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FINAL

Environmental Assessment for the Construction of Solar Photovoltaic Facilities at John F. Kennedy Space Center, Kennedy Space Center, Florida

June 2008

Submitted to:

National Aeronautics and Space Administration
John F. Kennedy Space Center
Kennedy Space Center, Florida

Prepared for:

Florida Power & Light Company
Juno Beach, Florida

Submitted by:

ecology and environment, inc.
International Specialists in the Environment

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Environmental Assessment for the Construction of Solar Photovoltaic Facilities at John F. Kennedy Space Center

Kennedy Space Center, Brevard County, Florida

Lead Agency: National Aeronautics and Space Administration (NASA)
John F. Kennedy Space Center

Proposed Action: The Florida Power & Light Company (FPL), the implementing agency, proposes to construct two solar photovoltaic (PV) power generation facilities on property located at NASA's Kennedy Space Center (NASA-KSC) in Brevard County, Florida. One facility would be an approximately 10-megawatt (MW) facility located on approximately 100 acres (40.5 hectares [ha]). The second solar PV facility would be an approximately 2-MW facility, located on approximately 10 acres (4.1 ha). The operation of these two facilities could potentially reduce approximately 10,000 tons of carbon dioxide (CO_2) emissions that otherwise would have been generated annually from a fossil fuel-fired power plant.

For Further Information: Mario Busacca, Mail Code TA-C3, John F. Kennedy Space Center, NASA, Kennedy Space Center, FL 32899, (321) 867-8456

Date: May 2008

Abstract: FPL proposes to construct two solar PV facilities on property located at NASA-KSC in Brevard County, Florida. The first facility would be an approximately 10-MW facility situated on approximately 100 acres (40.5 ha), and when constructed, would be the second largest solar PV facility in the United States. The power generated from this facility would go into FPL's general power supply and would be available to FPL customers. The second solar PV facility would be an approximately 2-MW facility, located on approximately 10 acres (4.1 ha). One hundred percent (100%) of the power generated at the approximately 2-MW facility would be used by NASA-KSC as part of their attempt to decrease their reliance on non-renewable energy sources.

The preferred site for the approximately 10-MW facility is on approximately 100 acres (40.5 ha) on NASA-KSC property, located on North Courtenay Parkway (State Road 3). This site is comprised primarily of agricultural areas (i.e., citrus groves), but small patches of other disturbed habitats are found within this site. The preferred site for the approximately 2-MW facility is an approximately 10-acre (4.1-ha) lot located in NASA-KSC's Industrial Area. The majority of this site is a now-scarified fenced-in lot previously used for industrial purposes. The remainder of this site is comprised of heavily impacted upland habitat.

Resources that may be impacted as a result of the Proposed Action include: land use, air quality, biological resources, soils, surface water resources and drainage, socioeconomics, aesthetics, infrastructure and utilities, and hazardous materials/waste. However, all potential impacts are anticipated to be negligible or minor in nature (with the exception of greater beneficial impacts), and any long-term impacts would not be significant.

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Executive Summary

This Environmental Assessment (EA) has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, as amended (Public Law 91-190, 42 United States Code §4321 et. seq.); the Council on Environmental Quality (CEQ) NEPA implementation regulations (40 Code of Federal Regulations [CFR] §§1500-1508); and the National Aeronautics and Space Administration (NASA) Procedural Requirement 8580.1, "Implementing the National Environmental Policy Act and Executive Order 12114." Executive Order (EO) 12114 (January 4, 1979) is entitled "Environmental effects abroad of major Federal actions" and the provisions appear at 44 *Federal Register* (FR) 1957, 3 CFR, 1979 Comp., p. 356, unless otherwise noted.

ES.1 Purpose and Need

ES.1.1 Florida Power & Light Company

At the 2007 Clinton Global Initiative in New York City, FPL Group, FPL's parent company, announced a $2.4 billion investment program aimed at increasing U.S. solar energy output and reducing carbon dioxide emissions that contribute to both global warming and climate change. One of the initiatives of this announcement included the construction and operation of new solar power generating facilities in both California and Florida. Coupled with this, State of Florida Governor Charlie Crist issued three EOs in 2007:

- EO 07-126 "Establishing Climate Change Leadership by Example: Immediate Actions to Reduce Greenhouse Gas Emissions from Florida State Government";
- EO 07-127 "Establishing Immediate Actions to Reduce Greenhouse Gas Emissions within Florida"; and
- EO 07-128 "Establishing the Florida Governor's Action Team on Energy and Climate Change."

All three EOs focus on various expectations regarding greenhouse gas reduction, the use of renewable resources, and the overall reduction of energy consumption by the State of Florida.

Florida Power & Light Company (FPL) proposes to construct two solar photovoltaic (PV) facilities on property located at NASA's Kennedy Space Center (NASA-KSC) in Brevard County, Florida. The proposed solar PV facilities serve as an example of FPL's commitment to examining ways to utilize renewable and alternative energy technologies to meet current and projected energy needs, as expressed in the *Ten Year Power Plant Site Plan, 2008-2017* (FPL 2008). FPL was also one of the founding members of United States Climate Action Partnership (USCAP), a group of businesses and leading environmental organizations that have joined together to call on the federal government to promptly enact

strong national legislation requiring significant reductions of greenhouse gas emissions. The USCAP report, *A Call for Action*, recognizes solar power as one of the technologies available that emit no greenhouse gases. Data gathered and lessons learned from the proposed solar PV facilities at NASA-KSC could lead to even greater efforts in reducing carbon emissions further benefiting the global environment.

ES.1.2 Kennedy Space Center

NASA-KSC is subject to federal EO 13423 "Strengthening Federal Environmental, Energy, and Transportation Management" and EO 13221 "Energy Efficient Standby Power Devices," as well as the Governor Crist-issued EOs mentioned previously. Energy management and conservation are part of the environmental stewardship practices that NASA-KSC currently employs. Pertinent to the Proposed Action, NASA energy goals contained within their Energy Management Five-Year Plan (NASA-KSC 2004a) include the following:

- Renewable Energy Use: Expand onsite generation and purchases of green energy; and
- Reduce utility costs and petroleum dependence.

As part of their Renewable Energy program, NASA-KSC plans to continue applying renewable energy technologies where they are life-cycle cost-effective. Current installations include solar PV for applications remote from the electric grid, such as perimeter fence security lighting, security intrusion detection, and hazardous warning sign and gate operation. Similarly, a 5-kilowatt PV system was installed at the NASA-KSC landfill in 2005. In addition to solar PV, NASA-KSC is working with solar thermal technology. While NASA-KSC has explored wind energy programs, local wind resources fall short of the average wind speed typically required to make a large-scale installation cost-effective: 5 meters per second versus 7 meters per second (NASA-KSC 2004a). Therefore, renewable energy projects using solar power are the most appropriate for the environment at NASA-KSC.

ES.2 Proposed Action and Alternatives

The Proposed Action is two-pronged; the first component involves the construction and operation of an approximately 10-megawatt (MW) solar PV facility on approximately 100 acres (40.5 hectares [ha]) of land at NASA-KSC (i.e., Alternatives 1 and 2), and the second component involves the construction and operation of an approximately 2-MW solar PV facility on approximately 10 acres (4.1 ha) of land, also on NASA-KSC (i.e., Alternatives 3 and 4). Two action alternatives are analyzed for each component of the Proposed Action; all four action alternatives include the same aspects of the Proposed Action that would occur on completely different parcels of land within the boundaries of NASA-KSC.

Under the No-Action Alternative, the PV facilities would not be constructed on NASA-KSC property and the production of renewable solar energy would not occur. The costs associated with the creation of non-renewable energy would continue to increase and greenhouse gases would continue to increase. Lessons on solar power energy would not be

learned that could be applied to larger-scale projects in the future. Dependence on foreign sources for fuels to produce energy would not be reduced.

ES.3 Affected Environment and Consequences

The following environmental resources, discussed in greater detail in Section 3, have been identified as having the potential to be impacted by the implementation of the Proposed Action: land use, air quality, biological resources, soils, surface water resources and drainage, socioeconomics, aesthetics, infrastructure and utilities, and hazardous materials/waste. Table ES-1 summarizes these impacts, which are discussed in detail in Section 4.

ES.4 Agency and Public Consultation

The following entities have been consulted in preparation of this EA. Section 5 provides points of contact and address information.

- United States Fish and Wildlife Service;
- United States Army Corps of Engineers;
- Florida Department of Environmental Protection;
- Florida State Historic Preservation Office;
- Florida Fish and Wildlife Conservation Commission;
- Florida Research Center for Agricultural Sustainability;
- St. Johns River Water Management District;
- Brevard County; and
- City of Titusville, Florida.

Table ES-1
Summary of Potential Impacts to Affected Environmental Resources

Environmental Resources		Classification and Duration of Potential Impacts				
	Sub-Category	**Alternative 1**	**Alternative 2**	**Alternative 3**	**Alternative 4**	**No-Action Alternative**
Land Use		Negligible; Long term	Negligible; Long term	No Effect	No Effect	No Effect
Air Quality		Minor; Short term (Beneficial Long term)	Minor; Short term (Beneficial Long term)	Minor; Short term (Beneficial Long term)	Minor; Short term (Beneficial Long term)	Minor; Long term
Biological Resources	**Vegetation and Habitats**	Minor (citrus groves and uplands) and No Effect (wetlands); Long term	Minor to Negligible (citrus groves and uplands) and No Effect (wetlands); Long term	Negligible; Long term	Negligible; Long term	No Effect
	Wildlife	Minor; Short and Long term	Minor to Negligible; Short and Long term	Negligible; Short and Long term	Negligible; Short and Long term	No Effect
	Migratory Birds	Negligible; Long term	Negligible; Long term	Negligible; Long term	Negligible; Long term	No Effect
	Threatened and Endangered Species	Minor; Short term	Minor; Short term	Negligible; Short term	Negligible; Short term	No Effect
Soils		Minor; Short and Long term	Minor; Short and Long term	Minor to Negligible; Short and Long term	Minor to Negligible; Short and Long term	No Effect
Surface Water Resources and Drainage		Negligible; Long term	Negligible; Long term	Negligible; Long term	Negligible; Long term	No Effect
Groundwater		Negligible; Long term	Negligible; Long term	Negligible; Long term	Negligible; Long term	No Effect
Socioeconomics		Minor (Beneficial); Short and Long term	Minor (Beneficial); Short and Long term	Minor (Beneficial); Short and Long term	Minor (Beneficial); Short and Long term	No Effect
Aesthetics		Negligible; Long term	Negligible; Long term	Negligible; Long term	Negligible; Long term	No Effect
Infrastructure and Utilities	**Electricity**	Minor; Long term	Minor; Long term	Minor (Beneficial); Long term	Minor (Beneficial); Long term	Negligible; Long term
	Solid Waste	Minor; Short term	Minor; Short term	Negligible; Short term	Negligible; Short term	No Effect
Hazardous Materials/Waste		Negligible; Short term	Negligible; Short term	Negligible; Short term	Negligible; Short term	No Effect
Environmental Justice		No Effect	No Effect	No Effect	No Effect	No Effect

Table ES-1
Summary of Potential Impacts to Affected Environmental Resources

Environmental Resources	Classification and Duration of Potential Impacts				
Sub-Category	Alternative 1	Alternative 2	Alternative 3	Alternative 4	No-Action Alternative
Protection to Children from Environmental, Safety, and Health Risks	No Effect	No Effect	No Effect	No Effect	No Effect
Cultural Resources	No Effect	No Effect	No Effect	No Effect	No Effect
Traffic and Transportation	No Effect	No Effect	No Effect	No Effect	No Effect
Public Health and Safety	No Effect	No Effect	No Effect	No Effect	No Effect
Water Facilities	No Effect	No Effect	No Effect	No Effect	No Effect
Noise	No Effect	No Effect	No Effect	No Effect	No Effect
Floodplains	No Effect	No Effect	No Effect	No Effect	No Effect
Geology	No Effect	No Effect	No Effect	No Effect	No Effect

Legend:
Negligible is defined as an impact that is so small or unimportant that it may safely be disregarded.
Minor is defined as one which is not of significance, but one that cannot be safely disregarded.

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Acronyms and Abbreviations

°F	degrees Fahrenheit
C & D	Construction and Demolition
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cm	centimeter
CNS	Canaveral National Seashore
CO	carbon monoxide
CO_2	carbon dioxide
DM	De-listed, Taxon Recovered
EA	Environmental Assessment
EO	Executive Order
ESA	Endangered Species Act
FDOT	Florida Department of Transportation
FR	Federal Register
Florida PSC	Florida Public Service Commission
FPL	Florida Power & Light Company
FY	fiscal year
ha	hectare(s)
IEEE	Institute of Electrical and Electronics Engineers
km	kilometer(s)
KNPD	Kennedy Policy Directive
KSC	Kennedy Space Center
kWh	kilowatt-hour(s)
MBTA	Migratory Bird Treaty Act
MINWR	Merritt Island National Wildlife Refuge
MOU	Memorandum of Understanding

MW	megawatt(s)
MWh	megawatt-hour(s)
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
NGO	non-governmental organization
NO_2	nitrogen dioxide
NO_X	nitrogen oxides
NPR	NASA Procedural Requirement
O_3	ozone
Pb	lead
PM	particulate matter
$PM_{2.5}$	particulate matter of less than 2.5 microns
PM_{10}	particulate matter of 10 microns or less
PV	photovoltaic
R & D	Research & Development
RCRA	Resource Conservation and Recovery Act
REC	Renewable Energy Credit
SIP	State Implementation Plan
SJRWMD	St. Johns River Water Management District
SO_2	sulfur dioxide
SR	State Road
USACE	United States Army Corps of Engineers
U.S.C	United States Code
USCAP	United States Climate Action Partnership
USFWS	U.S. Fish and Wildlife Service
VAB	Vehicle Assembly Building
VOC	volatile organic compound

1 Purpose and Need for the Action

This Environmental Assessment (EA) has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, as amended (Public Law 91-190, 42 United States Code [U.S.C.] §4321 et. seq.); the Council on Environmental Quality (CEQ) NEPA implementation regulations (40 Code of Federal Regulations [CFR] §§1500-1508); and the National Aeronautics and Space Administration Procedural Requirement (NPR) 8580.1, "Implementing the National Environmental Policy Act and Executive Order 12114." Executive Order (EO) 12114 (January 4, 1979) is entitled "Environmental effects abroad of major Federal actions" and the provisions appear at 44 *Federal Register* (FR) 1957, 3 CFR, 1979 Comp., p. 356, unless otherwise noted.

1.1 Introduction and Background

There is a growing awareness in the scientific community and the general public that global warming may be occurring as a result of man's activities related to emissions of greenhouse gases such as carbon dioxide (CO_2). These emissions come from a variety of sources including fossil fuel-fired power plants. The potential ramifications of global warming are significant as polar ice caps melt due to increases in global temperature causing potential significant sea level rise. Efforts are being promoted voluntarily and through legislation, treaties, and governmental initiatives to find ways to reduce the emission of greenhouse gases.

On December 13, 2007, Florida Power & Light Company (FPL) and the National Aeronautics and Space Administration-John F. Kennedy Space Center (NASA-KSC) signed a Memorandum of Understanding (MOU; Appendix A) whereupon both parties agreed to jointly study the technical and financial feasibility of implementing various renewable energy projects at NASA-KSC over a period of five years as part of an effort to reduce greenhouse gas emissions. The MOU identifies the various types of renewable energy projects that will be evaluated and provides a framework for the process to undertake such evaluations.

NASA-KSC is a significant federal consumer of electric power with land and/or facilities that may be available for renewable energy projects, and FPL is the electric power utility serving NASA-KSC. Both NASA-KSC and FPL are committed to expanding the use of renewable energy resources in compliance with respective federal and state energy polices and directives (NASA-KSC and FPL 2008). Solar power generation systems are the primary type of projects on which NASA-KSC and FPL are collaborating.

1.2 Purpose and Need for the Proposed Action

1.2.1 Florida Power & Light Company

At the 2007 Clinton Global Initiative in New York City, FPL Group, FPL's parent company, announced a $2.4 billion investment program aimed at increasing U.S. solar energy output and reducing CO_2 emissions that contribute to both global warming and climate change. One of the initiatives of this announcement included the construction and

operation of new solar power generating facilities in both California and Florida. Coupled with this, State of Florida Governor Charlie Crist issued the following EOs in 2007:

- **EO 07-126 "Establishing Climate Change Leadership by Example: Immediate Actions to Reduce Greenhouse Gas Emissions from Florida State Government,"** which establishes greenhouse gas reduction percentages for state agencies and departments (10% reduction from current emission levels by 2012, 25% reduction by 2017, and 40% reduction by 2025);
- **EO 07-127 "Establishing Immediate Actions to Reduce Greenhouse Gas Emissions within Florida,"** which focuses on the Florida Public Service Commission (Florida PSC) with a request to initiate rulemaking that requires utility companies to produce a minimum of 20% of their electricity from renewable sources, with a strong emphasis on solar and wind energy. EO 07-127 also requests that the Florida PSC initiate rulemaking to reduce the cost of connecting solar and other renewable energy technologies to Florida's existing power grid; this includes adopting the "IEEE (Institute of Electrical and Electronics Engineers) 1547 Standard for Interconnecting Distributed Resources with Electric Power Systems" as the uniform statewide interconnection standard for all utility companies; and
- **EO 07-128 "Establishing the Florida Governor's Action Team on Energy and Climate Change,"** which discusses Florida's energy consumption (ranked third in the nation) and the need to develop strategies that would diversify Florida's electric generation fuels to reduce greenhouse gas emissions and protect the Florida consumer from fuel price volatility.

The proposed solar photovoltaic (PV) facilities at NASA-KSC demonstrates FPL's commitment to examining ways to utilize renewable and alternative energy technologies to meet current and projected energy needs, as expressed in the *Ten Year Power Plant Site Plan, 2008-2017* (FPL 2008). FPL was one of the founding members of United States Climate Action Partnership (USCAP), a group of businesses and leading environmental organizations that have joined together to call on the federal government to promptly enact strong national legislation requiring significant reductions of greenhouse gas emissions. The USCAP report, *A Call for Action*, recognizes solar power as one of the technologies available that emit no greenhouse gases. Data gathered and lessons learned from the proposed solar PV facilities at NASA-KSC could lead to even greater efforts in reducing carbon emissions further benefiting the global environment.

1.2.2 Kennedy Space Center

NASA-KSC is subject to federal EO 13423 "Strengthening Federal Environmental, Energy, and Transportation Management" and EO 13221 "Energy Efficient Standby Power Devices," as well as the Governor Crist-issued EOs mentioned previously. Energy management and conservation are part of the environmental stewardship practices that

NASA-KSC currently employs. Pertinent to the Proposed Action, NASA energy goals contained within their Five-Year Energy Management Plan (NASA-KSC 2004a) include the following:

- Renewable Energy Use: Expand onsite generation and purchases of green energy; and
- Reduce utility costs and petroleum dependence.

As part of their Renewable Energy program, NASA-KSC plans to continue applying renewable energy technologies where they are life-cycle cost-effective. Current installations include solar PV for applications remote from the electric grid, such as perimeter fence security lighting, security intrusion detection, and hazardous warning sign and gate operation. Similarly, a 5-kilowatt PV system was installed at the NASA-KSC landfill in 2005. In addition to solar PV, NASA-KSC is working with solar thermal technology. While NASA-KSC has explored wind energy programs local wind resources fall short of the average wind speed typically required to make a large-scale installation cost-effective using currently available technology: 5 meters per second versus 7 meters per second (NASA-KSC 2004a). Therefore, renewable energy projects using solar power are currently the most appropriate for the environment at NASA-KSC.

1.3 Agency Coordination and Public Involvement

Public involvement for this EA includes the dissemination of the Draft EA to federal, state, and local agencies and interested parties that may want to review the environmental documentation associated with this project. Through this dissemination, comments from these entities will be solicited through a 30-day comment period beginning on May 14, 2008 and ending on June 16, 2008. A list of the agencies participating in this process is provided in Section 5.

During the course of the 30-day comment period, NASA-KSC received comments from the following agencies and interested parties: The Merritt Island National Wildlife Refuge (MINWR), the United States Army Corps of Engineers (USACE), the Natural Resources Management Office of Brevard County, and the North Merritt Island Homeowners Association. All commentors were generally supportive of the project and no objections to the project were voiced. Several minor suggestions regarding potential for permits and site use were noted.

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2 Description of the Proposed Action and Alternatives

This section describes the Proposed Action and the alternatives considered during the site selection process, including the No-Action Alternative and the Preferred Alternatives. As directed by CEQ regulations (§1501.7), this section also describes those environmental resources that have been eliminated from further analysis.

NASA-KSC implemented an internal selection process using pertinent evaluation criteria in order to identify the alternative site locations that would be evaluated in this EA. These site locations were selected in order to minimize environmental impacts due to the existing disturbed nature of each, and their proximity to existing developed and industrialized areas on NASA-KSC where necessary infrastructure already exists.

2.1 Description of the Proposed Action

FPL proposes to construct two solar PV facilities on property located at NASA-KSC in Brevard County, Florida (Figure 2-1). The first facility would be an approximately 10-MW facility situated on approximately 100 acres (40.5 ha), and when constructed, would be the second largest solar PV facility in the United States. The power generated from this facility would go into FPL's general power supply and would be available to FPL's customers. The second solar PV facility would be an approximately 2-MW facility, located on approximately 10 acres (4.1 ha). All power generated at the approximately 2-MW facility would be used by NASA-KSC in an attempt to reduce their dependency on non-renewable energy sources. The operation of these two facilities could potentially reduce approximately 10,000 tons of CO_2 emissions annually that otherwise would have been generated from a fossil fuel-fired power plant. Figure 2-2 illustrates an example site plan for these kinds of solar PV facilities.

2.1.1 The 100-Acre, Approximately 10-MW Solar PV Facility

FPL proposes to construct and operate a ground-mounted solar PV facility that would be capable of producing approximately 10 MW of power on approximately 100 acres (40.5 ha) of NASA-KSC property in Brevard County, Florida. Ground-mounted solar PV systems consist of either fixed systems or tracking systems. For a fixed system, the PV panels are constructed in a single, fixed position designed to optimize the solar energy output on either a daily, seasonal, or annual basis. There are several different types of tracking systems, with the most prevalent being the single-axis tracking system. The PV panels of the single-axis tracking system are designed to rotate on a single axis throughout the day, following the path of the sun to capture a higher percentage of the solar energy. However, the proposed solar PV systems to be constructed at NASA-KSC would be fixed systems. This type of solar PV system was chosen for these facilities because fixed systems require less acreage than tracking systems and limiting land usage was a critical factor for these projects.

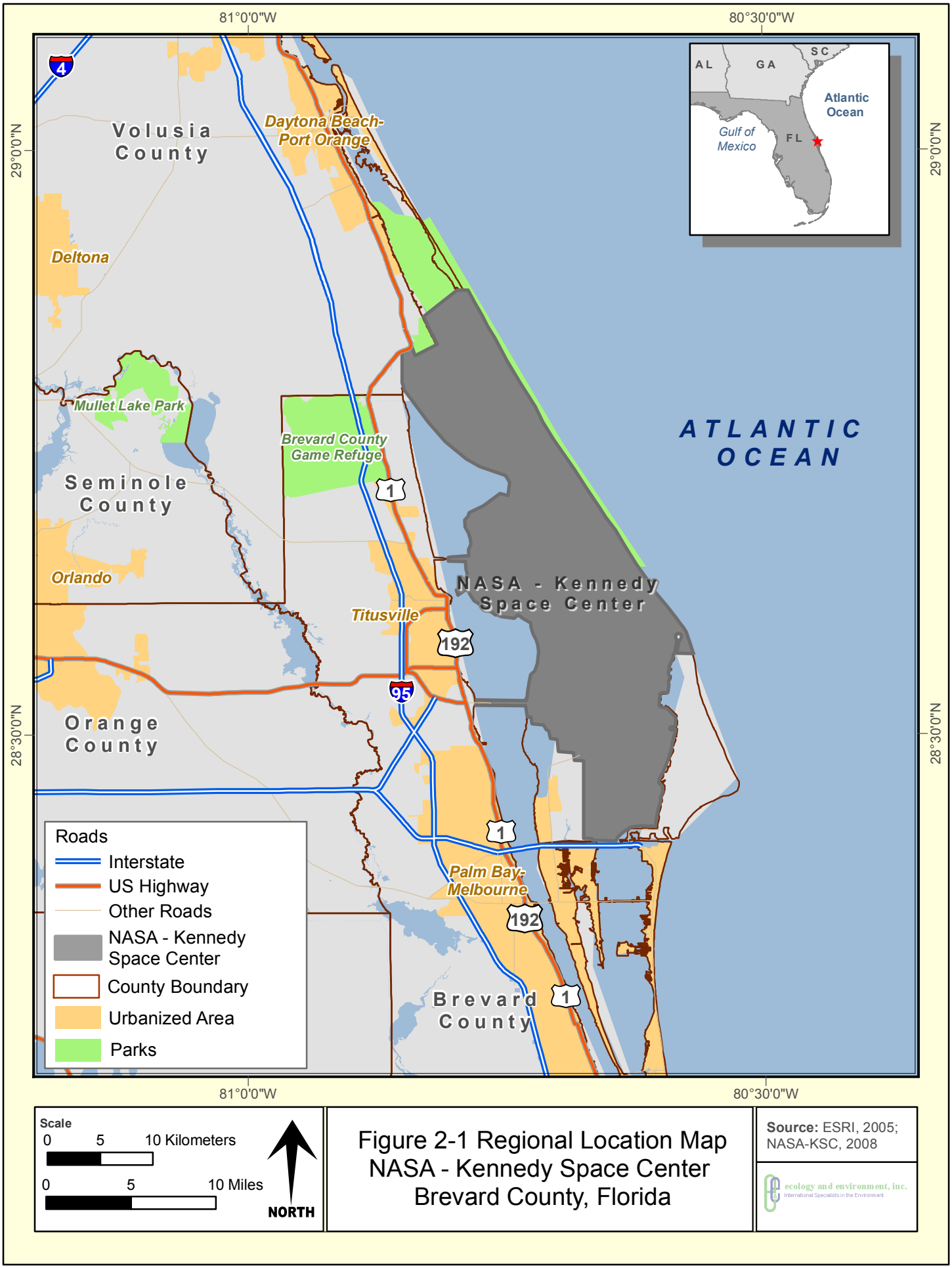

Figure 2-1 Regional Location Map
NASA - Kennedy Space Center
Brevard County, Florida

Source: ESRI, 2005; NASA-KSC, 2008

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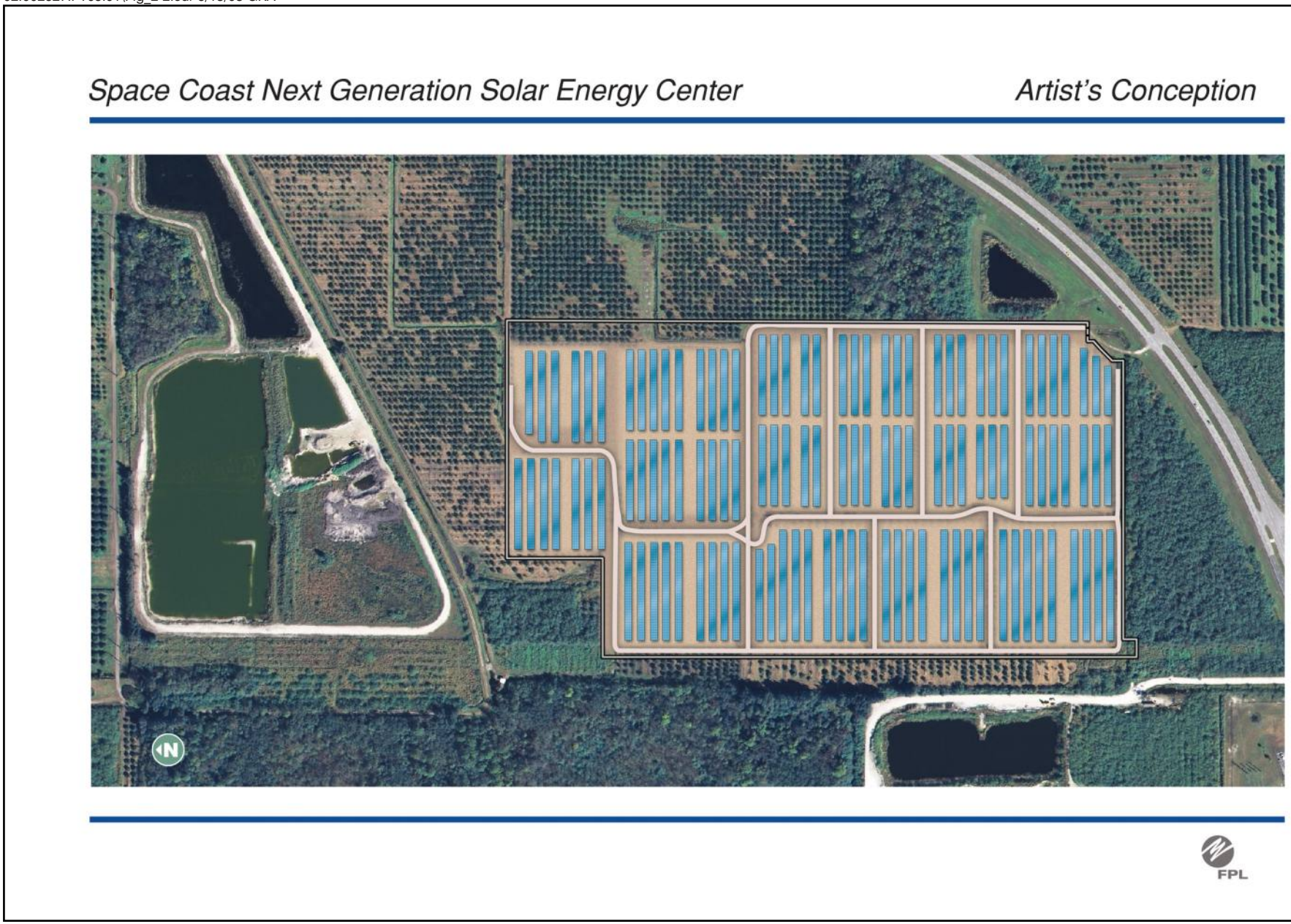

Figure 2-2 Example Site Plan for a Solar Photovoltaic Facility

The major components of the solar PV facility would include:

- PV panels and mounting structures;
- Direct current to alternating current inverters;
- Transformer(s); and
- Distribution feeder(s).

This proposed solar PV facility would require a distribution voltage interconnection and would connect to the Courtenay Substation via a newly constructed feeder. This feeder would connect all of the approximately 10 MW to the substation. The feeder may be overhead or underground. Existing feeders would not be used for the interconnection.

The staging area for the assembly of the PV panels would be located on-site. In addition, a small office trailer would be located on the site. The entire facility would be surrounded by a chain-link fence with a gate. Routine maintenance of the PV panels would include rinsing with water and/or blowing with condensed air. Solid waste generated during the construction phase would be removed by the contractor(s) and disposed of at an appropriate disposal facility located outside NASA-KSC. Any of the solid waste generated during this phase would be recycled, if possible. All applicable permits will be obtained prior to construction activities.

2.1.2 The 10-Acre, Approximately 2-MW Solar PV Facility

In addition to the approximately 10-MW solar PV facility discussed in Section 2.1.1, FPL proposes to construct an approximately 2-MW solar PV facility on approximately 10 acres (4 ha) on NASA-KSC property. All power generated from this facility would go directly into NASA-KSC's power supply; as a result, NASA-KSC would be the recipient of all the benefits associated with the on-site renewable energy generation. All components and routine maintenance procedures of this facility would be the same as discussed previously for the approximately 10-MW facility, but on a smaller scale. All applicable permits will be obtained prior to construction activities.

2.2 Alternative Sites for the 100-Acre, Approximately 10-MW Solar PV Facility

2.2.1 Alternative 1: Site 1 (100-Acre Northern Site)

Alternative 1 consists of implementation of the Proposed Action on an approximately 100-acre (40.5 ha) site located on NASA Parkway West (SR 405), just north of the NASA-KSC Visitor's Complex (Figure 2-3). It should be noted that while the project boundary is an approximately 100-acre (40.5 ha) site, it is estimated that only 70% of the site would be used for mounting the solar PV panels. This is due to the area between solar panels and the need to avoid impacts to wetlands. The groundcover under the arrays would be a pervious surface. Under this alternative, there would be no changes to the Proposed Action, as previously discussed in Section 2.1. Site 1 is comprised primarily of citrus groves, shrub and brushland (primarily exotic and invasive species), and disturbed wetland areas (mixed wetland

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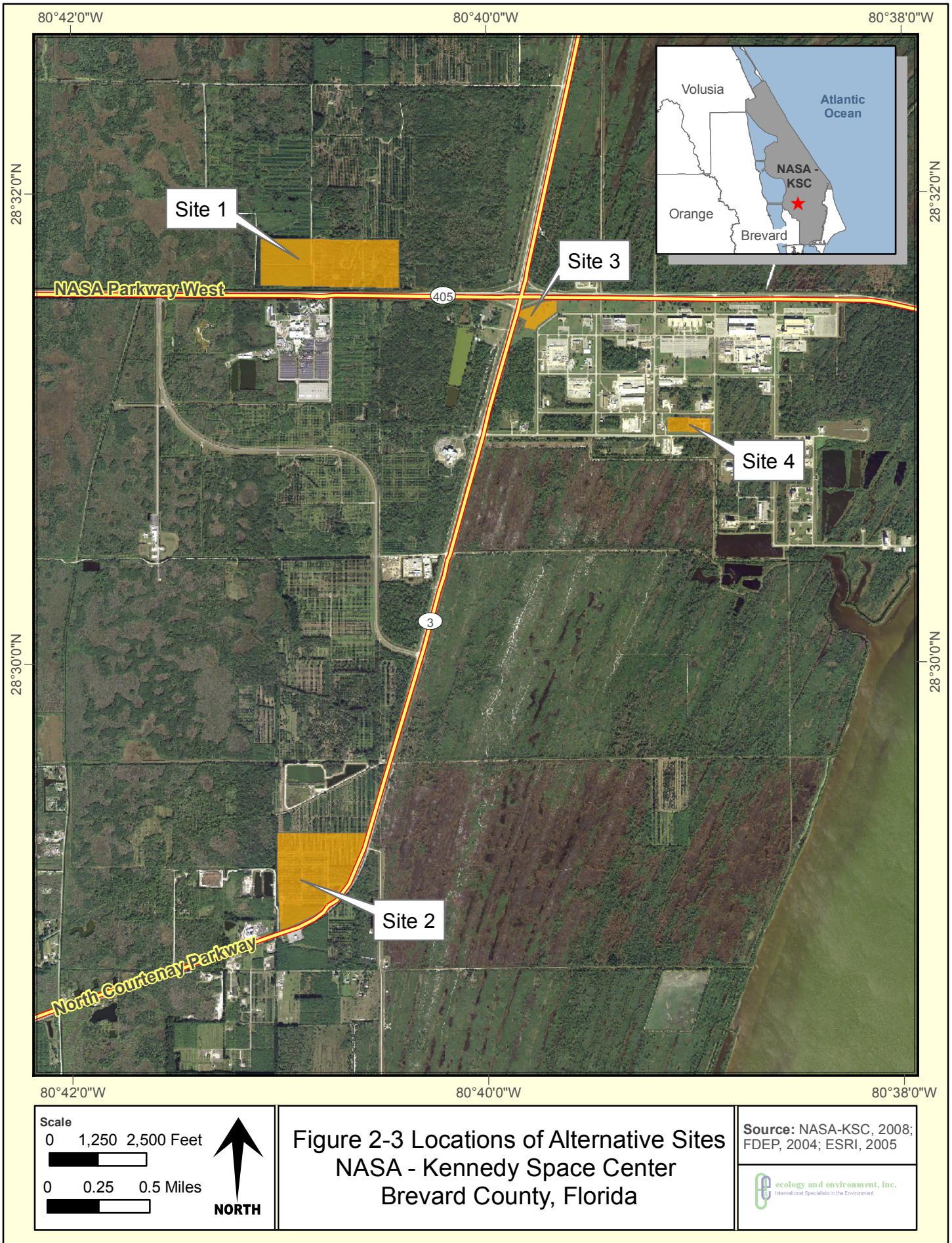

Scale
0 1,250 2,500 Feet
0 0.25 0.5 Miles
NORTH

Figure 2-3 Locations of Alternative Sites NASA - Kennedy Space Center Brevard County, Florida

Source: NASA-KSC, 2008; FDEP, 2004; ESRI, 2005

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hardwoods). Site 1 is located 7.75 miles (12.5 kilometers [km]) north of FPL's Courtenay Substation. For this site, a new feeder extension approximately 10 miles (16.1 km) in length would be required. The feeder extension would either be overhead or buried along the FDOT Right-of-Way, on SR 3. Construction is expected to last approximately nine months and the installed solar PV arrays would be approximately 4 to 8 feet (1.2 to 2.4 meters) tall.

As part of routine maintenance activities, the solar PV panels would be rinsed with water two to four times per year. Approximately 30,000 gallons of water, without added chemicals, would be used during each wash. Rinsing water would be transported onsite by truck. As an option, a small groundwater well would be installed to provide the required rinse water.

It should be noted that this site may be revisited in the future for an additional approximately 10-MW solar PV facility. Because this site is examined in this EA, additional NEPA documentation would not be required if the decision is made to construct an additional facility on this alternative site location.

2.2.2 Alternative 2 (Preferred Alternative): Site 2 (100-Acre Southern Site)

Alternative 2 consists of implementation of the Proposed Action on an approximately 100-acre (40.5 ha) site located on North Courtenay Parkway (State Road [SR] 3), south of the majority of the NASA-KSC Complex (Figure 2-3). Similar to Alternative 1, the project boundary is an approximately 100-acre (40.5 ha) site, and it is estimated that only 70% of the site would be used for mounting the solar PV panels for the same reasons stated in Section 2.2.1. The groundcover under the arrays would be a pervious surface. Under Alternative 2, there would be no changes to the Proposed Action as described in Section 2.1. Site 2 is comprised primarily of citrus groves with sparse pockets of both impacted upland and wetland communities. Because this site is located closer to FPL's Courtenay Substation, a new feeder extension approximately 5.5 miles (8.9 km) in length would be required. The feeder extension would either be overhead or buried along the FDOT Right-of-Way, on SR 3. Construction is expected to last approximately nine months and the installed solar PV arrays would be approximately 4 to 8 feet (1.2 to 2.4 meters) tall.

As part of routine maintenance activities, the solar PV panels would be rinsed with water two to four times per year. Approximately 30,000 gallons of water, without added chemicals, would be used during each wash. Rinsing water would be transported onsite by truck. As an option, a small groundwater well would be installed to provide the required rinse water.

2.3 Alternative Sites for the 10-Acre, Approximately 2-MW Solar PV Facility

2.3.1 Alternative 3: Site 3 (Northwestern Site)

Alternative 3 consists of implementation of the Proposed Action on approximately 10 acres (4 ha) located at the southeast corner of NASA Parkway West (SR 405) and North Courtenay Parkway (SR 3), near the Base Operations Building (Figure 2-3). There would be

no changes to the Proposed Action, as previously discussed in Section 2.1. Site 3 is comprised primarily of mowed grass/herbaceous communities with limited trees (cabbage palms, pines). Construction is expected to last approximately two months and the installed solar PV arrays would be approximately 4 to 8 feet (1.2 to 2.4 meters) tall. This facility would not require dedicated feeders; it would be connected to the existing feeders via a short on-site extension.

2.3.2 Alternative 4 (Preferred Alternative): Site 4 (Southeastern Site)

Alternative 4 consists of implementation of the Proposed Action on approximately 10 acres (4 ha) located in NASA-KSC's Industrial Area (Figure 2-3). There would be no changes to the Proposed Action, as previously discussed in Section 2.1. Approximately one-half of Site 4 is a scarified/disturbed area cleaned to industrial grade, and the other half is comprised of heavily impacted pine flatwoods, an upland community. Due to the location at NASA-KSC, Site 4 would not be viewed by visitors to NASA-KSC. Construction is expected to last approximately two months and the installed solar PV arrays would be approximately 4 to 8 feet (1.2 to 2.4 meters) tall. This facility would not require dedicated feeders; it would be connected to the existing feeders via a short on-site extension.

2.4 No-Action Alternative

Under the No-Action Alternative, the PV facilities would not be constructed on NASA-KSC property and the production of renewable solar energy would not occur. The costs associated with the creation of non-renewable energy would continue to increase and greenhouse gases would continue to increase. Lessons on solar power energy would not be learned that could be applied to larger-scale projects in the future. Dependence on foreign fuels for energy production would not be reduced. If the No-Action Alternative was implemented, greenhouse gas emissions would not be reduced because the proposed solar PV facilities would not be constructed. Additionally, renewable energy credits (RECs) would not be available for use by FPL and NASA-KSC or for purchase by other interested parties.

2.5 Resources Eliminated from Detailed Analysis

CEQ regulations (§1501.7) state that the lead agency shall identify and eliminate from detailed study the issues or resources that are not important or have been covered by prior environmental review, narrowing the discussion of these issues in the document to a brief justification that demonstrates a minor impact on the human environment. Resource areas not discussed in this analysis include the following.

Cultural Resources

NASA-KSC conducted surveys for cultural resources in the 1990s from which a map of "Zones of Archaeological Potential" was developed. The four alternative site locations are all located within Low Zones of Archaeological Potential; therefore, impacts to cultural resources are not anticipated as a result of implementing the Proposed Action.

Traffic and Transportation

NASA-KSC is serviced by approximately 211 miles (340 km) of roads, including 163 miles (263 km) of paved and 48 miles (77 km) of unpaved roads. NASA Parkway West (SR 405) is adjacent to the Alternative 1 site and North Courtenay Parkway (SR 3) is located adjacent to the Alternative 2 site.

During construction, a negligible increase in traffic may occur due to the need to transport equipment and workers to the sites. However, this would not be a discernable increase, and would remain temporary during construction. Operation and maintenance of the solar PV facility would require little additional traffic. Therefore, there would be little to no effect upon traffic and transportation as a result of the Proposed Action.

Public Health and Safety

Construction, operation, and maintenance of the solar PV facilities on NASA-KSC would not pose a threat to public health and safety.

Water Facilities

While there are no existing connections to potable water on the alternative site locations, any water needed for maintenance activities would be brought in by a water truck and connections to the potable water system would not be necessary. Therefore, there would be no effect upon NASA-KSC water facilities as a result of the Proposed Action.

Because wastewater/sewage would not be created as a result of implementing the Proposed Action, wastewater facilities on or near NASA-KSC would not be affected.

Noise

Current noise levels at both alternative site locations are primarily limited to ambient noise levels and occasionally agriculture-related traffic and workers. While construction of the solar PV facility would temporarily increase noise levels at the preferred site locations, these levels would be localized and temporary. Operation and maintenance of the solar PV facility would not create any sources of noise, and therefore, there would be no impacts from noise due to the Proposed Action.

Floodplains

Due to its location, much of NASA-KSC falls within both the 100- and 500-year floodplains established by the Federal Emergency Management Agency, which has published Flood Insurance Rate Maps for Brevard County. Only 0.29 acres (0.1 ha) of the Alternative 1 site falls within the 100-year floodplain; the sites of Alternatives 2, 3, and 4 are all outside floodplain boundaries. Because such a small amount of Alternative 1 (less than 0.3% of the total site) falls within a floodplain and the groundcover beneath the solar PV arrays would be pervious, floodplains on NASA-KSC would not be affected by the Proposed Action. Similarly, because all of the approximately 100 acres would not be required for the solar PV facility, construction on this portion of the alternative site can be avoided in order to eliminate any potential impacts to floodplains, if necessary.

Geology

The Proposed Action would have no effect on geologic resources on the alternative site locations or on NASA-KSC in general.

3 Affected Environment

This section discusses and describes those natural, physical, and human resources that may be potentially affected by the Proposed Action. NASA-KSC encompasses approximately 140,000 acres (56,000 ha) in Brevard County, Florida. Since the alternatives development process resulted in the identification of several alternative site locations, each site location may be discussed individually when applicable. These sites were selected in order to minimize potential environmental impacts, as the vegetation and habitat types located at each site have already been disturbed.

3.1 Land Use

The majority of NASA-KSC property is undeveloped. Operational and developed facilities at NASA-KSC (including undeveloped areas adjacent to operational facilities in the form of safety zones) account for 3% of NASA-KSC property. NASA-KSC developed 11 land use categories to describe these operational, support, and developed areas, as shown in Table 3-1. Figure 3-1 illustrates the land use on NASA-KSC.

Table 3-1
Land Use Categories on Kennedy Space Center

Land Use Category	Description	Occurrence in Alternative Site Locations
Launch	All facilities directly related to vehicle launch operations and is subdivided into horizontal launch (areas required for the paved runway surface, guideway or similar facility, together with land reserved for safety zones, parallel with and at each end of the launch facility) and vertical launch (launch pad and immediately adjacent terminal countdown facilities) subcategories.	No
Launch Support	All facilities and operations not classified as Launch, that are essential to processing and launching a vehicle from the Spaceport, recovering and processing a vehicle returning to the Spaceport, and supporting a mission during flight. Launch Support also includes all facilities (regardless of function) not classified as Launch, that are directly related to a specific program at the Spaceport.	No
Airfield Operations	Includes runways and helipads. It also includes adjacent open areas and related support facilities used for takeoff and landing of conventional aircraft in support of Spaceport or program-related operations or for commercial purposes. Facilities in this land use classification would include the Skid Strip (if not designated a horizontal launch/recovery test facility) and various heliports located throughout the Spaceport.	No
Spaceport Management	Includes all administrative functions that provide for management and oversight of Spaceport operations, plus the services administered by those managing entities for the benefit of the overall Spaceport complex, including operations and maintenance, service and utilities, and infrastructure.	Yes

Table 3-1
Land Use Categories on Kennedy Space Center

Land Use Category	Description	Occurrence in Alternative Site Locations
Research and Development (R & D)	Includes laboratories and related facilities that perform testing and experimentation for the purpose of developing new programs and technologies at the Spaceport. R & D may also include educational institutions offering advanced degrees in disciplines supporting Spaceport R & D activities.	No
Public Outreach	Facilities that provide an informational or educational connection between the Spaceport and the community.	No
Seaport	Includes wharves used for the docking of vessels and facilities, that directly support wharf operations. Also included in this classification are Naval Ordnance Test Unit facilities.	No
Recreation	Includes parks, outdoor fitness areas, athletic fields, recreation buildings, centers, and clubs within the Spaceport complex.	No
Conservation	Includes all natural areas and all undeveloped land not assigned to another land use classification. This classification is divided into two sub-classifications: wildlife refuge, which includes all natural and undeveloped land and impoundment areas, and bodies of water, which includes all defined water bodies within Spaceport property. Land within Canaveral National Seashore and Merritt Island National Wildlife Refuge is included in this classification. Facilities that support the administration, maintenance, and enjoyment of conservation areas are classified as part of the conservation area in which they are located.	No
Agriculture	Includes land areas used for the cultivation of crops or plant material for commercial purposes or for Spaceport facility landscape maintenance.	Yes
Open Space	Includes undeveloped open land within developed activity centers identified as likely for future development. The criteria for this category includes existing land that is primarily cleared of natural vegetation, leveled, and located in or immediately adjacent to developed activity centers, where future expansion of existing facilities may be anticipated.	Yes

Source: NASA-KSC 2003.

3.2 Air Quality

The Clean Air Act (CAA) of 1970, 42 U.S.C. 7401 *et seq.*, amended in 1977 and 1990, is the primary federal statute governing air pollution. The CAA designates six pollutants as criteria pollutants, for which National Ambient Air Quality Standards (NAAQS) have been promulgated to protect public health and welfare. The six criteria pollutants are particulate matter, (PM; PM_{10} and $PM_{2.5}$), carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), lead (Pb), and ozone (O_3). Volatile organic compounds (VOCs) are not considered a criteria pollutant, but are analyzed here since VOCs are a precursor to O_3. In addition, federal law requires states or local air quality control agencies to establish a State Implementation Plan (SIP) that prescribes measures to achieve or maintain attainment of these standards. Areas that do not meet the NAAQS for a criteria pollutant are designated as "non-attainment" for that pollutant. The Florida Department of Environmental Protection manages air quality for the state of Florida.

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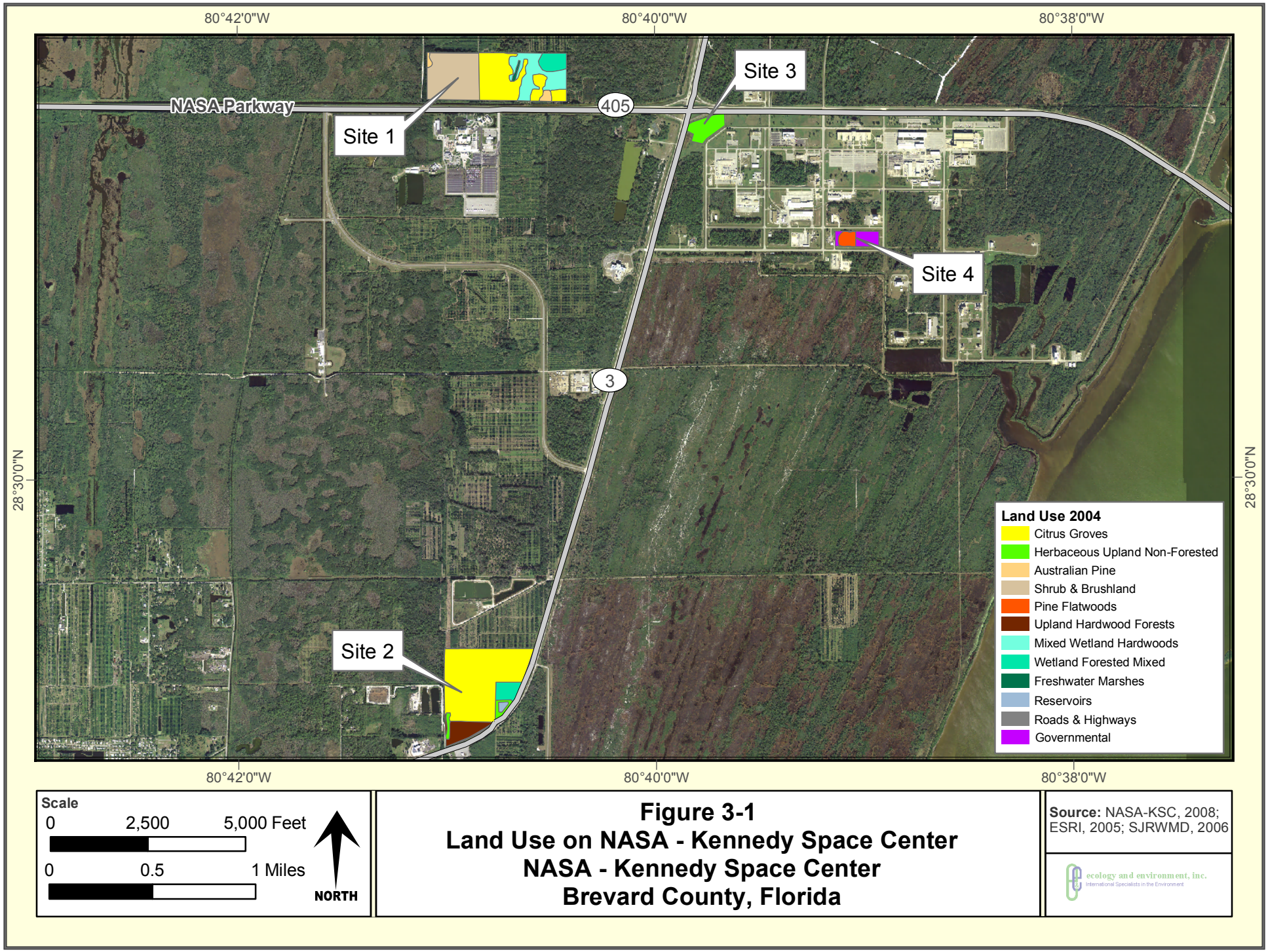

Figure 3-1
Land Use on NASA - Kennedy Space Center
NASA - Kennedy Space Center
Brevard County, Florida

Source: NASA-KSC, 2008; ESRI, 2005; SJRWMD, 2006

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The General Conformity Rule has been promulgated by the United States Environmental Protection Agency to ensure that the actions of federal departments or agencies conform to the applicable SIP. A conformity determination is required for each pollutant when the total of direct and indirect emissions caused by a federal action would equal or exceed 100 tons per year of CO, nitrogen oxides (NO_X), or VOCs, with the exceptions specified in 40 CFR 51.853(c), (d), or (e). Conformity evaluations are not required for areas that are "in attainment" for NAAQS. NASA-KSC is located in Brevard County which is in attainment status for all criteria pollutants; therefore, a conformity analysis is not required for this project.

The ambient air quality at NASA-KSC is influenced by daily operations, including vehicle usage, utilities fuel combustion, and standard maintenance operations. Infrequent operations that have an effect upon ambient air quality include prescribed burns, shuttle launches, and most notably, the visitor traffic associated with shuttle launches. To a lesser extent, air quality on NASA-KSC is influenced by factors located off-site, including emissions from two regional oil-fired power plants located within a 10-mile (18.5-km) radius of NASA-KSC.

3.3 Biological Resources

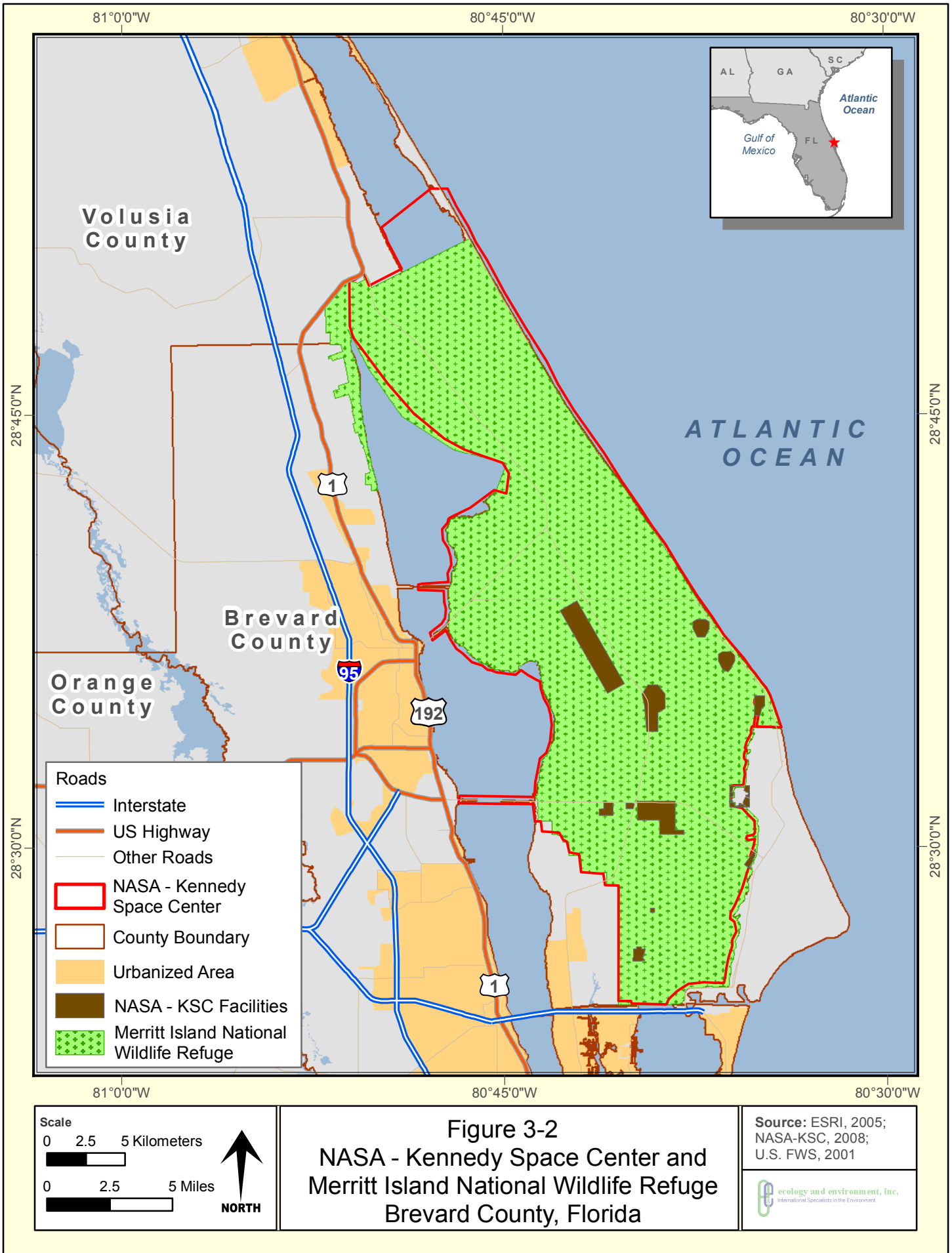
NASA-KSC covers over 219 square miles (567.2 square km) of which 91% remains undeveloped and managed by the United States Fish and Wildlife Service (USFWS) as the MINWR, including the citrus groves. Due to its restricted access and lack of development, some areas of NASA-KSC serve as important wildlife habitat. Because of this, it is often appropriate to refer to the area as KSC-MINWR. Figure 3-2 illustrates the boundaries of the MINWR in relation to NASA-KSC and the alternative site locations.

3.3.1 Vegetation and Habitats

NASA-KSC is comprised of a variety of vegetative habitats, including agriculture, uplands, and wetlands. The vegetation and habitat types found within the overall project area (i.e., all four alternative site locations) are either previously disturbed and/or impacted by man, or are surrounded by previously developed areas. The following subsections describe the vegetation and habitats currently found on each alternative site location. The following information comes from the 2004 Photointerpretation Key (published in 2006) by the St. John's River Water Management District (SJRWMD). The classification system used by the SJRWMD (SJRWMD 2006) is derived from the Florida Land Use and Cover Classification System (Florida Department of Transportation 1999).

Alternative Site 1: 100-Acre Northern Site

Site 1 (Figure 3-3) is comprised of approximately 37% agricultural habitat, which consists of citrus groves (including orange and grapefruit). The groundcover within the groves is primarily maintainable grasses and flowering herbs including blue mistflower (*Conoclinium coelestinum*). Australian pine (*Casuarina equisetifolia*), an invasive exotic species, is also found in parts of Site 1, particularly along the western and southern boundaries of the site.



Scale
0 2.5 5 Kilometers
0 2.5 5 Miles
NORTH

Figure 3-2
NASA - Kennedy Space Center and Merritt Island National Wildlife Refuge Brevard County, Florida

Source: ESRI, 2005; NASA-KSC, 2008; U.S. FWS, 2001

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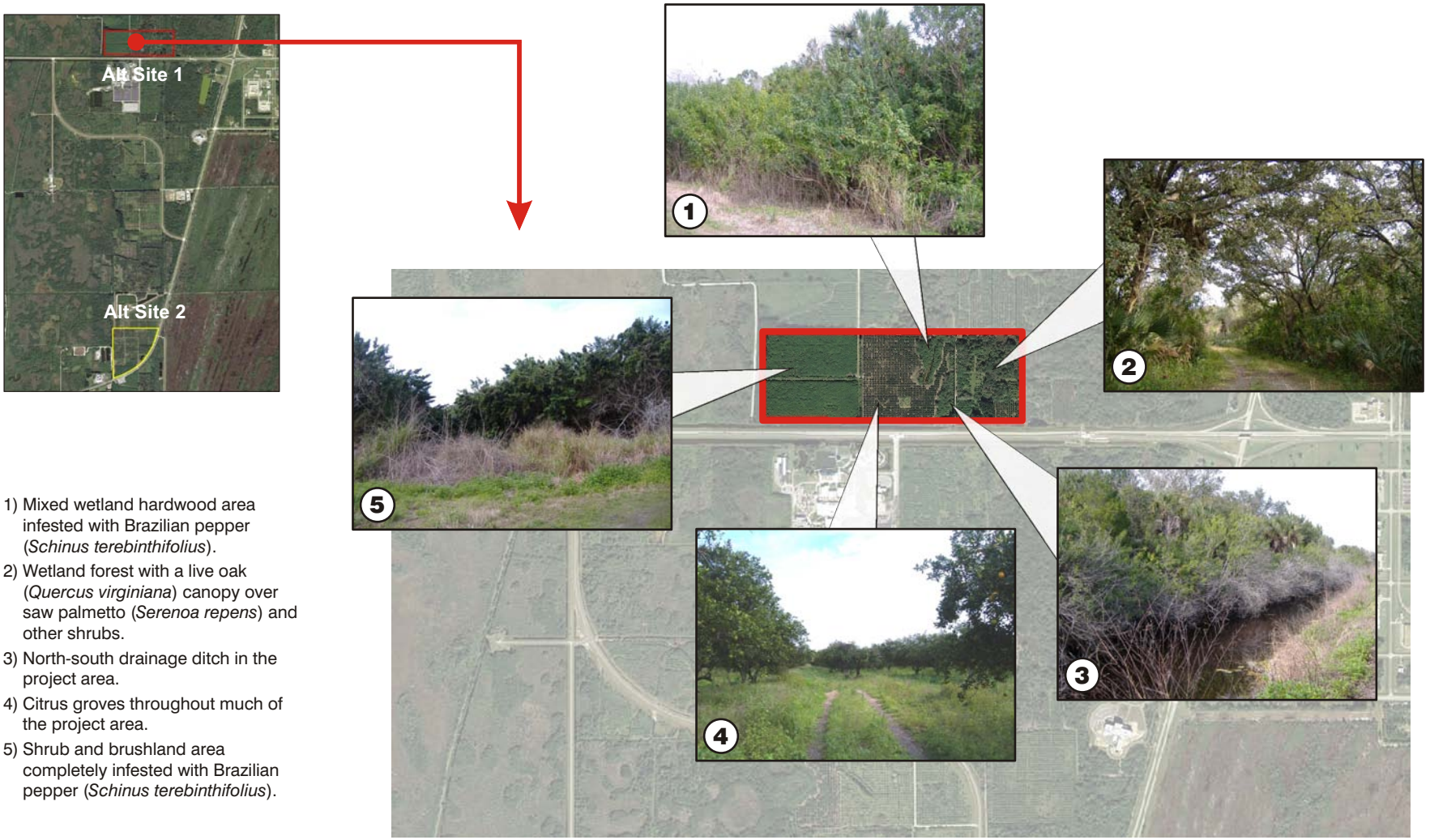


1) Mixed wetland hardwood area infested with Brazilian pepper (*Schinus terebinthifolius*).
2) Wetland forest with a live oak (*Quercus virginiana*) canopy over saw palmetto (*Serenoa repens*) and other shrubs.
3) North-south drainage ditch in the project area.
4) Citrus groves throughout much of the project area.
5) Shrub and brushland area completely infested with Brazilian pepper (*Schinus terebinthifolius*).

FPL

NASA

Figure 3-3 Alternative Site 1

N

The upland habitat found on Site 1 (comprising 35% of the site) is considered shrub and brushland, a habitat type that is typically identified by the presence of wax myrtle (*Myrica cerifera*) and saw palmetto (*Serenoa repens*). However, a site visit on January 15, 2008, revealed that substantial portions of the upland habitat type are now dominated by the nuisance exotic species Brazilian pepper (*Schinus terebinthifolius*), which appears to have choked out nearly any other upland species (Figure 3-3).

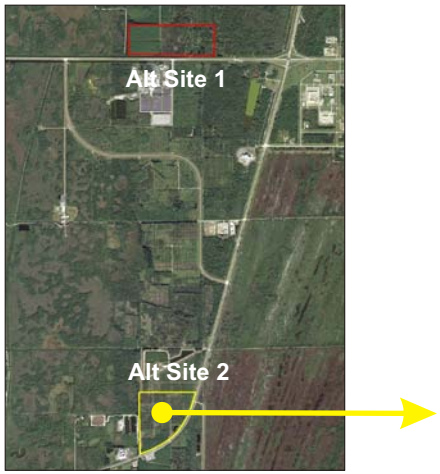
Approximately 27.3 acres (11 ha) of disturbed wetland habitats are located on Site 1, accounting for approximately 27% of the total site. These habitats include mixed wetland hardwoods, mixed wetland forest, and freshwater marsh. The freshwater marsh is less than 1 acre (0.4 ha) in size and is nearly entirely vegetated by cattails (*Typha* sp.). The area of mixed wetland hardwoods comprises the largest area of disturbed wetland habitats on Site 1 and is found on the eastern and northeastern portions of the site (Figure 3-3). However, this area is now dominated by live oak (*Quercus virginiana*), which may indicate a transitioning to upland habitat. Other species present include red maple (*Acer rubrum*), cabbage palm, and American elm (*Ulmus americana*), among others. The understory is dominated by saw palmetto. Scrubby flatwoods primarily comprised of slash pine (*Pinus elliottii*) are found at the transitional edges of these mixed wetland hardwood areas; however, these areas are minimal in size. Mixed wetland forest areas contain the same species as the mixed wetland hardwoods, but with a less dominant hardwood canopy.

Alternative Site 2 (Preferred Alternative for the Approximately 10-MW Solar PV Facility): 100-Acre Southern Site

Site 2 is dominated by agriculture, as citrus groves account for approximately 76% of this location (Figure 3-4). The groundcover consists mostly of maintainable grasses and flowering herbs, including but not limited to Spanish needles (*Bidens alba*), common sowthistle (*Sonchus oleraceus*), and morning glory (*Ipomoea* sp.). The citrus groves are lined with drainage ditches that were dry at the time of a site visit on January 15, 2008. The dry ditches were often bare, but occasionally were vegetated with cattails.

Upland habitats within Site 2 include non-forested herbaceous areas, shrub and brushland, and upland hardwood forests. Invasive exotic species, particularly Brazilian pepper, are found within Site 2 in many upland habitats, further contributing to the disturbed nature of these communities. Upland communities comprise approximately 14% of Site 2, and are found towards the southern and southwestern portions of the site. Upland hardwood forest, often synonymous with xeric hammock, is a habitat type that is dominated by an overstory consisting primarily of live oak, with a shrubby understory consisting primarily of saw palmetto. However, when observed during the January 15, 2008 site visit, this area of Site 2 appeared to be nearly choked out with Brazilian pepper plants (Figure 3-4) and would more accurately be classified as exotic wetland hardwoods (wet Brazilian Pepper). Stands of Australian pines are also found on Site 2, most notably along the western boundary of the site.

Disturbed wetland habitats found on Site 2 include mixed wetland forest and a reservoir/retention pond, and account for approximately 8% of the entire site (Figure 3-4). The approximately 1-acre (0.4-ha) retention pond is located on the site at the southwestern edge. The perimeter of the pond consists primarily of cattails, but arrowhead (*Sagittaria* sp.),



1) Citrus groves that cover more than 70% of site location.
2) Northern boundary of mixed wetland forest.
3) Red maple (*Acer rubrum*) within mixed wetland forest.
4) Retention pond surrounded by cattails (*Typha* sp.).
5) Typical drainage ditch located within citrus groves on site.
6) Upland hardwood forest containing Brazilian pepper (*Schinus terebinthifolius*).
7) North-south drainage ditch along western boundary of site location, lined with Australian pines (*Casuarina equisetifolia*).

Figure 3-4 Alternative Site 2

Spanish needles, and sedges (*Carex* sp.) are also present. The mixed wetland forest area on Site 2 encompasses approximately 6.5 acres (2.6 ha) and is located just north of the retention pond. This area consists of a closed canopy with a fairly dense shrub layer and little to no groundcover, except the occasional fern. Species observed in this habitat include Brazilian pepper (prevalent), red maple, myrsine (*Myrsine floridana*), cabbage palm (*Sabal palmetto*), slash pine, and wild coffee (*Psychotria nervosa*).

Alternative Site 3: 10-Acre Northwestern Site

Alternative Site 3 is comprised entirely of disturbed upland habitat, best described as herbaceous in nature. There are no wetlands on this site. The expanse of this area is maintainable grasses, with very few woody trees, including slash pine and cabbage palm (Figure 3-5).

Figure 3-5. Alternative Site 3. This site is comprised completely of herbaceous upland habitat which includes short, maintainable grasses with very few trees.

Alternative Site 4 (Preferred Alternative for the Approximately 2-MW Solar PV Facility): 10-Acre Southeastern Site

The majority of Site 4 (64%) is disturbed because it is an area once used for an industrial purpose, and is currently surrounded by a chain link fence (Figure 3-6). This portion of Site 4 is a former contaminated area that has been remediated to industrial cleanup standards and is currently covered in gravel.

The remainder of Site 4 (approximately 36%) is comprised of heavily-impacted pine flatwoods, an upland coniferous forest (Figure 3-7). Upon closer inspection during the site

visit on January 15, 2008, this area, while dotted with few slash pines and even fewer cabbage palms, contains an inconsistent understory of saw palmettos, and occasionally other upland shrubs and flowering herbs/grasses.

Figure 3-6. Alternative Site 4 – Scarified/Fenced Portion. Located in NASA-KSC's Industrial Area, Alternative Site 4 is an Installation Restoration Program site that has been cleaned to industrial grade.

Figure 3-7. Alternative Site 4 – Western Portion. The western portion of Site 4 is an upland area comprised mostly of grasses and saw palmettos, with a sparse covering of trees.

3.3.2 Wildlife

Thirty (30) species of mammals, 267 species of birds, 69 species of reptiles and amphibians, and 25 species of fish (not including those found in Indian River Lagoon) have been observed and/or found on KSC-MINWR (NASA-KSC 2003). However, due to the disturbed nature of all the alternative sites, far fewer species would be expected to be found or observed on the alternative site locations. Non-imperiled wildlife species that may be found on the alternative sites include: raccoon (*Procyon lotor*), Virginia opossum (*Didelphis virginiana*), nine-banded armadillo (*Dasypus novemcinctus*), Eastern cottontail (*Sylvilagus floridanus*), wild hog (*Sus scrofa*), green anole (*Anolis carolinensis*), brown anole (*A. sagrei*), tree frogs (*Hyla* sp.), and various birds including the mourning dove (*Zenaida macroura*), and the American robin (*Turdus migratorius*). During the January 15, 2008 site visit, more wildlife species were observed at Alternative Site 1 than on the other alternative site locations.

3.3.2.1 Migratory Birds

The Migratory Bird Treaty Act (MBTA) of 1918 (16 U.S.C. 701-715s) is the primary legislation in the United States established to conserve migratory birds. It implements the United States' commitment to four bilateral treaties, or conventions, for the protection of a shared migratory bird resource. The MBTA prohibits the taking, killing, or possessing of migratory birds unless permitted by regulation. The species of birds protected by the MBTA appear in Title 50, Section 10.13, of the Code of Federal regulations (50 CFR 10.13). Similarly, EO 13186 requires federal agencies to support the conservation intent of the migratory bird conventions by integrating bird conservation principles, measures, and practices into agency activities; by avoiding or minimizing adverse impacts on migratory bird resources; and by minimizing the intentional take of species of concern.

MINWR is an important overwintering and stopover site for neotropical migratory birds. Its location (as part of the Atlantic Flyway) situated on the coast and Indian River Lagoon, along with natural and spoil islands, impounded wetlands, ridges and swales, pine flatwoods and hardwood hammocks, has allowed MINWR to be designated as a Globally Important Bird Area and MINWR also serves as a gateway to the Great Florida Birding Trail. While a multitude of migratory species are found on MINWR, the refuge plays an important role for a few specific species, including the lesser scaup (*Aythya affinis*), northern pintail (*Anas acuta*), and the mottled duck (*Anas fulvigula*; USFWS 2006). However, these three species of migratory birds are waterfowl dependent upon bodies of water (both fresh and estuarine) for breeding, nesting, and foraging; therefore, they would not be found on any of the alternative site locations.

3.3.2.2 Threatened and Endangered Species

The Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531, et seq.) was designed to prevent the extinction of native and foreign species of wild flora and fauna. The ESA defines an endangered species as any animal or plant in danger of extinction and a threatened species as any plant or animal likely to become extinct within the foreseeable future. This act makes it illegal to harass, harm, or kill listed species and to possess, transport, buy, or sell the species or parts thereof in the course of an interstate or foreign commercial activity. A permit authorizing any prohibited activity may be issued for the

following: scientific research; educational purposes; enhancement of propagation or survival of the species; and incidental taking (not available for plants).

While there are no known federally listed plants on NASA-KSC, a total of 25 species of federally listed wildlife species have been documented on KSC-MINWR property. Due to the disturbed vegetative habitats located on the alternative site locations, only six have the potential of occurring on these sites. Additionally, 18 state-listed species are potentially found on the alternative site locations. Table 3-2 lists these federally and state-listed wildlife species that are potentially found within the overall project area. Additional descriptions of the federally listed species follow Table 3-2.

Table 3-2
Imperiled Species Potentially Found on the Alternative Site Locations

Common Name	Scientific Name	Federal Status	State Status
Florida gopher frog	*Rana capito aesopus*		SSC
American alligator	*Alligator mississippiensis*	T (S/A)	SSC
Gopher tortoise	*Gopherus polyphemus*		T
Eastern indigo snake	*Drymarchon couperi*	T	T
Florida pine snake	*Pituophis melanoleucus mugitus*		SSC
Snowy egret	*Egretta thula*		SSC
Little blue heron	*Egretta caerulea*		SSC
Tri-colored heron	*Egretta tricolor*		SSC
White ibis	*Eudocimus albus*		SSC
Roseate spoonbill	*Ajaia ajaja*		SSC
Wood stork	*Mycteria americana*	E	E
Bald eagle	*Haliaeetus leucocephalus*	DM	T
Southeastern American kestrel	*Falco sparverius paulus*		T
Least tern	*Sterna antillarum*		T
Black skimmer	*Rynchops niger*		SSC
Florida scrub-jay	*Aphelocoma coerulescens*	T	T
Southeastern beach mouse	*Peromyscus polionotus niveiventris*	T	T
Florida mouse	*Podomys floridanus*		SSC

Source: NASA-KSC 2008
Key:
DM = De-listed, Taxon Recovered.
E = Endangered.
S/A = Similarity of Appearance to a Threatened Taxon.
SSC = State Species of Special Concern.
T = Threatened.

American Alligator (Alligator mississippiensis)

The American alligator is federally listed as threatened due to the similarity in appearance to the federally endangered American crocodile (*Crocodylus acutus*), a species not potentially found on the alternative site locations. The American alligator is the largest reptile found in North America, and due to enforced protective legislation, has seen a rapid recovery in population size. It is found in many aquatic habitats including fresh and brackish marshes, ponds, lakes, rivers, and swamps. The alligator is commonly seen on NASA-KSC, and several individuals were observed on Site 1 during the January 15, 2008 site visit. These individuals were observed in the drainage ditch along the southern boundary of the alternative site and in a larger drainage ditch that bisects the alternative site.

Eastern Indigo Snake (Drymarchon couperi)

The Eastern indigo snake is federally and state-listed as threatened. It is found in numerous habitat types including pine flatwoods, scrubby flatwoods, tropical hardwood hammocks, freshwater marshes (edges), coastal dunes, agricultural areas, dry prairie, high pine, and human-altered habitats (USFWS 1999). It is often found in xeric habitats where gopher tortoises live and have created burrows, which the indigo snake uses during colder winter months, and critical habitat for this species has not been designated. It is only occasionally seen on NASA-KSC. The size of an individual's home range varies; males usually have larger ranges than females. Ten radio-tagged indigo snakes were monitored on NASA-KSC from 1998 to 2002. Of those ten, the home ranges for males varied from 159.6 acres to 807 acres (64.6 ha to 326.6 ha) and the home ranges for females varied from 48.4 acres to 250.6 acres (19.6 ha to 101.4 ha; NASA-KSC 2003). No indigo snakes were radio-tracked in any of the alternative site areas, but they have been visually observed there on various occasions.

Ascertaining the size of the indigo snake population on NASA-KSC is difficult, as it is in any location. Two standard survey methods are currently used at NASA-KSC, including drift fence arrays with both box and funnel traps, and road surveys.

Wood Stork (Mycteria americana)

The wood stork is a federally endangered stork that is typically associated with estuarine and freshwater habitats for nesting, foraging, and roosting. During breeding season, nests are typically constructed in medium to tall trees located in swamps or on islands surrounded by large areas of open water. During the non-breeding season (and while foraging), wood storks are found in, and use a wide variety of, wetland habitats, including freshwater marshes, agricultural ditches, swamp sloughs, impoundments, shallow tidal pools and narrow tidal creeks, and freshwater marshes. The common denominator in wood stork foraging areas is the shallow water depth where fish populations become concentrated (USFWS 1999). Critical habitat has not been designated for this species.

Wood stork feeding site monitoring on NASA-KSC began in 1987. Areas monitored included mosquito control impoundments, certain roadside ditches, and a portion of Indian River Lagoon and its associated creeks. Prior to 1985, wood stork nesting on NASA-KSC was relatively high, and began tapering off until 1990, when nesting was last documented on NASA-KSC (NASA-KSC 2003). Due to the habitat requirements for this species, it is highly unlikely that wood storks would be found on any of the alternative site locations.

Bald Eagle (Haliaeetus leucocephalus)

The bald eagle was removed from federal listing on August 8, 2007, as a result of the now-flourishing population across the United States. It had been protected under ESA and the law that preceded it since 1967 due to the use of the pesticide DDT and from habitat loss. However, it is still listed as threatened by the State of Florida, and is protected under the MBTA and the Bald and Golden Eagle Protection Act of 1949, as amended (16 U.S.C. 668-668d, 54 Stat. 250).

The bald eagle is considered a water-dependent species, and therefore is typically found near waterbodies including large lakes, rivers, estuaries, and reservoirs. However,

suitable nesting sites, such as perches and large trees, are a major factor in their distribution near large bodies of water. This species is a regular visitor and nester on NASA-KSC and the number of nests has increased every year, mirroring the recovery of the species. Eagle nest trees on NASA-KSC are protected by a 750- to 1,500-foot no-activity zone with an additional 750 feet to 1 mile permitted-only zone (NASA-KSC 2003). No bald eagle nests are located within any of the alternative site locations. Two bald eagle reproduction surveys were done during the 2006/2007 season on KSC-MINWR. Of the 20 nesting territories surveyed, the following information was collected:

- No eagle nests found (four nesting territories);
- Three or four nesting territories had old nests but were inactive;
- One nesting territory was occupied by great horned owls;
- One or two nesting territories failed; and
- The remaining 10 nesting territories fledged between 10 and 13 young (Bolt 2008).

Florida Scrub-Jay (Aphelocoma coerulescens)

The Florida scrub-jay is federally and state-listed as a threatened species, and is endemic to peninsular Florida's xeric oak scrub habitat. This habitat is typically comprised of sand live oak (*Quercus geminata*), Chapman oak (*Q. chapmanii*), myrtle oak (*Q. myrtifolia*), and scrub oak (*Q. inopina*; USFWS 1999). The KSC-MINWR is the site of the second largest scrub-jay population in the state, hosting approximately 550 family groups (USFWS 2006). Unlike the Lake Wales Ridge (where the aforementioned xeric oak scrub is located), the scrub-jay habitat on the KSC-MINWR is less scrub oak and more scrubby flatwoods, which contain a sparse cover of Florida slash pine (*Pinus elliottii*). Scrub-jays are also found in ruderal and/or disturbed areas, particularly near the coast. Scrub-jay habitat requires periodic fire management in order for the species to persist. Critical habitat for this species has not been designated.

Monitoring of scrub-jay nests has been done on NASA-KSC since 1987. This monitoring revealed that many of the nests are depredated due to several species, including yellow rat snake, small mammals, and other birds and snakes. The area nearest the alternative sites where scrub-jay nests may be found includes the area east of Alternative Site 2, but no nests are located within any of the alternative site locations.

Southeastern Beach Mouse (Peromyscus polionotus niveiventris)

The Southeastern beach mouse is federally and state-listed as threatened, and is a subspecies of the oldfield mouse (*P. polionotus*) that is found in coastal habitats on Florida's eastern coast. While critical habitat is not designated for this species, habitat essential to the Southeastern beach mouse includes sea oat (*Uniola paniculata*) communities of primary coastal dunes. It is also occasionally found in the coastal strand communities vegetated with prickly pear cactus (*Opuntia humifusa*), sea grape (*Coccoloba uvifera*), sand pine (*Pinus clausa*), and beach tea (*Croton punctatus*; USFWS 1999). Due to the nature of these sandy habitats, beach mice construct extensive burrows used for refuge, nesting, and the storage of food.

Distribution surveys for the Southeastern beach mouse were conducted throughout the 1990s on those areas that potentially support the species on NASA-KSC. The alternative site locations discussed in this EA were not included in those surveys because these locations are not situated along the coastline.

3.4 Soils

The soils for NASA-KSC are mapped in the soil surveys completed for Brevard County (Huckle, Dollar, and Pendleton 1974), as well as Volusia County (Baldwin *et al.* 1980). Eleven soil types are found on the four alternative site locations, as indicated on Figure 3-8 and in Table 3-3.

Table 3-3
Soil Types Located on the Alternative Site Locations

Soil Type	Details
Wabasso Sand	Nearly level, poorly drained sand. Found in flatwoods and on low ridges of floodplains.
Copeland-Bradenton-Wabasso Complex	Nearly level, sandy to loamy, very poorly drained.
Riviera Sand	Nearly level, poorly drained sand.
Bradenton Fine Sand- Limestone Substratum	Nearly level, poorly drained fine sand.
Quartipsamments-Smoothed	Nearly level to steeply sloping soils reworked by earthmoving equipment. Soil material is derived from a variety of sandy soils.
Myakka Sand	Nearly level, poorly drained sand. Found in flatwoods, wetter scrub, low ridges between sloughs, and in narrow areas between sand ridges and lakes or ponds.
Immokalee Sand	Nearly level, poorly drained sand. Found in flatwoods, scrub, low ridges between sloughs, and in narrow areas between sand ridges and lakes or ponds.
St. Johns Sand	Nearly level, poorly drained sand. Found on broad low ridges in flatwoods.
Anclote Sand	Nearly level, very poorly drained sand. Found in marshy depressions in flatwoods, broad areas on floodplains, and in poorly defined drainageways.
Basinger Sand	Nearly level, poorly drained sand. Found in sloughs of poorly defined drainageways and depressions in flatwoods.
Pomello Sand	Nearly level, moderately well-drained sand. Found on broad low ridges and low knolls in flatwood habitats.

Sources: Huckle, Dollar, and Pendleton 1974; Baldwin *et al.* 1980.

3.5 Surface Water Resources and Drainage

The major water bodies on or adjacent to NASA-KSC are the Atlantic Ocean, Indian River Lagoon, and Banana Creek (a freshwater creek that drains numerous estuaries adjacent to the Space Shuttle launch pads). However, the proposed alternative site locations are not on or near these water bodies. Surface water resources on Alternative Sites 1 and 2 include drainage and swales located within the citrus groves on both sites and a small retention pond on Site 2.

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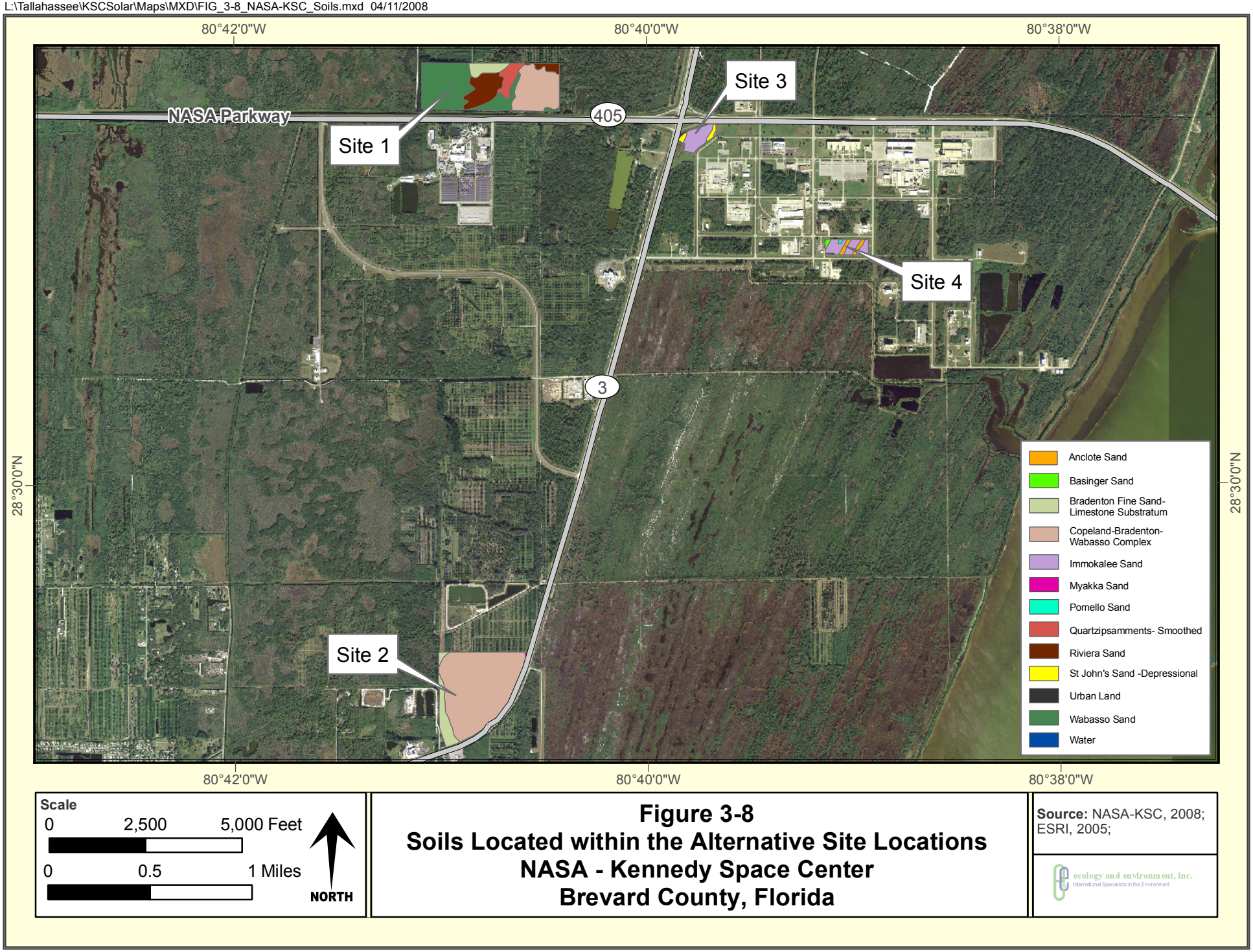

Figure 3-8
Soils Located within the Alternative Site Locations
NASA - Kennedy Space Center
Brevard County, Florida

Source: NASA-KSC, 2008; ESRI, 2005;

ecology and environment, inc.
International Specialists in the Environment

Drainage at all four alternative site locations is routed offsite via swales and ditches and ultimately into Indian River. At Alternative Site 1, stormwater sheet-flows into interior ditches and then into a large canal parallel to NASA Parkway West. Water in this canal gravity-flows and drains westward to Indian River. At Alternative Site 2, a series of small interior ditches or small swales drain the rows of citrus groves. The ditches and swales are dry except following a rain event. A pump located in the northwest corner of the site directs the water offsite.

Stormwater at Alternative Sites 3 and 4 sheet-flows into roadside swales. Stormwater from Alternative Sites 3 and 4 is routed to a regional retention pond and drainage is already accounted for as part of the Regional Stormwater Treatment System, thus any site modifications and resulting runoff are pre-approved from a drainage perspective.

3.6 Groundwater

The principal aquifer underlying NASA-KSC is the Floridan aquifer. It is a highly productive aquifer; however, in the coastal areas such as NASA-KSC, groundwater is highly mineralized. The Floridan aquifer is confined by the Hawthorne formation. Secondary aquifers are also present throughout the confining unit. These aquifers have little direct influence on surface vegetation; however, artesian wells have been used to irrigate local citrus groves. Seasonal fluctuations in the water table occur with changes in both precipitation and evapotranspiration (NASA-KSC 2000).

Surficial aquifers are subject to contamination from point sources and from general land use. Contaminants may include trace elements, pesticides, herbicides, and other organics. Baseline data from a June 2000 study at NASA-KSC indicate that widespread contamination at NASA-KSC has not occurred (NASA-KSC 2000).

3.7 Socioeconomics

A 2006 population estimate for Brevard County yielded a population of 534,359 (US Census Bureau 2008). In 2005, Brevard had a per capita personal income of $31,800, which ranked 18th in the state, and was 94% of the state average ($34,001) and 92% of the national average ($34,471; U.S. Department of Commerce Bureau of Economic Affairs 2007). As of 2002, the number of people employed at NASA-KSC was 14,044, making NASA-KSC the largest single employer in the county (NASA-KSC 2003). The vast majority of NASA-KSC jobs is associated with the space program; however, the agriculture industry is included within these numbers, as there are approximately 700 acres (283.3 ha) of citrus groves (managed and abandoned) located on NASA-KSC property.

3.8 Aesthetics

Undeveloped land dominates the landscape of NASA-KSC (91%), including open water, uplands (including agricultural areas), wetlands, and mosquito control impoundments. Developed facilities on NASA-KSC are primarily associated with the Shuttle Landing Facility, the Industrial Area, and the Vehicle Assembly Building (VAB) area. Currently, the tallest structure on NASA-KSC is the VAB, at a height of 52 stories. However, a proposed

lightning protection system in association with the Constellation Program at NASA-KSC includes the construction of three towers approximately 605 feet (184 meters) tall, which would surpass the height of the VAB.

3.9 Infrastructure and Utilities

As discussed in Section 2.4, certain infrastructure and utility components (including transportation and traffic, and water utilities) would not be affected by the Proposed Action and, therefore, are not discussed in this section. Due to the nature of the project, the only types of infrastructure/utilities that would be affected are electricity and solid waste.

3.9.1 Electricity

In Fiscal Year (FY) 2007, NASA-KSC programs and tenants consumed 273,214 megawatt hours (MWh) of electricity and 3.4 million therms of natural gas. Consumption from the two main electrical substations, the Orsino and the C-5 Substations, was 254,065 MWh. Ten other smaller accounts make up the difference (including the Courtenay Substation); the Courtenay substation supplied NASA-KSC with 207.9 MWh of electricity in FY 2007.

The proposed solar PV facility would require a distribution voltage interconnection and would connect to the Courtenay Substation via a newly constructed feeder. This feeder would connect all of the approximately 10 MW to the substation. The feeder may be overhead or underground and located in an existing FDOT Right-of-Way. Existing feeders would not be used for the interconnection.

3.9.2 Solid Waste

The removal of solid waste on NASA-KSC is managed under the NASA-KSC Landfill Operating Plan (NASA-KSC 2005a). Garbage is sent to the Brevard County Class I Landfill located in the City of Cocoa, Florida. A Class I landfill in the State of Florida is a landfill that receives an average of 20 tons or more of solid waste per day. Class I landfills are permitted to receive general, non-hazardous household, commercial, industrial, and agricultural wastes.

Construction and demolition (C & D) debris generated on NASA-KSC goes to their onsite landfill, an unlined, Class III landfill. C & D materials are those that are considered non-water soluble and non-hazardous in nature, including but not limited to steel, brick, glass, concrete, asphalt, pipe, gypsum wallboard, and lumber. This includes rocks, soils, tree remains, trees, and other vegetative matter that normally results from land clearing or development.

3.10 Hazardous Materials/Waste

NASA-KSC has developed a program of managing and handling hazardous and controlled wastes in compliance with the provisions of the Resource Conservation and Recovery Act (RCRA) of 1976 and the implementing regulations adopted by the State of Florida (62-730, Florida Administrative Code). NASA-KSC maintains a comprehensive

inventory of all RCRA-defined hazardous wastes and controlled wastes not regulated by RCRA. This inventory is maintained by a manifest records system that tracks the generation, on-site storage, treatment, and reclamation of hazardous and controlled wastes. Various types of waste being managed include used oil (which is recycled), used antifreeze (which is recycled), and fluorescent lamps, which are managed as universal waste and are also recycled. The manifest records system is integrated with an automated data processing system, which provides the capability to generate current waste status reports, as well as, quarterly and annual summary reports (NASA-KSC 2003).

Due to the nature of the alternative site locations, no hazardous wastes are generated on any of them at the present time. Some pesticides or fumacides have been used on lands, such as Alternative Sites 1 and 2, where orange groves are located; however there is no documented contamination on these properties. Alternative Site 4 is a former Solid Waste Management Unit that had elevated levels of contaminants (metals and polychlorinated biphenyls) in the soils. Remedial efforts at this site have cleaned up the soils to industrial standards making the property available and safe for industrial usage.

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4 Environmental Consequences

4.1 Land Use

Alternatives 1 and 2

Implementation of the Proposed Action at either Alternative Sites 1 or 2 would result in the long-term permanent land use designation change from Agriculture and Open Space to Spaceport Management, which includes utilities and infrastructure. This land use designation change is considered negligible due to the large amount of KSC-MINWR property that falls within the categories of Agriculture and Open Space (approximately 91%). Overall, each of the approximately 100-acre proposed site locations represents a small portion of the entire KSC-MINWR property (approximately 0.7%); therefore, the effect of this land use change would be negligible.

Alternatives 3 and 4

There would be no change to land use designation as a result of implementing the Proposed Action on either Alternative Sites 3 or 4, as these areas already fall under the Spaceport Management designation.

No-Action Alternative

Under the No-Action Alternative, the land use designation for all proposed Alternative Site locations would not change.

4.2 Air Quality

Alternatives 1 and 2

Construction of the Proposed Action would result in fugitive dust and equipment emissions; however, these emissions would have minor impacts on air quality. Fugitive dust is particulate emissions released from sources that do not have a point source such as a stack or vent. Examples include hauling, handling or storage of construction materials on site, or dust caused by vehicles traveling over an unpaved road. Windblown soil and dust may also occur during the construction phase as a result of equipment movement over exposed soil areas. Fugitive dust can be greatly minimized by appropriate dust control measures such as wetting the surfaces and by re-vegetating disturbed areas as soon as possible.

Short-term impacts to the area would be localized and would occur from emissions due to tailpipe emissions from the construction activities (Table 4-1; also see Appendix B). It is anticipated that overall local emissions would return to existing conditions after completion of construction activities. The operation of heavy equipment would have minor, temporary, negative impacts on air quality during the construction phase which is expected to last approximately nine months. These short-term impacts would be primarily in the form of increased exhaust pollutants that can be minimized by good vehicle maintenance.

No significant long-term impacts to air quality would be associated with the Proposed Action. The short-term air quality impacts resulting from the Proposed Action would be a

temporary increase of air pollutants during construction, which would cease once the project was completed.

The Proposed Action would have a beneficial effect on overall air quality due to the absence of CO_2 emissions which would be typically associated with a traditional power plant. Cumulative effects of this solar project would produce electric power from a non-polluting source, resulting in a small incremental improvement in air quality within the region when compared to burning fossil fuels for electric power.

Table 4-1
Summary of Emissions from the Construction of the Approximately 10-Megawatt Facility

Emission Source	Emissions [a] (tons)			
	VOC	NO_X	PM_{10}	CO
Tailpipe Exhaust	0.72	4.87	0.19	5.76
Worker Trip generation	0.00153	0.001	0.00008	0.012
Fugitive Emissions			23.10	
Asphalt Paving	1.05			0.24
TOTAL	**1.77**	**4.87**	**23.29**	**6.01**

Notes:
Total emissions are emissions from tailpipe exhaust, paving operations, and site preparation.
Key:
CO = carbon monoxide.
NO_X = nitrogen oxides.
PM_{10} = particulate matter of 10 microns or less.
VOC = volatile organic compounds.

Alternatives 3 and 4

Construction of the Proposed Action would have minor, temporary impacts on air quality. Construction of the Proposed Action would result in fugitive dust and equipment emissions, as discussed for Alternatives 1 and 2, but on a smaller scale (Table 4-2; also see Appendix B).

The operation of heavy equipment would have minor, temporary, negative impacts on air quality during the construction phase which is expected to last approximately two months. These short-term impacts would be primarily in the form of increased exhaust pollutants, which can be minimized by good vehicle maintenance.

No significant long term impacts to air quality would be associated with the Proposed Action. The short-term air quality impacts resulting from the Proposed Action would be a temporary increase of air pollutants during construction, which would cease once the project was completed.

The Proposed Action would have a beneficial effect on the overall air quality due to the absence of CO_2 emissions. Cumulative effects of this solar project would produce electric power from a non-polluting source, resulting in a small incremental improvement in air quality when compared to burning coal for electric power. However, the air quality improvement would not necessarily occur within the project area.

Table 4-2
Summary of Emissions from the Construction of the Approximately 2-Megawatt Facility

Emission Source	Emissions [(a)] (tons)			
	VOC	NO_X	PM_{10}	CO
Tailpipe Exhaust	0.16	1.13	0.05	1.27
Worker Trip generation	0.00015	0.000	0.00001	0.001
Fugitive Emissions			0.11	
Asphalt Paving	0.10			0.24
TOTAL	**0.27**	**1.13**	**0.16**	**1.51**

Notes:
Total emissions are emissions from tailpipe exhaust, paving operations, and site preparation.
Key:
CO = carbon monoxide.
NO_X = nitrogen oxides.
PM_{10} = particulate matter of 10 microns or less.
VOC = volatile organic compounds.

No-Action Alternative

Under the No-Action Alternative, the PV facilities would not be constructed on NASA-KSC property and the production of renewable solar energy would not occur. Because the facilities would not be constructed and operated, there would be no benefits towards reducing global climate change. The approximately 10,000 tons of CO_2 that would be potentially reduced annually from the atmosphere as a result of the solar PV facilities would remain a by-product of the operation of a traditional fossil-fueled power plant. The costs associated with the creation of non-renewable energy would continue to increase and greenhouse gases would continue to increase. Reliance on foreign fuels for energy production would not decrease.

4.3 Biological Resources

4.3.1 Vegetation and Habitats

Alternative Site 1

As a result of the Proposed Action, the 34 acres (13.8 ha) of citrus groves located on Alternative Site 1 would be removed and solar PV panels would be installed in their place. These groves account for approximately 34% of the disturbed vegetation found on Site 1. In the early 1980s, approximately 3,000 acres (1,214 ha) of citrus groves were located on KSC-MINWR. However, for many reasons (freezes, disease, etc.), approximately 700 acres (283.3 ha) of citrus groves (managed and abandoned) remain. The removal of these 34 acres (13.8 ha) would be a fraction of the total amount (approximately 4.9%). While this would be a long-term effect, it would be minor in nature.

The shrub and brushland upland communities found on Site 1 would also be impacted, as the trees would need to be removed in order to mount the solar PV panels. However, as previously mentioned in Section 3.3.1.1, this entire upland community has been completely overtaken by Brazilian pepper. Therefore, the habitat value of this portion of Site 1 is considerably low. Because of this, impacts to this community would be minor and

long term. This impact may also be beneficial, as it would include the removal of approximately 35 acres (14.2 ha) of exotic, invasive plants.

There are approximately 27.3 acres (11 ha) of predominantly disturbed, low-quality wetland habitats located on Alternative Site 1 that could potentially be impacted as a result of the Proposed Action. As noted in Section 2.1.1, it is estimated that only 70 acres (28.3 ha) of the approximately 100-acre (40.5 ha) project site would require clearing in order to mount the solar PV panels; therefore, these habitats will remain unaffected. Because of this, there would be no impacts to wetlands as a result of implementing the Proposed Action. However, should any impacts to wetlands occur, appropriate mitigation would be handled through the permitting process.

Alternative Site 2

Effects to citrus groves as a result of implementing the Proposed Action on Alternative Site 2 would be the same as those described for Alternative Site 1; however, there are approximately 72 acres (29 ha) of citrus groves on Alternative Site 2. This accounts for approximately 10% of the total number of acres of citrus groves on KSC-MINWR, but the effect would be long-term and minor.

The effects to upland communities found on Alternative Site 2 would be similar to those discussed for Alternative Site 1. Brazilian pepper has invaded the upland communities (non-forested herbaceous areas, shrub and brushland, upland hardwood forest), as observed during the January 15, 2008 site visit. Therefore, impacts to this community would be minor and long term. This impact may also be beneficial, as it would include the removal of approximately 12 acres (4.9 ha) of exotic, invasive plants.

There would be no effects to wetland communities found on Alternative Site 2 as a result of implementing the Proposed Action. Wetlands account for only 8% of the entire approximately 100-acre (40.5 ha) project boundary. Because it is estimated that only 70% of the entire project site would be impacted as a result of implementing the Proposed Action, these wetland areas would remain unaffected.

Alternative Site 3

Alternative Site 3 is comprised entirely of upland habitat best described as maintainable (i.e., mowed) herbaceous/grasses with very few trees. Impacts to this community as a result of implementing the Proposed Action would be negligible and long term, as this location provides very little habitat. Select trees may need to be removed, depending on the location of the solar PV panels, but this, too, would be a negligible impact due to the fact that these are individual trees in an otherwise grassy area that do not provide demonstrated habitat for wildlife species.

Alternative Site 4

Approximately 64% of Alternative Site 4 is previously disturbed as it is an old industrial site that has been remediated to industrial cleanup standards. Therefore, this portion of the site does not provide any habitat value to surrounding wildlife resources and the construction of a solar power facility on this section would be beneficial and long term.

Constructing the approximately 2-MW solar PV facility on this Alternative Site location would be an improvement in how this portion of the site is currently maintained.

The pine flatwoods that comprise approximately 36% of Alternative Site 4 would likely be impacted as a result of implementing the Proposed Action. However, upon closer inspection during the January 15, 2008 site visit, this upland community appeared disturbed; it is in the middle of NASA-KSC's Industrial Area. Because of the small size of this community (3.6 acres [1.5 ha]) and its location within the Industrial Area, impacts to this community would be negligible and long term.

No-Action Alternative

Under the No-Action Alternative, the Proposed Action would not be implemented and there would be no effects to any vegetation or habitat communities. It should also be noted that the amount of land at NASA-KSC currently managed as citrus groves has been steadily declining due to canker and other factors, and the long-term fate of the orange groves at Sites 1 and 2 are in question. Onsite observation indicates that abandoned and unmanaged citrus groves are easily overtaken by Brazilian pepper and other exotic, invasive species, which can negatively impact surrounding natural areas.

4.3.2 Wildlife

Alternative 1

Implementation of the Proposed Action on Alternative Site 1 would have both temporary and long-term minor impacts on non-listed wildlife species. During construction, some wildlife species may be temporarily disturbed by the presence of both construction vehicles and workers. Potential temporary impacts include elevated levels of noise from vehicles, machinery, and tools, and air quality impacts as a result of emissions from vehicles and machinery. However, those species that are mobile can easily disperse from the area to adjacent locations if they are bothered or frightened; other than the NASA-KSC Visitor's Complex to the immediate south of the project location, all areas immediately adjacent to the site are comprised of similar habitat types. Impacts as a result of operation of the solar PV facility would be negligible; the facility would be surrounded by a chain-link fence that could affect certain species from traversing the area. Some species, such as birds and snakes, would not be affected by a fence. Similarly, species with climbing capabilities, such as raccoons, would also be unaffected. Larger and/or more cumbersome species, including feral pigs and tortoises/turtles, would be negatively affected by a chain-link fence since they would have to move around it instead of being able to traverse the area; however, this impact would not have negative effects upon their populations as a whole.

Long-term impacts to non-listed wildlife species as a result of the construction and operation of the solar PV facility would include the removal of trees where the solar panels would be located. The vast majority of these are citrus trees; while these trees can provide some level of habitat to wildlife, the KSC-MINWR hosts far more pristine areas that include thousands of acres of both wetland and upland habitats.

Alternative 2

Effects to non-listed wildlife as a result of implementing the Proposed Action on Alternative Site 2 would be the same as those discussed for Site 1. It should be noted, however, that the habitat is less valuable at Site 2 and the surrounding area (predominately orange groves); thus potential impacts to wildlife would be further reduced.

Alternative 3

Effects to non-listed wildlife as a result of implementing the Proposed Action on Alternative Site 3 would be the same as those discussed for Site 1, but on an even smaller scale. The Proposed Action for Alternative Site 3 is for a much smaller solar PV facility than that proposed for Site 1; coupled with that, the habitat on Alternative Site 3 is comprised primarily of short, maintained grasses. Therefore, few species of wildlife currently utilize Alternative Site 3, and those that do use it do so on an infrequent and temporary basis. Potential effects would be negligible to none.

Alternative 4

Effects to non-listed wildlife as a result of implementing the Proposed Action on Alternative Site 4 would be the same as those discussed for Site 3. Approximately 64% of Alternative Site 4 is a previous industrial site that is not conducive to any wildlife needs. The remaining portion of Alternative Site 4 is disturbed pine flatwoods; while this may provide habitat to some non-listed wildlife species, it is a very small area (3.6 acres ([1.5 ha]) and is located within a highly industrialized area of NASA-KSC. Therefore, few species of wildlife are expected to be found here and those that are observed in these areas are expected to be mobile in nature. Similarly, any species that do use this property would do so on an infrequent and temporary basis.

No-Action Alternative

Under the No-Action Alternative, neither of the solar PV facilities would be constructed and all four alternative sites would remain as they are today. They would continue to provide limited habitat to certain non-listed wildlife species.

4.3.2.1 Migratory Birds

Alternatives 1 and 2

Potential impacts to migratory birds as a result of implementing the Proposed Action at either Alternative Site 1 or Site 2 would be long-term and negligible, and include those discussed in Section 4.2.2. Trees located within the alternative site locations at both sites would be removed; this would be a minor negative effect to migratory bird species (non-waterfowl). Migratory waterfowl, such as those mentioned in Section 3.3.2.1, would not be affected by the Proposed Action. However, in terms of area, either approximately 100-acre (40.5-ha) site only accounts for a miniscule fraction of the available migratory bird habitat located on KSC-MINWR (approximately 0.07%). Similarly, of the 140,000 acres (56,656 ha) that the KSC-MINWR encompasses, tens of thousands of acres of more ideal upland and wetland (including estuarine for waterfowl) habitats exist for migratory birds, including the three species of migratory waterfowl discussed in Section 3.3.2.1.

Alternatives 3and 4

Effects to migratory birds as a result of implementing the Proposed Action on either Alternative Site 3 or Site 4 would be the same as those discussed above for Alternatives 1 and 2, but on an even smaller scale. Far less habitat for migratory birds exist on Alternative Sites 3 and 4, so potential effects would be negligible to none.

No-Action Alternative

Under the No-Action Alternative, neither of the solar PV facilities would be constructed and all four alternative sites would remain as they are today. They would continue to provide limited habitat to some species of migratory birds. However, none of these site locations provide the ideal habitat for the three species of migratory birds (Section 3.2.2.1) that are most affected by changes to the KSC-MINWR landscape.

4.3.2.2 Threatened and Endangered Species

Alternative 1

As previously discussed in Section 4.2.1, agricultural and upland habitats would likely be impacted as a result of implementing the Proposed Action on Alternative Site 1. However, there would be no impacts to wetlands. Because of this, the potential exists for impacts to occur to some species of federally listed wildlife; these include the American alligator (with a federal status of DM) and the Eastern indigo snake. Habitat typically associated with the wood stork, bald eagle, Florida scrub-jay, and the Southeastern beach mouse (species discussed in Section 3.3.2.2) are not found on Site 1.

While American alligator individuals were observed on Alternative Site 1 during the site visit on January 15, 2008, it is unlikely that significant impacts to this species would occur as a result of implementing the Proposed Action. These individuals were observed in the larger drainage ditches/canals that would not be affected during construction or operation of the solar PV facility. Should the presence of man and vehicles/equipment during construction cause an individual alligator to feel bothered or threatened, it is likely that the individual would mobilize within their associated ditch/canal and temporarily leave the area. Therefore, impacts to the American alligator would be negligible and short term.

It is not known if the Eastern indigo snake inhabits or has been found on Alternative Site 1. Because the indigo snake uses a wide variety of habitat types and has relatively large home ranges, the possibility exists that this species could be located on this site. However, it is an unlikely scenario. No Eastern indigos were observed during the January 15, 2008 site visit, nor were any gopher tortoises or associated burrows discovered. While this does not preclude existence of these species on this site, there were no indications that these species would normally be found in the habitats specifically found on Alternative Site 1. Coupled with this, given the home range sizes described in Section 3.3.2.2, the extent of Alternative Site 1 would only comprise a fraction of an individual's range; this further decreases the likelihood of an indigo snake located on the actual site. Therefore, potential impacts to the Eastern indigo snake as a result of implementing the Proposed Action on Site 1 would be minor and short term. There are not expected to be any long-term impacts to Eastern indigo snakes because their ability to traverse the site location during operation of the PV facility would not be hampered by the chain link fence that would surround the solar PV arrays.

Alternative 2

Effects to federally threatened and endangered species as a result of implementing the Proposed Action on Alternative Site 2 would be the same as those discussed above for Alternative 1, but on an even smaller scale. This is because the only federally listed species that would be potentially found on Alternative Site 2 is the Eastern indigo snake. Similar to the discussion for Alternative Site 1, however, no individuals were observed during the January 15, 2008 site visit, nor were gopher tortoise burrows encountered. Therefore, potential impacts to the Eastern indigo snake as a result of implementing the Proposed Action on Site 2 would be minor and short term.

Alternatives 3 and 4

Potential effects to threatened and endangered species as a result of implementing the Proposed Action on Alternative Sites 3 and 4 would be negligible and short term. These sites are small (approximately 10 acres [4 ha]) and are primarily comprised of previously disturbed upland habitats (such as mowed grasses and few pine flatwoods) and industrialized lots. Because the pine flatwoods (on Site 4) are in the middle of NASA-KSC's Industrial Area, it is expected that very few, if any, threatened or endangered species would be found at this location. There is a strong presence of humans, vehicles, and developed properties adjacent to these sites, which would also inhibit the occurrence of most threatened and endangered species.

No-Action Alternative

There would be no effects to threatened and endangered species under the No-Action Alternative, as the Proposed Action would not be implemented.

4.4 Soils

Alternatives 1 and 2

Potential impacts to soils as a result of implementing the Proposed Action on Alternative Site 1 would be minor and both short and long term. Short-term impacts would include those associated with disturbances as a result of the presence of both man and vehicles/equipment that would be used during the construction period. Long-term impacts to soils include those associated with digging the footings of the solar PV arrays and the potential trenching of the associated conduit. Because the soil types found on the alternative site locations (Section 3.4) are all nearly level, erosion is not expected to be a significant problem. The feeder extension associated with this alternative site location may also impact those soils that are located in the FDOT Right-of-Way.

Alternatives 3 and 4

Effects to soils as a result of implementing the Proposed Action on either Alternative Site 3 or 4 would be the same as those discussed for Site 1, but on a smaller scale.

No-Action Alternative

No effects to soils would be expected under the No-Action Alternative, as the Proposed Action would not be implemented.

4.5 Surface Water Resources and Drainage

Alternatives 1 and 2

To the extent possible, the existing drainage of stormwater runoff via sheet-flow to ditches located adjacent to these sites would remain the same at these alternative site locations following construction. However, it is possible that some of the interior ditches may be filled or modified and some slight re-grading conducted depending on the final site layout. Any drainage modifications would be conducted in accordance with state and federal regulations and appropriate best management practices for erosion would be applied during construction. The ground surface underneath the solar panels would be primarily pervious, such as Bahia grass, thus minimizing any potential increase in stormwater runoff. In addition, pesticides would not be used, and herbicides (such as Roundup®) may be used for spot treatment and in accordance with the manufacturer's instructions. Onsite vegetation would be maintained by mowing. Appropriate environmental and stormwater permits will also be obtained. Therefore, potential impacts to surface water and drainage would be negligible and long term.

Alternatives 3 and 4

No surface waters exist on either Alternative Sites 3 or 4. Stormwater sheet-flows on these two sites to roadside swales. Similar to Alternative Sites 1 and 2, it is expected that there would be no significant changes to the site drainage and any changes would follow state and federal regulations, as applicable. It should be noted that drainage for Alternative Sites 3 and 4 is already accounted for as part of the Regional Stormwater Treatment System and thus any site modifications and resulting runoff are pre-approved from a drainage perspective (i.e., stormwater from these sites flows into Region 1). Since the ground surface beneath the solar panels would primarily remain pervious (i.e., Bahia grass), there would be a negligible impact on drainage as a result of the Proposed Action on either Alternative Sites 3 or 4. Similar to Alternatives 1 and 2, pesticides would be not be used and herbicides (such as Roundup®) may be used for spot treatment and in accordance with the manufacturer's instructions. Onsite vegetation would be maintained by mowing.

No-Action Alternative

Under the No-Action Alternative, there would be no effects to surface water and drainage because the Proposed Action would not be implemented.

4.6 Groundwater

Alternatives 1 and 2

No hazardous chemicals are contained within the solar PV panels. The area underneath the panels would require mowing and spot treatment with standard, non-selective herbicide, as needed. Herbicide spot treatment would be conducted in accordance to manufacturer guidelines and recommendations.

As part of routine maintenance activities, the solar PV panels would be rinsed with water two to four times per year. Approximately 30,000 gallons of water, without added

chemicals, would be used during each wash. Rinsing water would be transported onsite by truck. As an option, a small groundwater well would be installed to provide the required rinse water. Therefore, potential effects to groundwater as a result of the Proposed Action would be negligible and long term.

Alternatives 3 and 4

Effects to groundwater as a result of implementing the Proposed Action on either Alternative Site 3 or 4 would be the same as those discussed for Site 1, but on a smaller scale.

No-Action Alternative

Under the No-Action Alternative, there would be no effects to groundwater because the Proposed Action would not be implemented.

4.7 Socioeconomics

Alternatives 1 and 2

Because the existing lease ends in 2008 for the existing citrus groves located on Alternative Sites 1 and 2, these groves will cease production, regardless of whether the solar PV facility is constructed or not. Therefore, jobs associated with these groves would not be affected as a result of implementing the Proposed Action. Other potential effects to socioeconomics include the temporary beneficial effect as a result of the construction of the Proposed Action and a minor, long-term beneficial effect as a result of the maintenance associated with the approximately 10-MW facility. It is estimated that 30 to 60 construction personnel would be needed during the nine-month construction period. All effects to socioeconomics would be beneficial as these sites do not currently support jobs or create revenue.

Alternatives 3 and 4

Potential effects to socioeconomics as a result of implementing the Proposed Action on either Alternative Site 3 or Site 4 would similar to those discussed for Alternatives 1 and 2, but on a smaller scale.

No-Action Alternative

There would be no effects to socioeconomics under the No-Action Alternative. Jobs would neither be created nor lost, temporarily or long term.

4.8 Aesthetics

Alternatives 1 and 2

As a result of implementing the Proposed Action at either Alternative Sites 1 or 2, changes to the visual landscape at those sites would occur. Trees would be removed in order for the solar PV arrays to be mounted; however, the vast majority of the trees that would be removed are citrus trees. In their place, the solar PV arrays would be visible from the

adjacent roadways. However, these arrays would not be tall (approximately 4 to 8 feet [1.2 to 2.4 meters] tall, which is approximately half the height of the citrus trees). Also, the solar facility would be located in an area near existing development or industrial activities and would not be located in the middle of natural areas. Therefore, the impacts to aesthetics would be negligible and long term.

Alternatives 3 and 4

Effects to aesthetics as a result of implementing the Proposed Action on either Alternative Site 3 or 4 would be the same as those discussed for Sites 1 and 2, but on a smaller scale. Also, due to access restrictions, the solar PV arrays would be viewable by far fewer people (only NASA-KSC employees and contractors, but not the general public).

No-Action Alternative

Under the No-Action Alternative, there would be no effects to aesthetics because the Proposed Action would not be implemented and nothing would be constructed.

4.9 Infrastructure and Utilities

4.9.1 Electricity

Alternatives 1 and 2

The approximately 10-MW solar PV system would generate approximately 15 million kWh of electricity per year. However, due to the fact that this new technology is more expensive than current fossil- and nuclear-fueled power plants, there would be no additional financial savings. Therefore, the Proposed Action would have a minor, long-term effect.

Alternatives 3 and 4

The approximately 2-MW solar PV system would generate approximately 3 million kWh of electricity per year (using 4.25 average hours per day for an entire year). This would save NASA-KSC (the sole recipient of the power generated by this facility) approximately $260,000 per year in electricity costs. Since this form of renewable energy would be generated on a federal installation, the RECs are doubled and NASA-KSC can claim 6 million kWh of renewable energy generation. NASA Programs at NASA-KSC consumed close to $22 million in electricity in 2007; while the savings from the approximately 2-MW solar PV would account for only 1.2% of NASA-KSC's total electricity bill, it would still be a marked financial savings that could be used for other beneficial purposes. Therefore, the Proposed Action would have a minor, long-term beneficial effect.

No-Action Alternative

Under the No-Action Alternative, there would be no effects to current electricity generation or usage because the Proposed Action would not be implemented. Solar power would not contribute to NASA-KSC's power availability or be available to the general power grid in the surrounding area. RECs would not be available because there would be no generation of renewable energy.

4.9.2 Solid Waste

Alternatives 1 and 2

As a result of the Proposed Action, some solid waste would be generated (primarily packing materials and some scrap wire), as the assembly of the solar PV panels would occur on the project site. However, these materials would be removed from NASA-KSC and would be disposed of at the Brevard County Landfill, as mentioned in Section 3.8.2. If possible, recycling of these packing materials would occur. Trees that would be removed as a result of implementing the Proposed Action would either be mulched and used as landfill cover at the onsite NASA-KSC Class III landfill or burned on site. These impacts would be minor and short term.

Alternatives 3 and 4

Environmental effects as a result of the generation of solid waste due to the implementation of the Proposed Action on Alternative Sites 3 and 4 would be the same as those discussed for Sites 1 and 2, but on an even smaller scale.

No-Action Alternative

Under the No-Action Alternative, there would be no potential for environmental effects from solid waste because the Proposed Action would not be implemented and there would be no generation of solid waste.

4.10 Hazardous Materials/Waste

Alternatives 1 and 2

The potential for environmental effects from hazardous materials/waste as a result of the Proposed Action would be negligible and exists only as a result of a malfunction of, or damage to, construction vehicles and/or equipment (in the form of petroleum spills). The likelihood of this is very small; however, should an accident like this occur, all hazardous wastes would be handled in accordance with Kennedy Policy Directive (KNPD) 8500.1 "Environmental Management Plan" (NASA-KSC 2004b) and KSC-PLN 1919 "Spill Prevention, Control and Countermeasures Plan" (NASA-KSC 2005b). As mentioned previously in Section 4.5, pesticides would be not used for maintenance herbicides (such as Roundup®) may be used for spot treatment and in accordance with the manufacturer's instructions. Similarly, given the kind of materials that would be used, little maintenance is anticipated (such as painting); therefore, little to no hazardous materials/waste would be generated during operations of the facility.

Alternatives 3 and 4

Environmental effects from hazardous materials/waste as a result of implementing the Proposed Action on either Alternative Sites 3 or 4 would be the same as those discussed for Sites 1 and 2, but on an even smaller scale.

No-Action Alternative

Under the No-Action Alternative, there would be no potential for environmental effects from hazardous materials/waste because the Proposed Action would not be implemented.

4.11 Environmental Justice

EO 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," serves to: (1) focus the attention of federal agencies on the human health and environmental conditions in minority communities and low-income communities with the goal of achieving environmental justice; (2) foster non-discrimination in federal programs that substantially affect human health or the environment; and (3) give minority communities and low-income communities greater opportunities for public participation in, and access to public information on, matters relating to human health and the environment (NASA-KSC 1997). As a result of this EO, NASA-KSC also has an Environmental Justice Plan to ensure that: (1) NASA-KSC identifies and addresses which activities have disproportionately high adverse human health or environmental effects on minority or low-income populations in the surrounding area, and (2) the community continues to significantly participate in developing policies that seek to prevent disproportionately high adverse human health or environmental effects on minority or low-income populations in the surrounding area.

Through the Environmental Justice Plan, NASA-KSC analyzed several potential effects on minority or low-income populations in the surrounding area as a result of hazardous substances or chemical releases, hazardous wastes, non-hazardous wastes, wastewater, and noise. As a result, NASA-KSC did not identify any existing activities and programs that may have a substantial environmental effect beyond NASA-KSC's boundaries.

There would be no effects to Environmental Justice as a result of implementing the Proposed Action on any of the Alternative Sites as there would be no disproportionate impacts to minority groups, by race or by income at these site locations.

4.12 Protection of Children from Environmental, Health, and Safety Risks

EO 13045 "Protection of Children from Environmental Health Risks and Safety Risks", April 1997, directs federal agencies to "identify and assess environmental health risks and safety risks that may disproportionately affect children." Implementation of the Proposed Action at the preferred alternative site locations would not result in a disproportionate risk to children from environmental health risks or safety risks.

4.13 Irreversible and Irretrievable Commitments of Resources

Irreversible (i.e., destruction of a resource) and irretrievable (i.e., loss in value of a resource) commitments of resources are defined as the use of non-renewable resources and the effects that the uses of these non-renewable resources have on future generations.

As a result of implementing the Proposed Action on, an insignificant amount of irreversible resource commitments would be required; specifically, the use of fossil fuels for the construction vehicles and equipment used to construct the approximately 10-MW facility. However, the renewable power generated by the solar power facilities once constructed would more than compensate for the non-renewable fossil fuels used during construction. No irretrievable resources would be required to fulfill the Proposed Action.

4.14 Cumulative Impacts

A beneficial cumulative effect as a result of constructing and operating both solar PV facilities would be the greenhouse gas emission reduction associated with the use of solar power-generating facilities. As more renewable-resources are used to generate electricity (solar, wind, etc.), the damaging impacts as a result of carbon emissions diminish, which will ultimately slow global climate change. Lessons learned from the approximately 2-MW and the approximately 10-MW solar PV facilities, such as those proposed by FPL at NASA-KSC, can and will be applied to future facilities that will have even higher power-generating capacities.

As noted in Section 2.2.1, the potential exists for an additional approximately 10-MW solar PV facility to be constructed on Alternative Site 1. While the final decision has not yet been made, there would be potential cumulative effects to various environmental resources if this additional facility is constructed and operated. Because this site is comprised of citrus groves, upland habitat, and disturbed wetland habitat, trees and vegetation would be removed in order to construct the solar PV arrays. This would further contribute to the overall loss of both agricultural and natural (albeit disturbed) areas in both Brevard County and statewide. Similarly, wildlife species that potentially are found on or use habitats located on this site location would lose these habitats. However, none of these potential cumulative effects would be significant in nature. It should also be noted that all applicable environmental permits would be obtained prior to construction activities.

5 Consultation and Coordination

NEPA regulations require that federal, state, and local agencies with jurisdiction or special expertise regarding environmental impacts be consulted and involved in the NEPA process. The individuals and agencies listed in Table 5-1 were contacted during the preparation of this EA.

Table 5-1
Consultation and Coordination List

Affiliation	Point of Contact	Mailing Address and Phone Number
United States Fish and Wildlife Service	Ron Hight	P.O. Box 6504 Titusville, FL 32782 (321) 861-2278
United States Army Corp of Engineers (USACE)	Tamy Dabu, Project Manager	400 High Point Drive, Suite 600 Cocoa, FL 32926 (321) 504-3771
Florida Department of Environmental Protection	Sally Mann, Director of the Office of Intergovernmental Programs	Marjory Stoneman Douglas Building 3900 Commonwealth Boulevard Tallahassee, FL 32399-3000 (850) 245-2118
	Aaron T. Watkins, Environmental Specialist	3319 Maguire Boulevard, Suite 232 Orlando, FL 32803-3767 (407) 894-7555
Florida State Historic Preservation Service	Frederick Gaske, Director	500 S. Bronough Street Tallahassee, FL 32399-0250 (850) 245-6333
Florida Fish and Wildlife Conservation Commission	Ken Haddad, Executive Director	620 South Meridian Street Tallahassee, FL 32399-1600 (850) 487-3796
	Dennis David, Regional Director	1239 S.W. 10th Street Ocala, FL 34471-0323 (352) 732-1225
Florida Research Center for Agricultural Sustainability	Robert C. Adair, Jr., Executive Director	7055 33rd Street Vero Beach, FL 32966 (772) 562-3802
St. Johns River Water Management District	Susan R. Moor, Supervising Regulatory Scientist	525 Community College Parkway S.E. Palm Bay, FL 32909 (321) 676-6626

Table 5-1
Consultation and Coordination List

Affiliation	Point of Contact	Mailing Address and Phone Number
Brevard County	Peggy Busacca, County Manager	2725 Judge Fran Jamieson Way, Bldg. C Viera, Fl 32940 (321) 633-2010
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	Robin Sobrino, AICP, Director of Planning & Zoning Office	2725 Judge Fran Jamieson Way Viera, FL 32940 (321)633-2070
City of Titusville, Florida	Mark K. Ryan, City Manager	P.O. Box 2806 Titusville, FL 32796 (321) 383-5802
	Courtney Harris, AICP, Executive Director of the Planning & Growth Management	P.O. Box 2806 Titusville, FL 32796 (321) 383-5824

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The following individuals contributed to the preparation of this document:

Name	Role	Years Experience	Responsibilities
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Sarah N. Ramberg	Biologist	9	▪ Project Coordination ▪ Affected Environment ▪ Alternatives Analysis
Monica Perez, P. E.	Engineer	9	▪ Affected Environment ▪ Alternatives Analysis
Jason Moretz, Ph.D.	Ecologist	9	▪ Regulatory Requirements ▪ Affected Environment
Annie Menon	Air Quality Specialist	2	▪ Air Quality
Gene Stillman	Quality Assurance/Quality Control	13	▪ NEPA Compliance
Gina Edwards	Technical Editor	23	▪ Document Editing and Control
Aarthy Sabesan	GIS Specialist	3	▪ Maps/Figures Coordinator
Kristin Grove	Graphics Illustrator	8	▪ Graphic Design

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Appendix A

Memorandum of Understanding

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MEMORANDUM OF UNDERSTANDING BETWEEN
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION,
JOHN F. KENNEDY SPACE CENTER
and
FLORIDA POWER & LIGHT COMPANY
for
RENEWABLE ENERGY PROJECT PLANS
INVOLVING LAND USE AND FACILITIES DEVELOPMENT

I. INTRODUCTION & PURPOSE

This Memorandum of Understanding (hereinafter "MOU") is entered into by the National Aeronautics and Space Administration, John F. Kennedy Space Center (hereinafter "NASA-KSC"), located at Kennedy Space Center, Florida 32899, and FLORIDA POWER & LIGHT COMPANY (hereinafter "FPL") located at 700 Universe Boulevard, Juno Beach, Florida 33408. Collectively, NASA-KSC and FPL are referred to as the "Parties." The purpose of this MOU is to set forth the framework under which the Parties may undertake studies to determine the technical and financial feasibility of renewable energy projects on land, or at/in facilities, owned by NASA-KSC. The studies undertaken pursuant to this MOU create no obligation on the part of either Party to implement any such renewable energy project regardless of its technical or financial feasibility. Should the Parties mutually agree to implement any such renewable energy project, the Parties may do so under additional separate agreements.

II. BACKGROUND & SCOPE

NASA-KSC is a significant Federal consumer of electric power with land and/or facilities that may be available for renewable energy projects, and FPL is the electric power utility serving NASA-KSC. Both NASA-KSC and FPL are committed to expanding the use of renewable energy resources in compliance with respective Federal and State energy policies and directives. The types of projects contemplated that could expand the use of renewable energy resources at NASA-KSC include, but are not limited to, the following:

- A solar photovoltaic power generation system capable of producing up to 10 megawatts of electrical power and occupying a site of approximately 50 acres
- Additional solar photovoltaic applications associated with existing or new KSC facilities, and/or supporting the use by KSC of solar power to charge electric vehicles or produce hydrogen fuel
- Other solar energy power generation concepts
- Utilization of waste stream or biomass for energy production
- Investigation and potential demonstration of wind power generation

Under this MOU, the Parties intend to jointly study the technical and financial feasibility of such renewable energy projects. Such studies will identify the scope and potential site locations of each renewable energy project, as well as any applicable KSC environmental management requirements and facility projects siting processes. The studies shall also identify any design and/or construction requirements and costs, operations and life cycle requirements and costs, as well as an estimate of the amount of renewable energy that will be produced, the intended distribution of the renewable energy produced, and the proposed disposition of any renewable energy credits. In order to undertake these studies, the Parties shall have the following responsibilities:

III. RESPONSIBILITIES

A. FPL shall use reasonable efforts to perform the following tasks, and other such reasonable tasks that may be required to meet the purpose of this MOU:

1. Participate in joint technical exchanges with NASA-KSC, on a schedule and at locations as may be mutually agreeable, for the purpose of identifying and formulating candidate renewable energy projects of interest to both Parties.
2. For each candidate project, provide to NASA-KSC a Plan describing the proposed project site plan (e.g. land and/or facilities required, access requirements, power distribution system interconnections), the proposed approach for designing, constructing, operating, and maintaining the project throughout its lifecycle, the project schedule and estimated costs, the responsibilities of each of the Parties for meeting project schedule milestones and for funding the costs of the project, an estimate of the amount of renewable energy that will be produced, the intended distribution of the renewable energy produced, and the proposed disposition of any renewable energy credits.
3. Perform environmental studies and analysis as may be reasonably required by NASA-KSC to support NASA-KSC compliance with the National Environmental Policy Act (NEPA) and any other applicable Federal or State environmental laws and regulations.
4. Incorporate all NASA-KSC security, safety, and environmental protection requirements into each project proposed.

B. NASA-KSC will use reasonable efforts to perform the following tasks, and other such tasks as may be necessary to meet the purpose of this MOU:

1. Provide access to NASA-KSC property to FPL and its contractors' personnel, in accordance with security, safety, and operational procedures specified by NASA-KSC.
2. Participate in joint technical exchanges with FPL, on a schedule and at locations as may be mutually agreeable, for the purpose of identifying and formulating candidate renewable energy projects and sites of interest to both Parties.

3. Review and comment on each submitted project plan, and, subject to NASA-KSC acceptance of a final project plan, perform required site assignment coordination, environmental determinations, and preparation of appropriate implementing agreements governing land and facility use, project operation and maintenance.

4. Provide available, relevant data to assist FPL in carrying out its responsibilities under this MOU.

IV. FINANCIAL ARRANGEMENTS

This is a non-reimbursable agreement. There will be no transfer of funds or other financial obligations between NASA-KSC and FPL in connection with this MOU, and each party shall bear its own costs arising from, or attributable to, this MOU.

NASA's ability to perform its obligations under this MOU is subject to the availability of appropriated funds. Nothing in this MOU commits the United States Congress to appropriate funds for the purposes stated herein (pursuant to the Anti-Deficiency Act, 31 U.S.C. §1341).

V. LIABILITY AND RISK OF LOSS

With regard to activities undertaken pursuant to this MOU, neither Party shall make any claim against the other Party or its employees, agents or contractors for any injury to or death of its own employees or contractor's employees, or for damage to or loss of its own property or that of its contractors, except in the case such injury, death, damage or loss arises through the willful misconduct of the other Party or its employees.

The foregoing notwithstanding, neither Party will be liable for failure to agree upon and/or execute any lease, nor any other property/facilities use agreement. The Parties recognize and agree that liability and risk of loss provisions, including liability insurance and other protections, shall be set forth in any lease or other land/facilities use agreement that may be subsequently executed by the Parties to implement projects identified under this MOU.

VI. KEY PERSONNEL

The following personnel are designated as the key officials for their respective party. These key officials are the principal points of contact between the Parties in the performance of this MOU:

NASA-KSC:

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VII. TERM OF AGREEMENT AND RIGHT TO TERMINATION

The term of this MOU shall be five (5) years from the Effective Date, subject to the termination rights set forth below. If the Parties agree, this MOU may be extended for successive five (5) year terms periods.

This MOU sets forth the entire and complete agreement between the Parties. This MOU becomes effective on the date of the last signature of the Parties. Either party, upon a 60-day written notice to the other party, may terminate this MOU, without liability, at any time and for any reason it deems substantial. In the event of such termination, each party shall return to the other any data it furnished to assist the other in performance of this MOU, but each party may retain any data generated by its partial performance under the agreement.

VIII. MODIFICATIONS TO THE AGREEMENT

Any modification to this MOU shall be executed in writing and signed by an authorized representative of each party. Any modification which creates an additional commitment of NASA resources must be signed by the original NASA signatory authority or successor or a higher-level NASA official possessing original or delegated authority to make such a commitment.

IX. NEWS RELEASES AND PUBLICATIONS

The Parties agree to coordinate in advance any news releases and/or publicly distributed/available publications that result from activities performed pursuant to this MOU. Each Party shall have up to ten (10) business days to review and comment on a proposed news release or publication. Neither Party shall issue a news release or publication prior to providing the other Party at least ten (10) business days to review and comment.

X. USE OF THE NASA OR FPL NAME, INITIALS, AND DEVICES

FPL agrees to submit to NASA for its written approval all promotional and advertising material that uses the NASA name, initials, insignia, seal, or logotype prior to publication. Approval by NASA shall be based on applicable law (e.g., 42 U.S.C. §§2459(b), 2472(a), and 2473(c)(1); and 14 C.F.R. §1221.100 et seq.) and policy governing the use of the words "National Aeronautics and Space Administration" and the letters "N A S A" and the NASA insignia, seal, and logotype.

NASA agrees to submit to FPL for its written approval all promotional and advertising material that uses the FPL names, initials, insignia, seal, or logotype prior to publication.

XI. INDEPENDENCE OF CONTRACTS

The Parties agree that this MOU is independent of any other contract between the U.S. Government and FPL. This agreement does not constitute NASA's endorsement of the services provided by, or activities engaged in, by FPL.

XII. ASSIGNMENT OF RIGHTS

Neither this MOU nor any interest arising under it will be assigned by either Party without the express written consent of the officials executing the agreement.

XIII. APPLICABLE LAWS, RULES, REGULATIONS, AND POLICIES

A. United States Federal law governs this MOU for all purposes, including, but not limited to, determining the validity of the MOU, the meaning of its provisions, and the rights, obligations, and remedies of the Parties.

B. While engaged in activities on NASA-KSC property pursuant to this MOU, FPL agrees to comply with all NASA-KSC policies, rules, and regulations in effect at the time the activities are occurring. This includes, but is not limited to, all safety, health, security, and environmental requirements. FPL further agrees to flow down these requirements to all of its contractors who may perform work under contract to FPL on NASA-KSC property.

XIV. NO PARTNERSHIPS/EXCLUSIVITY

This MOU is not intended to constitute, create, give effect to or otherwise recognize a joint venture, partnership or formal business organization, or agency agreement of any kind, and the rights and obligations of the Parties shall be only those expressly set forth herein. With the exception of items A and B below, this MOU is not exclusive; accordingly, NASA may enter into similar agreements for the same or similar purpose with other private or public entities.

A. FPL shall have exclusive rights to develop large scale (>1 MW) solar PV projects, including the central solar PV project that is currently under preliminary development with NASA-KSC for a period of 1 year from the effective date of this agreement.

B. For any future, subsequent renewable project plan accepted by NASA-KSC pursuant to Section III.B.3, FPL shall have exclusive development rights for said project for a period of 2 years after NASA-KSC acceptance.

XV. EXECUTION

This MOU is hereby executed in duplicate originals by the undersigned.

National Aeronautics
and Space Administration,
JOHN F. KENNEDY SPACE CENTER

BY: _____
Michael J. Benik
Director, Center Operations
Date: 12/13/07

FLORIDA POWER & LIGHT
COMPANY, a Florida corporation

BY: _____
Michael L. Leighton
Vice President & Chief Development
Officer
Date: 12/13/07

Appendix B

Air Quality Analysis Tables

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Table 1 Approximately 10-Acre [(a)] PV Facility	
Activity	Area acres
Site Preparation and Clearing	10
Total area to be paved	1
Site preparation for area to be paved	1

Table 2 Fugitive Emissions		
Emission Factor	0.11	tons/acre/month
Total area to be cleared	1	acres
No: of months	1	months [(b)]
PM_{10} Emissions	0.11	tons

Notes:

Emission Factor obtained from ones & Stokes Associates, 2005, Software User's Guide: URBEMIS2002 for Windows with Enhanced Construction Module, Version 8.7, Emissions Estimation for Land Use Development Projects, April 2005, Prepared for South Coast Air Quality Management District, Diamond Bar, California, Prepared by Jones & Stokes Associates, Sacramento, California.

(a) 1 acre is assumed to be paved.

(b) One month is considered to include 20 working days with 8 hours of activity each day.

Key:

PM_{10} = particulate matter of less than 10 microns in diameter.

PV = photovolataic.

Table 3
Tailpipe Emissions for the Site Clearing and Construction Equipment

Activity	Equipment	Number of days [a]	Emission Factor (lb/day) [b]				Emissions (lb)			
			VOC	CO	NO_X	PM_{10}	VOC	CO	NO_X	PM_{10}
Site Clearing	Excavator	10	1.84	15.64	10.67	0.29	18.4	156.4	106.7	2.9
	Crawler tractor	10	1.45	10.75	11.08	0.5	14.5	107.5	110.8	5
Backhoe Excavation	Tractor, Loader, Backhoe	10	0.65	4.82	4.97	0.22	6.5	48.2	49.7	2.2
	Crane	20	1.44	12.27	8.72	0.31	28.8	245.4	174.4	6.2
Cut and Fill	Scraper	10	3.64	30.96	22.79	0.95	36.4	309.6	227.9	9.5
	Trencher	10	1.00	8.53	5.82	0.16	10	85.3	58.2	1.6
Grading	Grader	10	1.76	14.98	10.81	0.41	17.6	149.8	108.1	4.1
	Surfacing Equipment	20	3.77	27.91	28.77	1.29	75.4	558.2	575.4	25.8
Miscellaneous	Other Construction Equipment	40	2.08	15.39	15.87	0.71	83.2	615.6	634.8	28.4
Paving	Paver	10	1.37	11.62	8.12	0.26	13.7	116.2	81.2	2.6
	Paving Equipment	10	1.04	7.66	7.90	0.35	10.4	76.6	79	3.5
	Roller	10	0.86	7.34	5.13	0.16	8.6	73.4	51.3	1.6
	Total Emissions		20.9	167.87	140.65	5.61	323.5	2542.2	2257.5	93.4
Total Emissions	**Emissions in tons from all equipments used in construction**						**0.16**	**1.27**	**1.13**	**0.05**

Notes:
(a) Assuming 8-hour day, 200day month for a construction period of two months.

(b) Emission Factor obtained from Jones & Stokes Associates, 2005, Software User's Guide: URBEMIS2002 for Windows with Enhanced Construction Module, Version 8.7, Emissions Estimation for Land Use Development Projects, April 2005, Prepared for South Coast Air Quality Management District, Diamond Bar, California, Prepared by Jones & Stokes Associates, Sacramento, California.

Key:
CO = carbon monoxide.
lb = pounds.
NOX = nitrogen oxides.
PM10 = particulate matter of less than 10 microns in diameter.
VOC = volatile organic compounds.

Table 4 Construction Worker Trip Generation				
Units	**VOC**	**NO_X**	**PM_{10}**	**CO**
Pounds	0.3052	0.2212	0.0161	2.464
Tons	0.00015	0.00011	0.00001	0.00123

Notes:
Assume 1 acre to be paved
No: of woker trips = 0.32/1000 sqft * 43,560 sqft = 14 trips
Emissions interpolated for year 2008 for 14 trips from Table 4.9 of the El Dorado County Air Pollution Control District Guide to Air Quality Assessment Determining Significance of Air Quality Impacts Under the California Environmental Quality Act, First Edition, February 2002.

Table 5 VOC Emissions from Asphalt Paving				
			Emissions	
Activity	**Area (acres)**	**Emission Factor (lbs/acre/day)**	**lb**	**tons**
Off gas emissions (80 days activity)	1	2.62	209.60	0.10
Total VOC Emissions				**0.10**

Notes:
Asphalt Paving VOC Emission Factor obtained from Table 4.6 of the El Dorado County Air Pollution Control District Guide to Air Quality Assessment Determining Significance of Air Quality Impacts Under the California Environmental Quality Act, First Edition, February 2002.

Key:
CO = carbon monoxide.
lb = pounds.
lb/acre/day = pounds per acre per day.
NO_X = nitrogen oxides.
PM_{10} = particulate matter of less than 10 microns in diameter.
VOC = volatile organic compounds.

Table 6
Total Emissions

Emission Source	Emissions (tons)			
	VOC	NO_X	PM_{10}	CO
Tailpipe Exhaust	0.16	1.13	0.05	1.27
Worker Trip generation	0.00015	0.000	0.00001	0.001
Fugitive Emissions			0.11	
Asphalt Paving	0.10			0.24
TOTAL	**0.27**	**1.13**	**0.16**	**1.51**

Key:

CO = carbon monoxide.

NO_X = nitrogen oxides.

PM_{10} = particulate matter of less than 10 microns in diameter.

VOC = volatile organic compounds.

Table 1 Approximately 100-Acre [(a)] PV Facility	
Activity	Area acres
Site Preparation and Clearing	70
Total area to be paved	10
Site preparation for area to be paved	10

Table 2 Fugitive Emissions		
Emission Factor	0.11	tons/acre/month
Total area to be cleared	70	acres
No: of months	3	months [(b)]
PM_{10} Emissions	23.10	tons

Notes:

Emission Factor obtained from Jones & Stokes Associates, 2005, Software User's Guide: URBEMIS2002 for Windows with Enhanced Construction Module, Version 8.7, Emissions Estimation for Land Use Development Projects, April 2005, Prepared for South Coast Air Quality Management District, Diamond Bar, California, Prepared by Jones & Stokes Associates, Sacramento, California.

(a) 10 acres is assumed to be paved.

(b) 1 month is considered to include 20 working days with 8 hours of activity each day.

Key:

PM_{10} = particulate matter of less than 10 microns in diameter.

PV = photovolataic.

Table 3
Tailpipe Emissions for the Site Clearing and Construction Equipment

Activity	Equipment	Number of days [a]	Emission Factor (lb/day) [b]				Emissions (lb)			
			VOC	CO	NO_X	PM_{10}	VOC	CO	NO_X	PM_{10}
Site Clearing	Excavator	60	1.84	15.64	10.67	0.29	110.4	938.4	640.2	17.4
	Crawler tractor	60	1.45	10.75	11.08	0.5	87	645	664.8	30
Backhoe Excavation	Tractor, Loader, Backhoe	60	0.65	4.82	4.97	0.22	39	289.2	298.2	13.2
	Crane	80	1.44	12.27	8.72	0.31	115.2	981.6	697.6	24.8
Cut and Fill	Scraper	60	3.64	30.96	22.79	0.95	218.4	1857.6	1367.4	57
	Trencher	60	1.00	8.53	5.82	0.16	60	511.8	349.2	9.6
Grading	Grader	60	1.76	14.98	10.81	0.41	105.6	898.8	648.6	24.6
	Surfacing Equipment	40	3.77	27.91	28.77	1.29	150.8	1116.4	1150.8	51.6
Miscellaneous	Other Construction Equipment	140	2.08	15.39	15.87	0.71	291.2	2154.6	2221.8	99.4
Paving	Paver	80	1.37	11.62	8.12	0.26	109.6	929.6	649.6	20.8
	Paving Equipment	80	1.04	7.66	7.90	0.35	83.2	612.8	632	28
	Roller	80	0.86	7.34	5.13	0.16	68.8	587.2	410.4	12.8
	Total Emissions		20.9	167.87	140.65	5.61	1439.2	11523	9730.6	389.2
Total Emissions	**Emissions in tons from all equipments used in construction**						**0.72**	**5.76**	**4.87**	**0.19**

Notes:

(a) Assuming 8-hour day, 20-day month for a construction period of nine months

(b) Emission Factor obtained from Jones & Stokes Associates, 2005, Software User's Guide: URBEMIS2002 for Windows with Enhanced Construction Module, Version 8.7, Emissions Estimation for Land Use Development Projects, April 2005, Prepared for South Coast Air Quality Management District, Diamond Bar, California, Prepared by Jones & Stokes Associates, Sacramento, California.

Key:

CO = carbon monoxide.

lb = pounds.

NO_X = nitrogen oxides.

PM_{10} = particulate matter of less than 10 microns in diameter.

VOC = volatile organic compounds.

Table 4 Construction Worker Trip Generation				
Units	**VOC**	**NO_X**	**PM_{10}**	**CO**
Pounds	3.052	2.212	0.161	24.64
Tons	0.00153	0.00111	0.00008	0.01232

Notes:
Assume 10 acres to be paved
No: of woker trips = 0.32/1000 sqft * 43,5600 sqft = 140 trips

Emissions interpolated for year 2008 for 140 trips from Table 4.9 of the El Dorado County Air Pollution Control District Guide to Air Quality Assessment Determining Significance of Air Quality Impacts Under the California Environmental Quality Act, First Edition, February 2002.

Table 5 VOC Emissions from Asphalt Paving				
			Emissions	
Activity	**Area (acres)**	**Emission Factor (lbs/acre/day)**	**lb**	**tons**
Off gas emissions (80 days activity)	10	2.62	2096.00	1.05
Total VOC Emissions				**1.05**

Notes:

Asphalt Paving VOC Emission Factor obtained from Table 4.6 of the El Dorado County Air Pollution Control District Guide to Air Quality Assessment Determining Significance of Air Quality Impacts Under the California Environmental Quality Act, First Edition, February 2002.

Key:
CO = carbon monoxide.
lb = pounds.
lb/acre/day = pounds per acre per day.
NO_X = nitrogen oxides.
PM_{10} = particulate matter of less than 10 microns in diameter.
VOC = volatile organic compounds.

Table 6
Total Emissions

Emission Source	Emissions (tons)			
	VOC	NO_X	PM_{10}	CO
Tailpipe Exhaust	0.72	4.87	0.19	5.76
Worker Trip generation	0.00153	0.001	0.00008	0.012
Fugitive Emissions			23.10	
Asphalt Paving	1.05			0.24
TOTAL	**1.77**	**4.87**	**23.29**	**6.01**

Key:
CO = carbon monoxide.
NO_X = nitrogen oxides.
PM_{10} = particulate matter of less than 10 microns in diameter.
VOC = volatile organic compounds.