities at LC-36 would create a new source of light emissions due to artificial facility lighting. In order to minimize light emissions from new facility lighting, all exterior lighting for redevelopment activities at LC-36 would be designed and installed in accordance with the 45<sup>th</sup> Space Wing Instruction 32-7001, *Exterior Lighting Management*. In addition, a Construction and Operation Light Management Plan would be required prior to the installation of any exterior lighting. The nearest light-sensitive receptors would be communities which are acclimated to frequent launches of similar or larger size, and would be unlikely to experience light emissions as a result of launch events. Sea turtles nesting in the vicinity of LC-36 could be affected by light emissions, and a discussion of these impacts is presented in Section 5.2.1.3.

There would not be any additional impacts to visual resources as a result of construction because redevelopment activities at LC-36 would consist of modifications to existing infrastructure and the addition of new facilities that are similar to the other structures at CCAFS. Impacts to visual resources from launch operations would be temporary and infrequent, as launches are only planned to occur approximately once a month at LC-36, in addition to the two per month at LC-46.

The Coastal Zone Management Act (CZMA) of 1972 requires Federal agency activities with reasonably foreseeable effects on coastal zones to be consistent with state programs that are approved under Federal coastal management programs. The state agency that implements or coordinates a state's federally approved coastal management program is responsible for Federal consistency reviews. Construction activities at LC-36 would take place in the State-designated coastal zone. All construction activities would take place only on previously disturbed land and no construction would take place seaward of the mean high water line. Thus, no impacts to natural shoreline processes and coastal resources would be expected.

### **5.3.2 Conclusion**

The addition of the redevelopment and operation activities at LC-36 would not result in a substantial increase in potential impacts to land use compatibility, visual resources, or coastal resources. The Proposed Action would not be expected to have a significant impact on land use compatibility, visual resources, or coastal resources.

### **5.3.3 No Action Alternative**

Under the No Action Alternative, the FAA would not issue a Launch Site Operator License to Space Florida for commercial launches from LC-36 and LC-46 at CCAFS, and no additional impacts to compatible land use, visual resources, or coastal resources would occur. Existing USAF activities could continue at LC-36 and LC-46.

## **5.4 Cultural Resources and Section 4(f) Properties**

The Proposed Action would not be expected to significantly impact cultural resources around LC-36 and LC-46. The USAF would consult with the Florida State Historic Preservation Officer (SHPO) before beginning any future renovation activities planned for the Blockhouse which is the only site eligible for listing in the National Register and could be impacted by the proposed operations on LC-36. The cultural resources data and analyses in the 2008 EA remain substantially valid, and the FAA used those data and analyses to support the conclusions in Section 5.4.1.

### **5.4.1 Proposed Action**

Cultural resources include prehistoric and historic archaeological sites, buildings, sites, districts, structures, landscapes, or objects having historical, architectural, archaeological, cultural, or scientific importance. The Blockhouse (Launch Control Building, see Exhibit 5-5) is a circular two-story, blast proof structure situated on LC-36 and is eligible for listing in the National Register of Historic Places. The exterior concrete wall is 5 feet thick covered with a 7 feet thick sand revetment protected by a 6-inch layer of shotcrete. A unique feature of the Blockhouse is the four periscopes on the second floor which were used by launch control to directly observe a launch. Specific details of proposed renovation activities planned for the Blockhouse are not known at this time. Under the proposed redevelopment activities at LC-36, the USAF would consult with the Florida SHPO and obtain concurrence on determination of effects before any future renovation activities planned for the Blockhouse begin. Specifically, renovations to the Blockhouse could be limited to the interior in order to preserve the historic architectural design of the exterior of the Blockhouse.

**Exhibit 5-5. View of Blockhouse (Building 05501) from LC36A, view towards the west**



Source: RS&H, 2009.

As stated in the 2008 EA, and as supported by the 2009 USAF Catex and the 2009 EBS, redevelopment activities and additional launch operations at LC-36 would not be expected to have a significant impact on cultural resources, provided SHPO consultation is completed before any future renovation activities for the Blockhouse begin.

As stated in the 2008 EA, launches from LC-46 would not include activities that would affect nearby Section 4(f) properties. Similar to the launch vehicles from LC-46, the GLV launch vehicle from LC-36 would accelerate over the Atlantic Ocean due to its trajectory, and its recoverable parts would fall several hundred miles off the Florida coastline and away from the Section 4(f) properties. The Proposed Action would not be considered a constructive or physical use of these Section 4(f) properties, and therefore, the Proposed Action would not result in significant impacts on Section 4(f) properties.

#### **5.4.2 Conclusion**

The addition of the redevelopment and operation activities at LC-36 would not result in a substantial increase in potential impacts to cultural resources and Section 4(f) properties. The Proposed Action would not be expected to have a significant impact on cultural resources or Section 4(f) properties.

#### **5.4.3 No Action Alternative**

Under the No Action Alternative, the FAA would not issue a Launch Site Operator License to Space Florida for commercial launches from LC-36 and LC-46 at CCAFS and no additional

impacts to cultural resources would occur. Existing USAF activities could continue at LC-36 and LC-46.

## **5.5 Hazardous Materials, Solid Waste, and Pollution Prevention**

The Proposed Action would not be expected to significantly impact hazardous materials, solid waste, and pollution prevention around LC-36 and LC-46. The hazardous materials, solid waste, and pollution prevention data and analyses in the 2008 EA remain substantially valid, and the FAA used those data and analyses to support the conclusions in Section 5.5.1.

### **5.5.1 Proposed Action**

The Proposed Action would not cause any significant impacts related to solid waste, pollution prevention, and hazardous materials.

#### **5.5.1.1 Solid Waste**

Solid waste generated during redevelopment of LC-36 would be disposed of in accordance with existing environmentally safe waste disposal practices. The production of solid waste would be expected to increase slightly due to construction activities and launch operations.

#### **5.5.1.2 Pollution Prevention**

Pollution prevention methods would be applied to all pollution-generating activities associated with the Proposed Action. Project design engineers would incorporate sustainment initiatives, and all contractors would comply with the Air Force Green Purchasing Program requirements to select environmentally friendly products and services, both of which would accomplish energy conservation, water conservation, and use of recycled or reclaimed materials. Space Florida would develop a Pollution Prevention Management Plan, in coordination with CCAFS pollution prevention plans and goals, in order to comply with all local, State, and Federal regulations.

#### **5.5.1.3 Hazardous Materials**

As described in the 2008 EA, primary hazardous materials used under the Proposed Action would be propellants. All propellants would be stored and used in compliance with Federal regulations 14 CFR §420.65 and 14 CFR §420.67 for solid and liquid propellants, respectively. In addition to the propellants, other hazardous materials (e.g., various composites, synthetics, and metals) may be used for rocket operation, including solvents, oils, and paints. The Proposed Action would be expected to generate hazardous wastes that are of manageable volume for handling within CCAFS and the hazardous waste stream types are typical for Florida. No changes in existing collection and disposal practices for solid waste or hazardous waste would be necessary and no changes to hazardous waste management plans would be needed. As detailed in the 2008 EA, in the event of a spill, clean up procedures from the Hazardous Materials Emergency Planning and Response document would be enacted. Space Florida would be responsible for compliance with all applicable State and EPA reporting requirements.

Prior to any construction activities, Space Florida would consult with the State of Florida Department of Environmental Protection (FDEP) and the Installation Restoration Program,

which has established controls and other measures to ensure that proper administrative and engineering controls are in place to prevent exposure to site workers and control any contaminated media.

Asbestos surveys conducted by the USAF revealed that Building 05501 (the Blockhouse) could contain asbestos. Therefore, any planned renovation of Building 05501 could disturb asbestos-containing material and create a potential for releasing asbestos fibers in the air. The presence of asbestos-containing material would first be verified, then the material would be removed and properly managed before renovation activities commence.

The USAF has conducted two separate soil clean-up actions that removed polychlorinated biphenyls (PCBs) so that PCB levels now are below the Florida Department of Environment's safety level of 2.1 mg/kg, and no additional remedial efforts are required since land use controls are in place. Little or no adverse impacts related to the presence of PCB's would be expected for the Proposed Action.

All hazardous materials and hazardous waste would be handled and disposed of in accordance with all Federal, State, local and installation restoration program regulations and directives, including the CCAFS Environmental Standards and Safety Standards, Space Florida's Hazardous Waste Management Plan, and 40 CFR Parts 260-279. The Proposed Action would not be expected to significantly impact hazardous materials around LC-36 and LC-46.

### **5.5.2 Conclusion**

The addition of the redevelopment and operation activities at LC-36 would not result in a substantial increase in potential impacts related to solid waste, pollution prevention, and hazardous materials. The Proposed Action would not be expected to have a significant impact related to solid waste, pollution prevention, and hazardous materials.

### **5.5.3 No Action Alternative**

Under the No Action Alternative, the FAA would not issue a Launch Site Operator License to Space Florida for commercial launches from LC-36 and LC-46 at CCAFS and no additional impacts relating to hazardous materials, solid waste, and pollution prevention would occur. Existing USAF activities could continue at LC-36 and LC-46.

## **5.6 Noise**

The Proposed Action would not be expected to have significant noise impacts around LC-36. The noise impact data and analyses in the 2008 EA remain substantially valid, and the FAA used those data and analyses to support the conclusions in Section 5.6.1.

### **5.6.1 Proposed Action**

Construction activities such as those required for elevation of the launch deck and road construction at LC-36 would generate temporary noise. The noise levels would vary depending on the nature of the work and the type of construction equipment required. At LC-36, no construction work would occur at night when noise would cause the most annoyance. Because

construction noise is temporary, and because there are no sensitive receptors in the immediate vicinity, no significant adverse noise impacts associated with the redevelopment of LC-36 would be expected.

Noise impacts resulting from launch operations would be created by both engine noise and sonic booms associated with launch activities. Launch noise can interrupt activities and result in annoyance to communities in close proximity to launch events. These noise impacts to communities are typically measured using the Day Night Average Sound Level (DNL), which is an average of sound levels over a 24-hour period with a 10 decibel (dB) adjustment factor applied at night (to account for the greater sensitivity of most people to noise during the night). FAA regulations (FAA Order 1050.1E, Change 1) state that any project that leads to an increase of 1.5 dB or more from a baseline level of 65 DNL constitutes a significant adverse noise impact.

The 2008 EA analyzed the noise levels associated with the Falcon 1 and Athena-2 launch vehicle operations at LC-46. The 2008 EA concluded that a maximum of 24 launches per year of these vehicles would result in an annual DNL substantially less than 65 DNL in the City of Cape Canaveral (approximately 7 miles from the launch pad). This conclusion was drawn, in part, by comparing modeled Falcon 1 and Athena-2 launch noise levels with actual measured noise levels of the much larger Atlas II which also would produce noise levels substantially less than 65 DNL at this same distance.

The conceptual GLV, which the FAA is using for the purposes of the environmental review at LC-36, would produce an estimated noise level of approximately 160 dB on the launch deck, and the same noise level would be expected for static test firings of the GLV engines. The overall vehicle noise level would be 132 dB at 1,500 feet, which is less than the noise level produced by the Atlas II launch vehicle at 1,500 feet. This noise level would occur for approximately two minutes and take place once a month. Assuming an additional 12 launches per year and noise levels equal to or lower than the Atlas II, the resulting DNL in the City of Cape Canaveral which is the nearest noise sensitive area would be substantially less than 65 and therefore no significant adverse impacts would be expected.

Personnel in the vicinity of launch pads may be exposed to high noise levels during launch events. According to U.S. Occupational Safety and Health Administration (OSHA) standards, no worker shall be exposed to noise levels higher than 115 dBA, and shall not be exposed to 115 dBA for longer than 15 minutes during an 8 hour work shift. As a result, all launch personnel would be within buildings and wear adequate hearing protection in order to meet OSHA standards for noise exposure.

The GLV is a larger launch vehicle than those studied in the 2008 EA for LC-46, and therefore sonic booms of greater magnitude could occur as a result. Sonic booms would be generated by launch vehicles as they reach supersonic speeds and are generally described by their peak overpressure. Assuming a sonic boom with a magnitude of 4 pounds per square foot (psf), such as generated by an Atlas II (USAF, 2007), which is a larger vehicle than the GLV, and 12 launches per year, the annual C-Weighted Day-Night Average Sound Level (CDNL) would be 49 dB, which is substantially lower than the 61 CDNL significance threshold. Therefore, no significant adverse impacts from sonic booms would be expected.

## **5.6.2 Conclusion**

The addition of the redevelopment and operation activities at LC-36 would not result in a substantial increase in potential impacts related to noise. The Proposed Action would not be expected to have a significant impact related to noise.

## **5.6.3 No Action Alternative**

Under the No Action Alternative, the FAA would not issue a Launch Site Operator License to Space Florida for commercial launches from LC-36 and LC-46 at CCAFS and no additional impacts related to noise would occur. Existing USAF activities could continue at LC-36 and LC-46.

## **5.7 Socioeconomics**

The Proposed Action would not be expected to significantly impact socioeconomics in the areas surrounding LC-36 and LC-46. The socioeconomic data and analyses in the 2008 EA remain substantially valid, and the FAA used those data and analyses to support the conclusions in Section 5.7.1.

### **5.7.1 Proposed Action**

The socioeconomics region of influence for the Proposed Action is Brevard County, Florida. The 2008 EA discusses the regulatory setting and existing conditions related to socioeconomics. The operation of LC-36 would not cause any displacement of populations, residences, or businesses in Brevard County. The additional construction personnel and costs associated with redeveloping LC-36 would have a temporary positive economic impact on the local community, but would not cause any permanent population growth. In addition, an increase in launch activities would make a small positive economic impact on Florida's aerospace industry. Additional personnel for launch-related activities would not increase the demand for existing services, including housing, hotels, restaurants, and transportation due to the temporary nature of their stay. Traffic would not be significantly affected during pre- and post-launch activities. Launches could increase tourism in the region and result in a slight short-term positive impact on socioeconomic resources.

### **5.7.2 Conclusion**

The addition of the redevelopment and operation activities at LC-36 would not result in a substantial increase in potential impacts to socioeconomics. The Proposed Action would not be expected to have a significant impact on socioeconomics except for the anticipated, small added benefit to Florida's space economy due to the increase in launches.

### **5.7.3 No Action Alternative**

Under the No Action Alternative, the FAA would not issue a Launch Site Operator License to Space Florida for commercial launches from LC-36 and LC-46 at CCAFS and no additional impacts related to socioeconomics would occur, however, not issuing the license would forgo the

anticipated added benefit to the economy from the Proposed Action. Existing USAF activities could continue at LC-36 and LC-46,

## **5.8 Water Resources (Surface Water, Groundwater, Floodplains, and Wetlands)**

The Proposed Action would not be expected to significantly impact water resources around LC-36 and LC-46. The water resources data and analyses in the 2008 EA remain substantially valid, and the FAA used those data and analyses to support the conclusions in Section 5.8.1.

### **5.8.1 Proposed Action**

The Proposed Action would not be expected to cause any significant impacts related to surface water, groundwater, wetlands, or floodplains.

#### **5.8.1.1 Surface Water**

Redevelopment activities at LC-36 have the potential to impact surface waters through short-term and temporary erosion, sedimentation, and water quality impacts resulting from ground disturbance activities during construction. In order to minimize these impacts, construction personnel would utilize best management practices in accordance with the standards established by the FDEP. Prior to construction of pad facilities, the operator of the construction site would need to obtain a National Pollution Discharge Elimination System Construction General Permit from the FDEP for construction activities at LC-36 that would disturb more than one acre of land or might discharge to surface water and would discharge storm water runoff into a municipal separate storm water sewer system or water of the United States.

Launch operations at LC-36 would produce rocket exhaust emissions that could impact surface water quality. Combustion of solid rocket propellants can emit hydrogen chloride vapor which can react with water in the atmosphere to form hydrochloric acid. As the hydrochloric acid falls back to earth, this could result in acidification of surface waters. In the event of a storm event occurring soon after launch, the potential exists for strongly acidic storm water runoff from the pad area. However, the small quantity of acidic storm water would be diluted in the event of a storm; therefore, the impacts from acidic storm water after a launch would be small. In the event that the waterbodies near LC-36 were directly exposed to launch emissions, the small amount of contamination may result in a slight decrease in pH (potential hydrogen) levels. However, as stated in the 2008 EA, the pH level of these waterbodies may decline for a period of time, but would be expected to return to pre-launch conditions within hours of the launch event.

Therefore, launch emissions would be expected to have little to no impact on these waterbodies. The nearby drainage system could also experience a slight drop in pH due to the launch emissions. Given the relatively high salinities of estuarine waters within the Indian River Lagoon system, and ocean waters, along with predictable pH stabilities of those waters, major short-term and long-term adverse impacts on surface water quality resulting from the launch emissions would not be expected.

Non-recoverable rocket components and hardware would be jettisoned by GLVs during rocket launches and would typically fall downrange of LC-36 several hundred miles off the Florida coastline into the open ocean. While these actions may result in the release of small quantities of RP-1 propellant, this propellant would be expected to dissipate within hours (USAF, 2007). Due

to the small volume of this release into the open ocean, impacts on water quality in the ocean would be negligible.

The probability of launch anomalies resulting in the accidental release of rocket propellant in the early stage of flight is small (1 percent probability) (NASA, 1997). In the unlikely event of such an anomaly, perchlorate from solid propellant rockets could leach into surface waters, resulting in short-term impacts to near-shore environments along the Atlantic coastline and the Banana River. However, perchlorate leaches slowly (in freshwater at 20°C it would take over a year for the perchlorate contained in solid propellant to leach out into the water, and even longer in lower water temperatures and more saline waters). As a result, perchlorate would be diluted in the water over this time period, and would not reach toxic concentrations (MDA, 2003).

In addition, in the unlikely event of such a launch mishap, emergency response and clean-up procedures would reduce the magnitude and duration of any impacts to floodplains and wetlands from accidental propellant releases. The 2008 EA presents a more detailed discussion of the impacts to surface waters resulting from accidental releases of rocket propellants.

### **5.8.1.2 Groundwater**

Redevelopment activities at LC-36 also have the potential to impact groundwater through runoff associated with ground disturbance activities during construction. In order to minimize these impacts, construction personnel would utilize best management practices in accordance with the standards established by the FDEP. In addition, if any construction activity is planned at LC-36 that would disturb more than one acre of land or might discharge to surface water, and would discharge storm water runoff into a municipal separate storm water sewer system or water of the United States, a National Pollution Discharge Elimination System Construction General Permit must be obtained from the FDEP.

Prior to the 2005 decommissioning, launch operations at LC-36 resulted in contamination of groundwater at the site with the industrial solvent, trichloroethylene (TCE), which was used in the component cleaning process. Periodic monitoring of the TCE plume at the site has revealed that the plume is slowly degrading, and no further remedial actions are planned or occurring. The proposed redevelopment of LC-36 would not interfere with ongoing groundwater monitoring plans and remedial actions.

While unlikely, launch anomalies could also result in short-term impacts to groundwater as a result of rocket propellant contamination associated with the launch anomaly. In particular, perchlorate resulting from solid propellant rockets has the potential to affect groundwater by leaching into groundwater aquifers. However, due to the slow leaching of perchlorate, small quantities would be released in comparison to the large groundwater aquifers that exist at CCAFS. As a result, these emissions would have little to no impact on groundwater resources. The 2008 EA presents a more detailed discussion of the impacts to groundwater resulting from accidental releases of rocket propellants

Acid deposition from launch emissions could impact the pH of groundwater as described for surface waters above and in the 2008 EA. As the pH would be expected to return to pre-launch conditions within hours of the launch event, adverse impacts to groundwater resulting from the launch emissions would not be expected.

### **5.8.1.3 Floodplains and Wetlands**

Construction activities associated with redevelopment at LC-36 would take place only on previously developed land and would not occur in wetland or floodplain areas. One small palustrine emergent wetland area has been identified at the southern portion of LC-36, but no redevelopment activities are planned in the vicinity of this wetland.

Acid deposition from launch emissions could impact the pH of wetland areas as described for surface waters above and in the 2008 EA. As the pH of these waterbodies would be expected to return to pre-launch conditions within hours of the launch event, adverse impacts to wetlands resulting from the launch emissions would not be expected. In addition, launch emissions and heat can cause localized foliar scorching and spotting of vegetation in nearby wetland areas. As stated in the 2008 EA, these impacts would be localized and temporary, and of insufficient intensity to cause long-term damage to vegetation.

Launch anomalies could result in short-term impacts to nearby emergent wetlands as a result of rocket propellant contamination associated with the launch anomaly. Emergency response and clean-up procedures would reduce the magnitude and duration of any impacts to wetlands from accidental propellant releases. The 2008 EA presents a more detailed discussion of the impacts to wetlands resulting from accidental releases of rocket propellants.

### **5.8.2 Conclusion**

The addition of the redevelopment and operation activities at LC-36 would not result in a substantial increase in potential impacts to surface water, groundwater, floodplains, and wetlands. The Proposed Action would not be expected to have a significant impact on surface water, groundwater, floodplains, and wetlands.

### **5.8.3 No Action Alternative**

Under the No Action Alternative, the FAA would not issue a Launch Site Operator License to Space Florida for commercial launches from LC-36 and LC-46 at CCAFS and no additional impacts to water resources would occur. Existing USAF activities could continue at LC-36 and LC-46.



## **6. CUMULATIVE IMPACTS**

### **6.1 Introduction**

According to 40 CFR § 1508.7, cumulative impacts are defined as "...the incremental impact of the actions when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions." Cumulative impacts include impacts from the vehicles that would be launched under Space Florida's license and other past, present, and reasonably foreseeable future activities that could affect the resources impacted by the Proposed Action.

### **6.2 Other actions**

The past, present and reasonably foreseeable actions at CCAFS and in the surrounding areas, including Kennedy Space Center (KSC) and Merritt National Wildlife Refuge as described in Section 10.2 of the 2008 EA are assumed to still be accurate and applicable to the Cumulative Impacts analysis in this SEA. Updates to these actions are described here.

As described in Exhibit 10-2 in the 2008 EA, the launch rate forecast for Cape Canaveral includes a total of 30 launches in 2010 up to 38 launches in 2013. A similar launch rate trend would be expected at Cape Canaveral beyond 2013. As of December 2009, there remain four active launch licenses at CCAFS as stated in the 2008 EA. As of December 2009, Space Exploration Technologies (SpaceX) has not completed the inaugural Falcon 9 launch vehicle flight and anticipates that the Falcon 9 will be on its launch pad at LC-40 at CCAFS in early 2010 (SpaceX, 2009).

KSC and Space Florida have partnered to establish a technology and commerce park titled the Exploration Park at KSC. The Exploration Park is expected to support expanded private sector participation in space exploration, support commercial space transportation, and promote commercial development of technologies for application in space and on Earth (FAA, 2009b). The initial phase is soon to be under design/construction by Space Florida and its contractor. With the Exploration Park, up to 315,000 square feet of planned floor space will be available for research and lab facilities, offices, and processing and light manufacturing (Space Florida, 2009). The launch rate forecast in Exhibit 10-2 for launches at KSC of 1 and 2 Ares I Ascent Development Flight Test /Orbital Flight Test in 2012 and 2013 respectively would not be expected to vary much beyond 2013.

The Merritt Island National Wildlife Refuge published their final Comprehensive Conservation Plan (CCP) developed by the USFWS in August 2008 to guide the management of the refuge and outline its programs and resource needs for the next 15 years. In the CCP, the USFWS describes its recommended course of action for the management and use of the refuge focusing its management on wildlife and habitat diversity. The plan includes increased efforts to control exotic plants, restore coastal islands, and increase environmental education with a focus on diversity of habitats and global warming, and enhancement of partnerships and coordination efforts.

## **6.3 Cumulative impacts analysis**

### **6.3.1 Air Quality**

The addition of up to 36 annual launches from CCAFS would not significantly increase air emissions. Even though the applicable ambient air quality standards have changed since the publication of the 2008 EA, the Proposed Action, in addition to the past, present, and reasonably foreseeable actions in the project area, would result in a minor, temporary increase in air emissions in an area that is currently in attainment for all criteria pollutants. Because these impacts would be minor and temporary, the incremental contribution to cumulative air quality impacts from the Proposed Action would be negligible.

The Intergovernmental Panel on Climate Change (IPCC) and the U.S. Global Change Research Program (USGCRP) have assessed the potential consequences of global climate change (IPCC, 2007 and USGCRP, 2009). The global average temperature since 1990 has risen by about 1.5 degrees Fahrenheit (°F) and it is projected to rise another 2 to 11.5°F by 2100, with the U.S. average temperature very likely to rise more than the global average over this century, with some variation from place to place (USGCRP, 2009). Precipitation patterns are also changing and in some regions there have been increases in both droughts and floods (USGCRP, 2009). Sea levels are rising at roughly double the rate observed over the past century as recorded by satellite data over the last 15 years (USGCRP, 2009). As stated in Section 10.3.1 in the 2008 EA, the emissions of GHGs and ODSs would be extremely small in the context of national and global emissions. Although the GHG emissions would be very small, they would contribute to global greenhouse gases emissions, and when added to emissions from the other reasonably foreseeable projects and actions detailed in Section 10.2 of the 2008 EA, and Section 6.2 of this SEA, and similar projects and actions across the globe, they could contribute to a cumulative impact on global climate change.

### **6.3.2 Biological Resources (Fish, Wildlife, and Plants)**

The area surrounding LC-36 and LC-46 has a history of launching commercial and government launch vehicles, including NASA's Space Shuttles, and hence the vegetation and wildlife that occur at CCAFS have been previously exposed to impacts from the launch industry. As described in Section 10.3.2 of the 2008 EA, other actions at CCAFS that are similar to the Proposed Action, would cause temporary and short-term impacts to vegetation, including scorching and acid deposition near the launch pad, and temporary noise impacts to wildlife but no long-term impacts would be expected. Accidental release of fuels in the ocean could impact marine animals; however, the propellant would be quickly diluted within the ocean. Any jurisdictional wetlands losses at LC-41 and LC-37 due to construction activities from other actions at CCAFS would be mitigated with replacement, protection, restoration, and avoidance. As stated in the 2008 EA, implementation of the Merritt Island Comprehensive Conservation Plan would have a positive impact on wildlife and their habitat and increase removal of invasive species. In addition, due to the similarity of the environment at the Refuge with that at the CCAFS, startled animals may find temporary shelter at the Refuge.

As stated in the 2008 EA, many of the projects in the Proposed Action area would potentially impact sea turtle hatchlings and other wildlife, and thus mitigation measures would be

implemented to minimize impacts and wildlife populations would be monitored. Additionally, since CCAFS requires compliance with a Light Management Plan to minimize impacts on sea turtles, the Proposed Action would have a negligible cumulative impact on the sea turtle. To minimize potential impacts to the gopher tortoise, survey and relocation efforts would also be conducted prior to any ground disturbance at LC-36. Since the impacts on biological resources would be temporary and relatively infrequent and mitigation measures would be implemented, the total cumulative impact would not be significant, and the Proposed Action makes a negligible incremental contribution to cumulative biological resources impacts.

### **6.3.3 Compatible Land Use (Light Emissions and Visual Resources, Coastal Resources)**

The area surrounding LC-36 and LC-46 contains launch infrastructure and associated facilities owing to its historical use for commercial and government launches. As discussed in Section 10.3.5 of the 2008 EA, any impacts to visual resources, coastal resources, and compatible land use from the other actions at the CCAFS and KSC would be minor and temporary. Further, a Construction and Operation Light Management Plan would be required prior to the installation of any exterior lighting, and all exterior lighting for redevelopment activities at LC-36 would be designed and installed in accordance with the 45<sup>th</sup> Space Wing Instruction 32-7001, *Exterior Lighting Management* in order to minimize light emissions. The Proposed Action would not have any significant impacts on compatible land use, visual resources, or coastal resources around LC-36 and LC-46, and thus the incremental contribution to cumulative impacts on compatible land use, visual resources, or coastal resources from the Proposed Action would be negligible.

### **6.3.4 Cultural Resources and Section 4(f) Properties**

Under the Proposed Action, no modification or construction activities would take place on LC-46 and no impacts to cultural resources would be expected. In addition, the facilities to be used on LC-46 are not listed or eligible for listing on the National Register of Historic Places, and the launch site does not contain a historic or tribal site of significance. LC-36 occurs within a large archaeological site at CCAFS and the Blockhouse or Building 05501 on LC-36 is eligible for the National Register of Historic Places. LC-36 has been developed since the early 1960s and the USAF has documented the historical significance of the launch complex. The USAF would complete SHPO consultation before conducting any future renovation activities planned for the Blockhouse. The Proposed Action would not have an impact on cultural resources and thus it would not contribute to cumulative cultural resource impacts in the project area.

No designated Section 4(f) properties, including public parks, recreation areas, or wildlife refuges, exist within the boundaries of CCAFS. As detailed in the 2008 EA, numerous public parks, recreation areas, and wildlife refuges are located outside of CCAFS including the Merritt Island Wildlife Refuge and the Cape Canaveral National Seashore. Launches under the Proposed Action and other actions at CCAFS would not result in any direct or constructive use of nearby Section 4(f) resources. As stated in the 2008 EA, the other launches from CCAFS including the SpaceX Falcon 1 and Falcon 9 would not include activities that would affect nearby Section 4(f) resources. Launch vehicles under the Proposed Action would accelerate over the Atlantic Ocean due to their trajectory and the recoverable parts of the launch vehicles would fall several hundred miles off the Florida coastline and away from the Section 4(f) lands. The

Proposed Action would not be considered a constructive or physical use of Section 4(f) Properties and thus the incremental contribution to cumulative impacts to Section 4(f) Properties from the Proposed Action would be negligible.

### **6.3.5 Hazardous Materials, Solid Waste, and Pollution Prevention**

Due to the historical use of the area around LC-36 and LC-46 for commercial rocket launches and NASA Space Shuttle launches, past and present actions have required the use and handling of hazardous materials, disposal of generated solid wastes, and pollution prevention. Similar to past and present programs in the project area, for all future programs all hazardous materials storage, use, and handling would take place in accordance with all applicable rules and regulations and disposal of generated solid wastes would occur in accordance with existing environmentally safe waste disposal practices. In addition, for the Proposed Action, Space Florida would develop a Pollution Prevention Management Plan, in coordination with CCAFS' pollution prevention plans and goals, in order to comply with all local, State, and Federal regulations. Section 10.3.7 in the 2008 EA discusses hazardous materials impacts from launch activities at the KSC and CCAFS and states that cumulative impacts from hazardous materials and hazardous waste management could occur on portions of CCAFS with historic soils and groundwater contamination. This would include LC-36 and LC-46. However, significant cumulative impacts would not be expected due to remediation activities that have been completed. The actions at CCAFS and KSC would have minor and temporary impacts on hazardous materials, solid wastes, and pollution prevention and the incremental contribution to cumulative hazardous materials, solid wastes, and pollution prevention impacts from the Proposed Action would be negligible.

### **6.3.6 Noise**

Commercial rocket launches and NASA Space Shuttle launches have historically been a part of the activities in the area surrounding LC-36 and LC-46 which has been exposed to the resulting launch noise. As discussed in Section 10.3.4 of the 2008 EA, noise impacts from other actions at CCAFS and KSC would be temporary with sonic boom impacts over the Atlantic Ocean.

Sensitive receptors would experience a maximum of a 1.8 dB increase in noise due to the cumulative effect of adding 36 launches per year associated with overall launch activity from LC-46 and LC-36. However, cumulative launch noise levels would be substantially less than 65 DNL and cumulative sonic boom noise levels would be substantially less than 61 CDNL, and therefore no significant cumulative impacts would be expected.

### **6.3.7 Socioeconomics**

Past and present actions at CCAFS and KSC have provided both construction jobs and jobs for implementing the programs within the project area. As stated in Section 10.3.6 of the 2008 EA, a temporary increase in personnel during launch activities at the CCAFS or KSC would not increase the demand for housing, hotels, restaurants or other existing services. All identified projects in the area would have small positive socioeconomic impacts and the additional construction personnel and costs associated with redeveloping LC-36 under the Proposed Action would result in slight short-term positive impacts on socioeconomic resources. The additional

launches under the Proposed Action may increase tourism in the area however, the region is well accustomed to accommodating tourists and the infrastructure exists to handle such demand. Owing to the minor and temporary impacts on the socioeconomic resources of the region, the incremental contribution to cumulative socioeconomic impacts from the Proposed Action would be negligible.

### **6.3.8 Water Resources (Surface Water, Groundwater, Floodplains, and Wetlands)**

Since the area surrounding LC-36 and LC-46 has historically been exposed to many commercial space rocket launches and NASA Space Shuttle launches, the local water resources have been exposed to launch impacts by many past actions. Incidental spills or releases to water from other actions at CCAFS and KSC that may impact surface water, groundwater, floodplains, and wetlands would require emergency response and clean up procedures as discussed in Section 5.5 of the 2008 EA and Section 5.8 of this SEA. As stated in Section 10.3.3 of the 2008 EA, the other actions at CCAFS and KSC would have temporary and minor impacts on the water resources in the vicinity, and the probability of any accidental spills from other launches would be extremely low. The water requirements for the Exploration Park project are unknown at this time but would not be expected to affect the operating requirements of other projects in the vicinity and thus would be expected to have a minimal cumulative impact on water supply. The Proposed Action's water requirements would have a minimal effect on water resources surrounding LC-36 and LC-46 and thus the incremental contribution to cumulative water resources impacts from the Proposed Action would be negligible.



## **7. LIST OF PREPARERS**

This chapter lists the primary contributors to the technical content of this SEA.

### **Government Preparers**

Name: Daniel Czelusniak

Affiliation: FAA Office of Commercial Space Transportation

Education: Juris Doctorate, BS Environmental Management

Experience: 8 years of environmental assessment experience

Name: Stacey M. Zee

Affiliation: FAA Office of Commercial Space Transportation

Education: MS Environmental Policy, BS Natural Resource Management

Experience: 12 years of environmental assessment experience

### **Contractor Preparers**

Name: Shawna Barry

Affiliation: ICF International, FAA Contractor

Education: MA Environmental and Resource Policy, BS Biology

Experience: 2.5 years of environmental assessment experience

Name: David Coate

Affiliation: ICF International, FAA Contractor

Education: MS Energy Technology, BA Mathematics, Physics, and Chemistry

Experience: 30 years of acoustics analysis experience

Name: David Ernst

Affiliation: ICF International, FAA Contractor

Education: MCRP Planning in Environmental Policy, BS Engineering, BA Ethics and Politics

Experience: 27 years of air quality and environmental assessment experience

Name: Kelly Hammerle

Affiliation: ICF International, FAA Contractor

Education: MPA Environmental Policy, BS Fisheries and Wildlife Sciences

Experience: 5 years of environmental analysis experience

Name: David Johnson

Affiliation: ICF International, FAA Contractor

Education: BS Biology, Minor in Geology and Chemistry

Experience: 10 years water resources and environmental assessment experience

Name: Tanvi Lal

Affiliation: ICF International, FAA Contractor

Education: MS Environmental Science, MPA, BS Life Sciences

Experience: 3 years of environmental assessment experience

Name: Michael Smith

Affiliation: ICF International, FAA Contractor

Education: PhD Sociology, MA Geography, BA Environmental Studies

Experience: 15 years of environmental assessment experience

Name: Neil Sullivan

Affiliation: ICF International, FAA Contractor

Education: MS Environmental Management, BS Human and Physical Geography

Experience: 13 years of environmental assessment experience

Name: Hova Woods

Affiliation: ICF International, FAA Contractor

Education: MPA Environmental Management, BS Finance

Experience: 8 years of environmental assessment experience

## **8. DISTRIBUTION LIST**

### **Federal Agencies**

Camardese, Michael B.  
45<sup>th</sup> Space Wing  
Cultural and Natural Resources Program  
Manager  
45 CES/CEVR  
185 West Skid Strip Road, MS #2006  
Patrick AFB, FL 32925-2231

Callister, Kathleen  
NEPA Program Manager  
NASA Headquarters  
Div. Mail Suite 5B42  
300 E Street, SW  
Washington, DC 20546

Hawkins, Dale  
45 CES/CEAO  
185 West Skid Strip Road  
Cape Canaveral Air Force Station,  
FL 32925-2231

Dawson, Bruce  
Field Manager  
U.S. Department of Interior  
Bureau of Land Management  
Eastern States Office  
411 Briarwood Drive, Suite 404  
Jacksonville, MS 39206

Hillyer, Rich  
45<sup>th</sup> Space Wing  
Program Requirements Office  
16460 Hanger Road (CCAFS)  
Patrick AFB, FL 32925

Hooper, Kevin  
45<sup>th</sup> Space Wing  
45 CES/CEVR  
185 West Skid Strip Road, MS #2006  
Patrick AFB, FL 32925-2231

Kershner, Mark A.  
45 CES/CEVR  
185 West Skid Strip Road, MS #2006  
Patrick AFB, FL 32925-2231

Keys, David  
SERO NEPA Coordinator  
NOAA Fisheries Service  
Southeast Regional Office  
263 13th Avenue South  
St. Petersburg, FL 33701

Hankla, Dave  
Field Supervisor  
U.S. Fish and Wildlife Service  
North Florida Field Office  
7915 Baymeadows Way, Suite 200  
Jacksonville, FL 32256-7517

Public Relations Office  
45SW/PA  
1201 Edward H. White II MS 7105  
Patrick Air Force Base, FL 32925

Straw, William  
Regional Environmental Officer  
Federal Emergency Management Agency  
3003 Chamblee Tucker Road  
Atlanta, GA 30341

Sutherland, Robin  
45<sup>th</sup> Space Wing  
45 CES/CEVR  
185 West Skid Strip Road, MS #2006  
Patrick AFB, FL 32925-2231

Thoben, Thomas, CHMM, REM  
Hazardous Waste Program Manager  
45<sup>th</sup> Space Wing 45CES/CEVC  
1224 Jupiter Street  
Patrick AFB, FL 32925

U.S. Environmental Protection Agency  
Office of Federal Activities  
EIS Filing Section  
Ariel Rios Building (South Oval Lobby),  
Mail Code 2252-A  
1200 Pennsylvania Avenue, NW  
Washington, DC 20460

U.S. Environmental Protection Agency  
Region 4 NEPA Program Office  
61 Forsyth Street, SW  
Atlanta, GA 30303

**State Agencies**

Dierfen, Kat  
Florida Fish and Wildlife Conservation  
Commission  
620 South Meridian Street  
Tallahassee, FL 32399

Griffin, Jason  
Florida Natural Areas Inventory  
1018 Thomasville Road  
Suite 200-C  
Tallahassee, FL 32308

Milligan, Lauren P.  
Office of Intergovernmental Programs  
State Clearinghouse  
Florida Department of Environmental  
Protection  
3900 Commonwealth Boulevard, MS 47  
Tallahassee, FL 32399-3000

Pastucha, Richard E.  
St. Johns River Water Management District  
19561-B SE Highway 42  
Umatilla, FL 32784

Weaver, Richard  
Florida Department of Agriculture and  
Consumer Services  
Division of Plant Industry  
P.O. Box 147100  
Gainesville, FL 32614-7100

**Local Agencies**

Kamm, Bob  
Staff Director  
Brevard County Metropolitan Planning  
Organization  
2725 Judge Fran Jamieson Way  
Bldg. B, Room 105, MS82  
Viera, FL 32940

Planning and Growth Management  
City of Titusville  
P.O. Box 2806  
Titusville Fl, 32781-2806

**Libraries**

Boddy, Pam  
Director  
Titusville Public Library  
2121 S. Hopkins Ave.  
Titusville, FL 32780

Dickinson, Ray  
Director  
Cocoa Beach Public Library  
550 North Brevard Ave  
Cocoa Beach, FL 32931  
(321) 868-1104

Escapa, Isabel  
Director  
Cape Canaveral Public Library  
201 Polk Avenue  
Cape Canaveral, FL 32920

Thompson, Jeff  
Director  
Merritt Island Public Library  
1195 North Courtenay Parkway  
Merritt Island, FL 32953

**Organizations**

Phillips, Daniel  
Spec Pro  
Mail Unit ESC  
Patrick AFB, FL 32925

Sanibani, Pius  
Spec Pro  
Air Pollution Program Engineer  
16460 Hanger Road (CCAFS)  
Patrick AFB, FL 32925



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