APPENDIX C
ENVIRONMENTAL JUSTICE ANALYSIS

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APPENDIX C
ENVIRONMENTAL JUSTICE ANALYSIS

C-1 INTRODUCTION

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, directs Federal agencies to identify and address, as appropriate, the disproportionately high and adverse health or environmental effects of their programs, policies, and activities on minority populations and low-income populations.

The Council on Environmental Quality (CEQ) has oversight responsibility for documentation prepared in compliance with the National Environmental Policy Act (NEPA) of 1969, as amended (42 U.S.C. 4321 et seq.). In December 1997, the CEQ released its guidance on Environmental Justice (CEQ 1997). The CEQ's guidance was adopted as the basis for the information provided in this Environmental Impact Statement (EIS) for the proposed Mars 2020 mission. The launch opportunity for the proposed Mars 2020 mission occurs during July – August 2020 and the next opportunity occurs 26 months later.

This appendix provides data necessary to assess the potential for disproportionately high and adverse human health or environmental effects on minority and low-income populations that may be associated with implementation of the Mars 2020 mission. The areas examined in this appendix include the counties for which any part of the county is within 100 kilometers (km) (62 miles (mi)) of either Space Launch Complex 41 (SLC-41) located in the northernmost section of Cape Canaveral Air Force Station (CCAFS), Brevard County, Florida, Space Launch Complex 37 (SLC-37), located on the northeastern section of CCAFS Brevard County Florida; or Launch Complex 39A (LC-39A) located on KSC, Brevard County, Florida north and east of SLC-41 and SLC-37. The counties that lie within 100 km (62 mi) of LC-39A and SLC-40 include Brevard, Indian River, Orange, Osceola, Seminole, Volusia, and small portions of Flagler, Lake, and Polk (Figure C-1). The counties that lie within 100 km (62 mi) of SLC-37 include those listed above with the exclusion of Flagler.

C-2 DEFINITIONS AND APPROACH

C-2.1 MINORITY POPULATIONS

During the Census of 2010, the U.S. Bureau of the Census (USBC) collected population data in compliance with guidance adopted by the Office of Management and Budget (62 FR 58782). The following definitions of minority individuals and population are used in this analysis of environmental justice:

Minority Individuals: Persons who are members of any of the following population groups: Hispanic or Latino of any race, American Indian or Alaska Native, Asian, Black or African-American, Native Hawaiian or Other Pacific Islander, or Multiracial (and at least one race, which is a minority race under CEQ guidance of 1997).

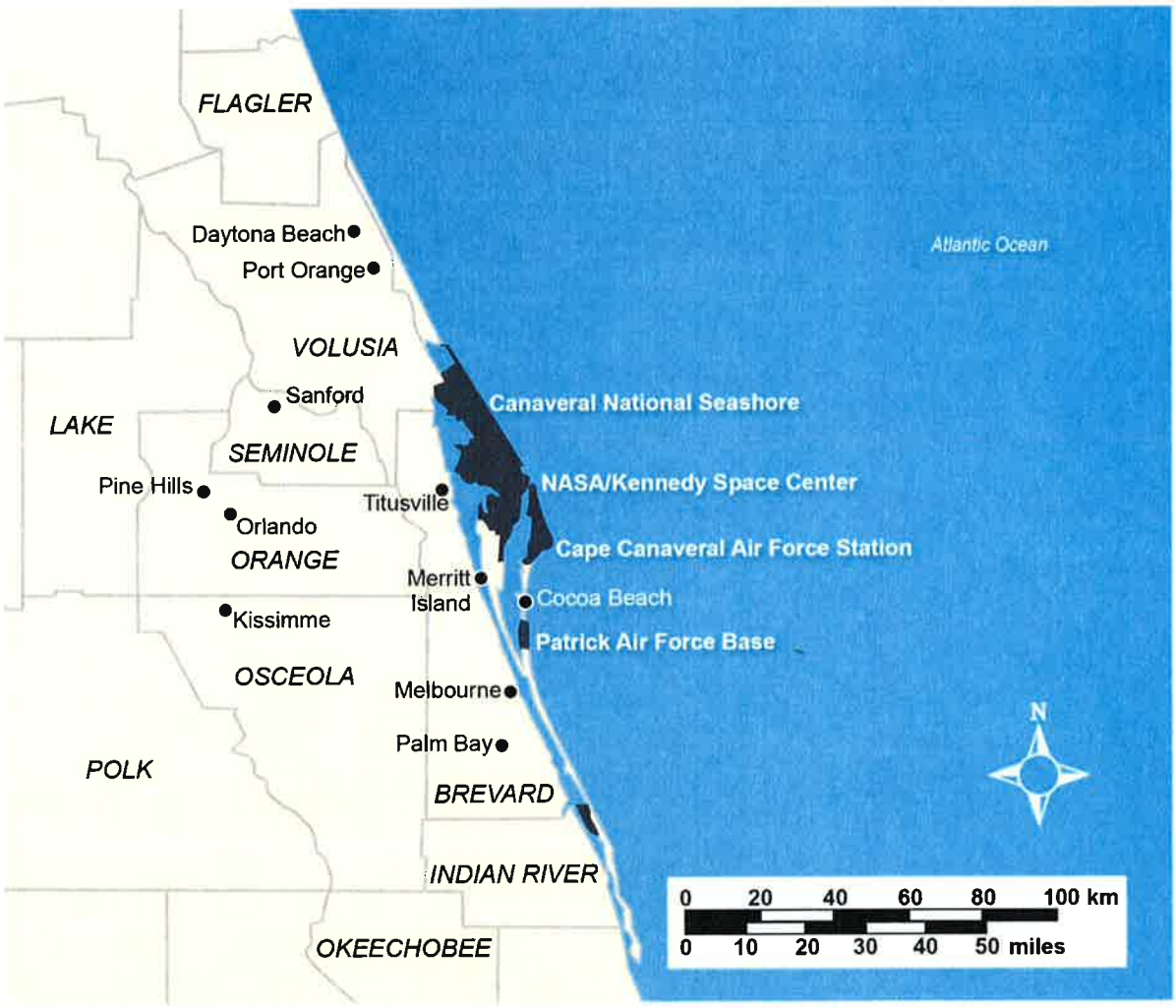

Figure C-1. The Area within 100 km (62 mi) of SLC-41, LC-39A and SLC-37

Minority Population: The total number of minority individuals residing within a potentially affected area.

Persons self-designated as Hispanic or Latino are included in the Hispanic or Latino population regardless of race. For example, Asians self-designated as Hispanic or Latino are included in both the Hispanic or Latino population and in the Asian population. Data used to characterize minority populations in the years 2010 and 2012 was extracted from the American Fact Finder portion of the U.S. Census Bureau 2010 census website (USBC 2013c) containing Census 2010 demographic data. Data used for the projection of population groups in Florida for the year 2020 was projected from the USBC's 2010 and 2012 (projected) census data for the nine surrounding counties.

C-2.2 LOW-INCOME POPULATIONS

Poverty thresholds are used to identify "low-income" individuals and populations (CEQ 1997). The following definitions of low-income individuals and population are used in this analysis:

Low-Income Individuals: Persons whose self-reported income is less than the poverty threshold for a given year.

Low-Income Population: The total number of low-income individuals residing within a potentially affected area.

Data used to characterize low-income populations in the year 2010 was extracted from the American Fact Finder portion of the U.S. Census Bureau 2010 census website (USBC 2013c) containing Census 2010 demographic data.

C-2.3 DISPROPORTIONATELY HIGH AND ADVERSE HUMAN HEALTH EFFECTS

Disproportionately high and adverse health effects are those that are significant (40 CFR1508.27) or above generally accepted norms, and for which the risk of adverse impacts to minority populations or low-income populations appreciably exceeds the risk to the general population.

C.2-4 DISPROPORTIONATELY HIGH AND ADVERSE ENVIRONMENTAL EFFECTS

Disproportionately high and adverse environmental effects are those that are significant (40 CFR 1508.27), and that would adversely impact minority populations or low-income populations appreciably more than the general population.

C-3 METHODOLOGY

C-3-1 SPATIAL RESOLUTION

For the purposes of enumeration and analysis, the USBC has defined a variety of aerial units (USBC 2001; USBC 1992). Aerial units of concern in this document include (in order of increasing spatial resolution) states, counties, census tracts, block groups, and blocks. The block is the smallest of these entities and offers the finest spatial resolution. This term refers to a relatively small geographical area bounded on all sides by visible features such as streets and streams, or by invisible boundaries such as city limits and property lines. In the analysis below, the county level data was used in the analysis of minority impacts.

C-3-2 PROJECTIONS OF POPULATIONS

The U.S. Census estimates for population groups living in the nine counties of interest closest to KSC for the years 2010 and 2012 are shown in Table C-1. Estimates for the 2020 populations living in the nine counties were obtained as linear projections of resident populations for the years 2010 and 2012.

C-3.3 ENVIRONMENTAL JUSTICE ASSESSMENT

The purpose of this analysis is to (1) identify minority populations and low-income populations residing within the identified area that would be potentially affected by

implementation of the Proposed Action (Alternative 1) or Alternatives 2 and 3, and determine if implementation of the Proposed Action or Alternatives would result in disproportionately high and adverse effects on these populations. In the event that radiological or other human health risks resulting from the implementation of the Proposed Action or Alternatives are found to be significant, then the health risks to minority populations and low-income populations will be evaluated to determine if they are disproportionately high.

C-4 CHARACTERIZATION OF POTENTIALLY AFFECTED POPULATIONS

The land area within the nine counties surrounding KSC includes approximately 2.2 million hectares (5.4 million acres) of central Florida's eastern coast. Approximately 4.0 million persons lived within the nine counties in the year 2010 (Table C-1). Between 2010 and 2012, the minority population within this area declined slightly and in 2012, minority persons comprised approximately 24 percent of the total population. By the year 2020, the total population is projected to increase to nearly 4.6 million persons, and minorities are projected to comprise approximately 24 percent of the total population.

In 2010, approximately 40 percent of the total and minority populations lived in Orange County.

Hispanic or Latino and Black or African-American populations were the largest minority groups living within the nine counties surrounding KSC in 2010. Blacks or African-Americans are the largest resident minority group in Brevard and Flagler counties; Hispanic or Latino the largest in the remaining seven counties. Hispanics or Latinos comprise the largest group of minority residents in the total area.

Data from Census 2010 (USBC 2013c) shows that 13.7 percent of the population living within the nine counties reported incomes below the poverty threshold; lower percentages than reported by Florida (14.7 percent) and the United States (14.3 percent).

Table C-1. Composition of the Population in the KSC Area

Population	Region		
	2010	2012	2020a
Total	4,008,199	4,123,015	4,633,191
White alone	3,000,817	3,150,914	3,517,600
Black or African American alone	563,524	597,053	682,502.3
American Indian and Alaska Native alone	16,119	10,080	11,225
Asian alone	117,240	123,613	142,107
Native Hawaiian and Other Pacific Islander alone	3,221	3,584	3,741
Some other race alone	194,124	134,859	158,873
Two or more races	113,154	102,912	117,142
Hispanic or Latino	768,264	840,134	979,685
Percent Minority	25.1%	23.6%	24.1%
Percent Low Income	13.7%	—	—

(a) Projected based on increase in total population by county between 2010 and 2012

Population	Brevard County			Flagler County			Indian River County		
	2010	2012	2020a	2010	2012	2020a	2010	2012	2020a
Total	543,376	547,307	563,317	95,696	98,359	109,773	138,028	140,567	151,199
White alone	450,927	456,906	470,272	78,710	77,874	86,911	116,346	120,669	129,796
Black or African American alone	54,799	55,223	56,838	10,884	11,999	13,391	12,397	12,825	13,795
American Indian and Alaska Native alone	2,118	1,146	1,180	267	0	0	408	0	0
Asian alone	11,349	12,279	12,638	2,046	2,174	2,426	1,666	1,807	1,944
Native Hawaiian and Other Pacific Islander alone	514	2,519	2,593	59	64	71	51	0	0
Some other race alone	9,299	5,658	5,824	1,544	4,058	4,529	4,909	3,080	3,313
Two or more races	14,370	13,576	13,973	2,186	2,190	2,444	2,251	2,186	2,351
Hispanic or Latino	43,943	47,891	49,292	8,251	8,705	9,715	15,465	15,970	17,178
Percent Minority	17.0%	16.5%	16.5%	17.7%	20.8%	20.8%	15.7%	14.2%	14.2%
Percent Low Income	13.7%	—	—	13.30%	-	-	13.40%	-	-

Population	Lake County			Orange County			Osceola County		
	2010	2012	2020a	2010	2012	2020a	2010	2012	2020a
Total	297,052	303,186	329,015	1,145,956	1,202,234	1,456,375	268,685	287,416	376,341
White alone	243,624	254,060	275,704	728,795	777,502	941,859	190,641	215,200	281,781
Black or African American alone	29,103	30,197	32,770	238,241	256,542	310,773	30,369	34,793	45,558
American Indian and Alaska Native alone	1,472	993	1,078	4,532	1,874	2,270	1,452	978	1,281
Asian alone	5,173	4,525	4,910	56,581	57,438	69,580	7,406	8,402	11,002
Native Hawaiian and Other Pacific Islander alone	215	267	290	1,266	100	121	294	0	0
Some other race alone	10,778	5,945	6,451	77,216	72,607	87,955	27,623	18,795	24,610
Two or more races	6,687	7,199	7,812	39,325	36,171	43,817	10,900	9,248	12,109
Hispanic or Latino	36,009	39,299	42,647	308,244	339,202	410,906	122,146	137,250	179,714
Percent Minority	18.0%	16.2%	16.2%	36.4%	35.3%	35.3%	29.0%	25.1%	25.1%
Percent Low Income	11.40%	-	-	14.90%	-	-	13.90%	-	-

Population	Polk County			Seminole County			Volusia County		
	2010	2012	2020a	2010	2012	2020a	2010	2012	2020a
Total	602,095	616,158	675,772	422,718	430,838	464,908	494,593	496,950	506,491
White alone	452,854	486,415	533,476	330,664	348,662	376,234	408,256	413,626	421,567
Black or African American alone	88,833	93,201	102,218	47,107	48,809	52,669	51,791	53,464	54,490
American Indian and Alaska Native alone	2,706	1,878	2,060	1,386	1,422	1,534	1,778	1,789	1,823
Asian alone	9,760	10,458	11,470	15,692	18,345	19,796	7,567	8,185	8,342
Native Hawaiian and Other Pacific Islander alone	360	213	234	258	58	63	204	363	370
Some other race alone	32,847	8,954	9,820	15,421	5,099	5,502	14,487	10,663	10,868
Two or more races	14,735	15,039	16,494	12,190	8,443	9,111	10,510	8,860	9,030
Hispanic or Latino	106,532	114,459	125,533	72,457	78,568	84,781	55,217	58,790	59,919
Percent Minority	24.8%	21.1%	21.1%	21.8%	19.1%	19.1%	17.5%	16.8%	16.8%
Percent Low Income	16.40%	-	-	10.00%	-	-	15.00%	-	-

C-5 IMPACTS ON MINORITY AND LOW-INCOME POPULATIONS

As discussed in Chapter 4 of this EIS, accidents during launch of the proposed Mars 2020 mission could result in human exposure to radioactive and other hazardous materials. Plutonium-238 is the primary radioactive material of concern. Potential radiological releases could affect populations residing both within and beyond 100 km (62 mi) of the launch complex. As shown in Tables 4-5, 4-12, and 4-17 of Chapter 4, if either Alternative 1, 2, or 3 is implemented, and if an accidental release of radioactive material were to occur during any mission phase, on average no latent cancer fatalities would be expected to occur.

Mission risks (consequences that would occur in the event of a radioactive release multiplied by the probability of a release) are also small. As shown in Table 4-6, should Alternative 1 be selected, the likelihood of an accident resulting in a release of radioactive material from the Multi-Mission Radioisotope Thermoelectric Generator (MMRTG) during the pre-launch and early launch phases combined is 9.9×10^{-5} (approximately 1 in 10,000). The corresponding risk to the local population (persons residing within 100 km (62 mi) of the launch facilities) of a latent cancer fatality resulting from an accident in pre-launch or early launch is 1.7×10^{-5} (approximately 1 in 59,000) (Table 4-7). The risk to the global population (persons residing more than 100 km (62 mi) from the launch site) of a latent cancer fatality resulting from an accident during the Mars 2020 mission is 1.3×10^{-5} (approximately 1 in 77,000).

As shown in Table 4-17, should Alternative 3 be selected, the likelihood of an accident resulting in a release of radioactive material from the Light Weight Radioisotope Heater Units (LWRHUs) during the pre-launch and early launch phases combined is 6.2×10^{-5} (approximately 1 in 16,000). The corresponding risk to the local population (persons residing within 100 km (62 mi) of the launch facilities) of a latent cancer fatality resulting from an accident in pre-launch or early launch is 8.2×10^{-7} (approximately 1 in 1,200,000) (Table 4-18). The risk to the global population (persons residing more than 100 km (62 mi) from the launch site) of a latent cancer fatality resulting from an accident during the Mars 2020 mission is 4.6×10^{-7} (approximately 1 in 2,200,000).

As shown in Table 4-13, should Alternatives 1, 2, or 3 be selected, the likelihood of an accident resulting in a release of radioactive material from the instrumentation small quantity source terms during the pre-launch and early launch phases combined is 6.0×10^{-4} (approximately 1 in 1,600). The corresponding risk to the affected population of a latent cancer fatality resulting from an accident in pre-launch or early launch is 3.2×10^{-8} (approximately 1 in 31,000,000) (Table 4-13). The risk to the affected population of a latent cancer fatality resulting from an accident during the Mars 2020 mission is 1.6×10^{-6} (approximately 1 in 600,000).

As discussed in Section 4.1.3, non-radiological accidents also pose no significant risks to the public. Toxic effects that could result from a liquid propellant spill during fueling operations would not extend beyond the immediate vicinity of the launch pad. Members of the public are excluded from the area at risk during fueling operations. A fuel explosion on the launch pad or during the first few seconds of flight could (if the Atlas V is selected as the launch vehicle) temporarily increase carbon monoxide (CO), hydrochloric acid (HCl), and aluminum oxide levels near the CCAFS boundary. One-

hour average concentrations of hazardous emissions from such an explosion are less than the emergency response guidelines recommended by the American Industrial Hygiene Association and the National Research Council for the Department of Defense (USAF 1998).

Thus, implementation of the Proposed Action or the Alternatives would pose no significant radiological or non-radiological risks to the public, including minority and low-income groups within the potentially affected population.

C-6 REFERENCES FOR APPENDIX C

CEQ 1997. Council on Environmental Quality. *Environmental Justice: Guidance under the National Environmental Policy Act.* Executive Office of the President. Washington, DC. December 10, 1997. Available at *http://www.epa.gov/compliance/ej/resources/policy/ej_guidance_nepa_ceq1297.pdf*

USAF 1998. U.S. Air Force. *Final Environmental Impact Statement – Evolved Expendable Launch Vehicle Program.* HQ USAF/ILEVP, 1260 Air Force Pentagon, Washington, DC. April 1998. Available at handle.dtic.mil/100.2/ADA413417

USBC 2013c. U.S. Census Bureau. *2010 Census, American Fact Finder.* November 2013. Available at *http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml*