



Final Environmental Assessment

New NRO Eastern Processing Facility

**Cape Canaveral Air Force Station
Florida**

31 August 2005

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FINDING OF NO SIGNIFICANT IMPACT

NRO Eastern Processing Facility Cape Canaveral Air Force Station, Florida

Pursuant to provisions of the National Environmental Policy Act (NEPA), 42 U.S. Code 4321 *et seq.*, implementing Council on Environmental Quality (CEQ) Regulations, 40 Code of Federal Regulations (CFR) 1500-1508, and 32 CFR Part 989, *Environmental Impact Analysis Process* (EIAP), the U.S. Air Force (Air Force) conducted an assessment of the potential environmental consequences associated with the National Reconnaissance Office (NRO) proposal to construct a new Eastern Processing Facility (EPF) on Cape Canaveral Air Force Station (AFS) in Brevard County, Florida.

The primary missions of the U.S. Air Force at Cape Canaveral AFS are to launch and track satellites in space, test and evaluate America's intercontinental ballistic missile systems, and support aircraft operations in the Eastern Range. As a non-military facet of operations, Cape Canaveral AFS is also committed to promoting commercial space launch ventures.

Cape Canaveral AFS occupies 15,804 acres of the barrier island located along the east-central coast of Florida. The installation is bounded on the north by the John F. Kennedy Space Center, a national Aeronautics and Space Administration installation, on the west by the Banana River, on the south by Port Canaveral, and on the east by the Atlantic Ocean.

The Environmental Assessment (EA) (incorporated as an attachment to this finding) considered all potential impacts of the proposed action and alternatives, both as a solitary action and potentially in conjunction with other similar projects. The EA summarizes the results of the evaluations of the proposed action and alternatives. It analyzes activities that have the potential to affect both the natural and human environment. This analysis summarizes the options evaluated and provides information explaining the need for the Proposed Action and its effect on human and natural resources.

PROPOSED ACTION

The NRO is proposing to construct and operate a new EPF that can support processing of satellites that use multiple launch vehicles, and that provides operational flexibility by allowing the various programs to support their launch complex activities simultaneously. The proposed EPF is needed to meet all criteria for Evolved Expendable Launch Vehicle (EELV) processing and is required to protect the future ability of the NRO to respond to all launch processing requirements of their customers.

The site selected under the Proposed Action for construction of the EPF is a 45-acre area located on the northeast corner of Samuel C. Phillips Parkway and Lighthouse Road. The proposed facility would be constructed over a two-year period between 2006 and 2007, and operation of the new facility would commence in 2008. Construction and operation of the facility would entail the development of approximately 810,000 square feet that would include a payload processing building, propellant spill containment tanks, back-up generators and fuel tanks, storm water retention area, parking area, access roads to the facility and associated infrastructure installation and modifications.

Implementation of the No-Action Alternative would require extensive modifications to existing payload processing facilities, resulting in a severe impact for NRO and Department of Defense programs, as they would be impeded from processing satellite vehicles during this facility modification period. A decision to not construct the proposed new EPF would cause the NRO program to miss critical milestones and program objectives and may impact national security.

All other sites considered for location of the proposed NRO PPF were eliminated from further analysis due to conflicts with launch hazard zones, and airfield clearance requirements.

SUMMARY OF FINDINGS

The analyses of the affected environment and environmental consequences of implementing the Proposed Action and the No-Action Alternative presented in the EA concluded that no significant adverse impacts should result on Cultural Resources (Section 4.3), Earth Resources (Section 4.4), Environmental Justice (Section 4.5), Hazardous Materials and Waste Management (Section 4.6), Land Use (Section 4.7), Noise (Section 4.8), Socioeconomics (Section 4.9), Traffic and Transportation (Section 4.10), Utilities (Section 4.11), and Water Resources (Section 4.12). All measures described in the EA will be implemented to ensure adverse impacts are precluded.

Because the project would disturb an area greater than one acre, a National Pollutant Discharge Elimination System (NPDES) permit would be required to protect water resources. The NPDES Permit requires the development and implementation of a Storm Water Pollution Prevention Plan that includes preventative maintenance measures for construction equipment, spill prevention and response measures, sediment and soil erosion control measures, and identifies measures for management of runoff.

Minor environmental effects on Air Quality have the potential to occur during construction activities (Section 4.1). Mobile source emissions would temporarily increase during construction, but would not exceed regulatory standards. No significant impacts are anticipated (see EA Sections 3.1 and 4.1). All measures

described in the EA will be implemented to further decrease emissions during construction. Because Cape Canaveral AFS is located in an area that is in attainment for all criteria air pollutants, an Air Conformity Determination is not required.

The Proposed Action would result in adverse effects on Biological Resources (Section 4.2) as described below.

- a) Construction of the proposed EPF would necessitate the permanent removal of approximately 45 acres of oak scrub vegetation, with no opportunity for restoration. Thirty-eight (38) acres of this vegetation were cut and subsequently mulched in March 2005. However, seven acres of oak scrub remain undisturbed. Although this plant community is not considered sensitive and no special status plant species occur in this area, the federally and Florida threatened Florida scrub-jay (*Aphelocoma caerulescens*) inhabits this site, which is considered prime habitat for the species. The 45-acre site, and remaining eight acres of undisturbed scrub, is within an area previously restored for the scrub-jay. Formal Section 7 consultation under the Endangered Species Act (ESA) with the U.S. Fish and Wildlife Service (USFWS) was completed on August 1, 2005, to address the adverse effects of the Proposed Action on the Florida scrub-jay and two other federally threatened species (eastern indigo snake [*Drymarchon corais couperi*] and southeastern beach mouse [*Peromyscus polionotus niveiventris*]) that have potential to occur. All terms and conditions contained in the resulting Biological Opinion will be implemented to minimize adverse effects on these species:
 - If clearing of habitat occupied by Florida scrub-jays is to occur within scrub-jay nesting season (March 1 through June 30), the area would be surveyed prior to clearing to determine if there are any active scrub-jay nests located within the vegetation. If an active scrub-jay nest is located, to the maximum extent practicable, clearing activities cannot take place within 150 feet of the nest site until nestlings have fledged or until it has been determined that the nest has failed.
 - The 45 SW will develop an eastern indigo snake protection/education plan to be followed by all construction personnel. The USFWS will review and approve the plan at least 30 days prior to the start of clearing activities (see Appendix E of the Final EA for details).
 - Only individuals authorized by a section (10)(a)(1)(A) permit issued by the USFWS, or authorized by the Florida Fish and Wildlife Conservation Commission (FWCC) for such activities are permitted to come in contact with or relocate eastern indigo snakes.

- If necessary, eastern indigo snakes shall be held in captivity only long enough to transport them to a release site; at no time shall two snakes be kept in the same container during transportation.
 - In the event that more than one Eastern indigo snake is encountered within the boundaries of the work area, the FWCC would be contacted.
 - An eastern indigo snake monitoring report must be submitted to the USFWS Jacksonville Field Office within 60 days of the conclusion of clearing activities. The report should be submitted when any eastern indigo snakes are observed or relocated (see Appendix E of the Final EA for details).
 - If during the course of the project a dead Florida scrub-jay, southeastern beach mouse or eastern indigo snake is found on the project site, the specimen should be thoroughly soaked in water and frozen, and the USFWS Jacksonville Field Office contacted immediately (see Appendix E of the Final EA for details).
 - The Proponent will provide funding to the 45 SW to clear 166 acres of Compartment 6 for Florida scrub-jay habitat. A prescribed burn of this compartment will follow as soon as it is deemed ready for burning.
 - The Proponent will provide funding for a 5-year study to determine the effectiveness of different land management practices as a temporary management tool when prescribed burning has not occurred on Florida scrub-jay habitat.
- b) One Florida species of special concern, the Gopher tortoise (*Gopherus polyphemus*), has the potential to be adversely impacted during clearing of vegetation and grading. Preconstruction surveys immediately preceding the removal of vegetation and monitoring during these activities would prevent accidental crushing by equipment and reduce the potential for adverse impact to less than significant.
- c) Other wildlife species in the vicinity of the construction activities would be subject to short-term temporary disturbances as a result of noise generated by construction activities. However, these effects would not be considered significant.
- d) Three species of special status sea turtles are known to nest on Cape Canaveral AFS. While sea turtles spend much of their lives roaming ocean waters, females that come ashore to nest can be adversely affected by light sources, resulting in delayed nesting, and can also cause hatchling mortality due to disorientation caused by the lights. Per 45 SWI 32-7001 of 1 April 2003, the proponent for the proposed EPF will incorporate a Light Management Plan for construction activities and

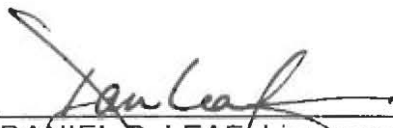
operation of the new facility to minimize potential adverse effects on sea turtles. The 45 CES/CEVP Office will coordinate USFWS approval of the Light Management Plan.

- e) During normal operation of the EPF facility, wildlife species that occur in the vicinity or along roadways that would be used for transportation of payloads may be subject to temporary disturbances resulting from noise. However, this effect would not be considered significant.

Cumulative adverse impacts were identified as having the potential to occur for one resource area, Biological Resources (Section 4.2). Two projects were identified within the vicinity of the Proposed Action that would result in adverse effects on the Florida scrub-jay as a result of loss of habitat. The Biological Opinion issued by the USFWS for the proposed EPF states that these projects would require separate consultation pursuant to Section 7 of the ESA, and are therefore not considered in the Biological Opinion. Through the formal Section 7 consultation with the USFWS, mitigation measures would be developed to reduce these adverse impacts to a less than significant level.

FINDING OF NO SIGNIFICANT IMPACT

Based upon my review of the facts and analyses contained in the attached EA, conducted in accordance with the provisions of NEPA, the CEQ Regulations, AFI 32-7061, as amended by the interim change dated March 12, 2003, which adopted 32 CFR Part 989, I conclude that the Proposed Action should not have a significant environmental impact, either by itself or cumulatively at Cape Canaveral AFS. Accordingly, an Environmental Impact Statement is not required. The signing of this Finding of No Significant Impact completes the environmental impact analysis process.



DANIEL R. LEAF, Lieutenant General, USAF
Vice Commander, HQ AFSPC

14 Sep 05

Date

**Final
Environmental Assessment**

New NRO Eastern Processing Facility

**Cape Canaveral Air Force Station
Florida**



U.S. Air Force
45th Space Wing
Environmental Flight
1224 Jupiter Street
Patrick Air Force Base, Florida 32925-3343

31 August 2005

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ACRONYMS AND ABBREVIATIONS

45 SW	45th Space Wing
45 SWI	45th Space Wing Instruction
45 CES	45th Civil Engineer Squadron
45 CES/CEV	45th Environmental Flight
AFB	Air Force Base
AFCEE	Air Force Center for Environmental Excellence
AFI	Air Force Instruction
AFPD	Air Force Policy Directive
AFS	Air Force Station
AIRFA	American Indian Religious Freedom Act
ARMS	Air Resources management Systems
ARPA	Archaeological Resources Protection Act
AWSPL	A-weighted sound pressure level
BDA	Blast Danger Area
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIA	Central Intelligence Agency
CNS	Canaveral National Seashore
CO	Carbon monoxide
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
CZMP	Coastal Zone Management Program
dB	Decibel
dBA	Decibel, A-weighted
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
EA	Environmental Assessment
EIAP	Environmental Impact Analysis Process
EIS	Environmental Impact Statement
EMCS	Energy Management Control System
EMI	Electromagnetic interference
EO	Executive Order
EOD	Explosive ordnance detonations
EPA	Environmental Protection Agency
EPP	Environmentally Preferred Products
ERP	Environmental Resource Permit
ESA	Endangered Species Act
ESA-60	Explosives Storage Area-60
FAC	Florida Administrative Code

FCMA	Florida Coastal Management Act
FDCA	Florida Department of Community Affairs
FDEP	Florida Department of Environmental Protection
FHA	Flight Hazard Area
FNAI	Florida Natural Areas Inventory
FONSI	Finding of No Significant Impact
FS	Florida Statute
ft	Feet
ft ²	Square feet
FWCC	Florida Fish and Wildlife Conservation Commission
GHe	Gaseous helium
GN ₂	Gaseous nitrogen
gpd	Gallons per day
HMTA	Hazardous Materials Transportation Act
HPS	High-pressure sodium
IBD	Inhabited Building Distance
IL	Interline Distance
ILL	Impact Limit Line
In	Inch
IRP	Installation Restoration Program
JBOSC	Joint Base Operations Support Contractor
KSC	John F. Kennedy Space Center
kV	Kilovolt
kVA	Kilovolt-Ampere
L _{eq1H}	One-hour average sound level
LMP	Light Management Plan
LPS	Low-pressure sodium
MAIS	Major Automated Information System
MBTA	Migratory Bird Treaty Act
MDAPs	Major Defense Acquisition Programs
MGD	Million gallons per day
MSL	Mean sea level
MW	Megawatt
MWH/day	Megawatt-hours per day
NAAQS	National Emission Standards for Hazardous Air Pollutants
NAGPRA	Native American Graves Protection and Repatriation Act
NASA	National Aeronautics and Space Administration
National Register	National Register of Historic Places
NEPA	National Environmental Policy Act
NET	National Emission Trends
NHPA	National Historic Preservation Act
NOAA	National Oceanic and Atmospheric Administration
NO _x	Nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRO	National Reconnaissance Office
OFW	Outstanding Florida water
OPlan	Operations Plan
OSHA	Occupational Safety and Health Administration
OSL	Office of Space Launch
EPF	Eastern Processing Facility
PM ₁₀	Particulate matter equal to or less than 10 microns in diameter

POL	Petroleum, oil and lubricants
PPA	Pollution Prevention Act
ppm	Parts per million
PTR	Public Transportation Distance
RCRA	Resource Conservation and Recovery Act
RF	Radio frequency
ROI	Region of Influence
SARA	Superfund Amendments and Reauthorization Act
SCAT	Space Coast Area Transit
SHPO	State Historic Preservation Officer
SJRWMD	St. John's River Water Management District
SLC	Space Launch Complex
SO ₂	Sulfur dioxide
SPIF	Spacecraft Processing and Integration Facility
SR	State Route
SW	Space Wing
SWPPP	Storm Water Pollution Prevention Plan
TSCA	Toxic Substances Control Act
U.S.	United States
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USFWS	U.S. Department of the Interior, Fish and Wildlife Service
VOC	Volatile organic compound
µg/m ³	Micrograms per cubic meter

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1 PURPOSE OF AND NEED FOR THE PROPOSED ACTION

1.1 Introduction

The National Environmental Policy Act (NEPA) and the Council on Environmental Quality (CEQ) regulations require a lead agency to prepare an Environmental Assessment (EA) to evaluate the potential impacts of Federal actions on the surrounding environment. The United States (U.S.) Air Force is the lead agency for NEPA compliance on this proposed project. CEQ regulations require that an EA provide evidence and analysis to determine whether a Proposed Action might have significant effects that would require preparation of an Environmental Impact Statement (EIS). If the analysis determines that the environmental effects will not be significant, a Finding of No Significant Impact (FONSI) will be prepared.

This EA evaluates the potential environmental impacts associated with the National Reconnaissance Office (NRO) proposal to construct a new Eastern Processing Facility (EPF) on Cape Canaveral Air Force Station (AFS), in Brevard County, Florida. Construction of the proposed facility would commence in the year 2006, with an expected duration of 24 months. Operations within the facility are expected to start some time in the year 2008.

The NRO is a Department of Defense (DoD) agency, funded through the National Reconnaissance Program (part of the National Foreign Intelligence Program), and staffed by DoD and Central Intelligence Agency (CIA) personnel. As part of the 14-member Intelligence Community, the NRO plays a primary role in achieving information superiority for the U.S. Government and Armed Forces, and operates the nation's reconnaissance satellites. The Office of Space Launch (OSL), is the organization within the NRO responsible for launching satellites into space.

This EA has been prepared in accordance with the NEPA of 1969, as amended [42 U.S. Code (USC) 4321 et seq.]; as implemented by CEQ Regulations [40 Code of Federal Regulations (CFR) Parts 1500-1508]; and U.S. Air Force Instruction (AFI) 32-7061, *Environmental Impact Analysis Process*, as amended by the interim change dated March 12, 2003, which adopted 32 CFR Part 989. Accordingly, this EA analyzes the potential environmental consequences of constructing and operating the proposed NRO EPF. The environmental resources analyzed in this document reflect the unique features and the environmental setting of Cape Canaveral AFS and the surrounding region of influence (ROI).

Cape Canaveral AFS provides space launch capability and support for the DoD and commercial launch customers. The 45th Space Wing (SW) is headquartered at Patrick Air Force Base (AFB), approximately 20 miles south of Cape Canaveral AFS. The primary missions of the U.S. Air Force at Cape Canaveral AFS are to launch and track satellites in space, test and evaluate America's intercontinental ballistic missile systems, and support aircraft operations in the Eastern Range. As a non-military facet of operations, Cape Canaveral AFS is also committed to promoting commercial space launch ventures.

1.2 Project Location

Cape Canaveral AFS is located north of the city of Cape Canaveral on the east coast of Florida in Brevard County (Figure 1-1). Cape Canaveral AFS is on the Canaveral Peninsula, a barrier island located approximately 155 miles south of Jacksonville, 210 miles north of Miami, and approximately 60 miles east of Orlando. Cape Canaveral AFS occupies 15,804 acres of the barrier island. The installation is bounded on the north by the John F. Kennedy Space Center (KSC), a National Aeronautics and Space Administration (NASA) installation, on the west by the Banana River, on the south by Port Canaveral, and on the east by the Atlantic Ocean. The nearest civilian community to Cape Canaveral AFS is the City of Cape Canaveral, located south of Port Canaveral.

1.3 Purpose of the Proposed Action

The NRO is proposing the construction of a new EPF on Cape Canaveral AFS that can support processing of satellites that use multiple launch vehicles, and that provides operational flexibility by allowing the various programs to support their launch complex activities simultaneously. Construction of this new facility would occur during the years 2006 and 2007, and operations within the facility would commence in 2008.

The proposed NRO EPF and site where it would be located must meet the following requirements:

- The payload processing building must be between 180 and 200 feet (ft) high to accommodate payload requirements.
- Given the hazardous materials that would be present within the facility, the facility would need to meet the 1,250 ft Inhabited Building Distance (IBD), 750 ft Public Transportation Distance (PTR), and 313 ft Interline Distance (IL).
- The facility must be located in a secured area given the sensitivity of payloads and processes and the presence of hazardous materials.
- The site must be outside the Impact Limit Line (ILL), Flight Hazard Area (FHA) and Blast Danger Area (BDA) for any space launch complex (SLC) in the vicinity to prevent the potential loss of National Assets that are critical to the National Security of the United States and to prevent conflicts between payload processing schedules and launch schedules (i.e., evacuation of personnel within the facility during launches; evacuation of personnel within launch complexes during fuel loading of payloads). The only exception to this is being within the ILL for SLC-17 – because of available program launch data, Range Safety allows personnel within the ILL of SLC-17 during launches.
- Infrastructure components (i.e., electrical power supply, water supply, sewer system, communications lines) to support operation of the proposed facility should be available to the proposed site.
- The facility should be as close as possible to the airfield (Skid Strip) to minimize required travel time when transporting the satellite vehicle and its components (Figure 1-2).

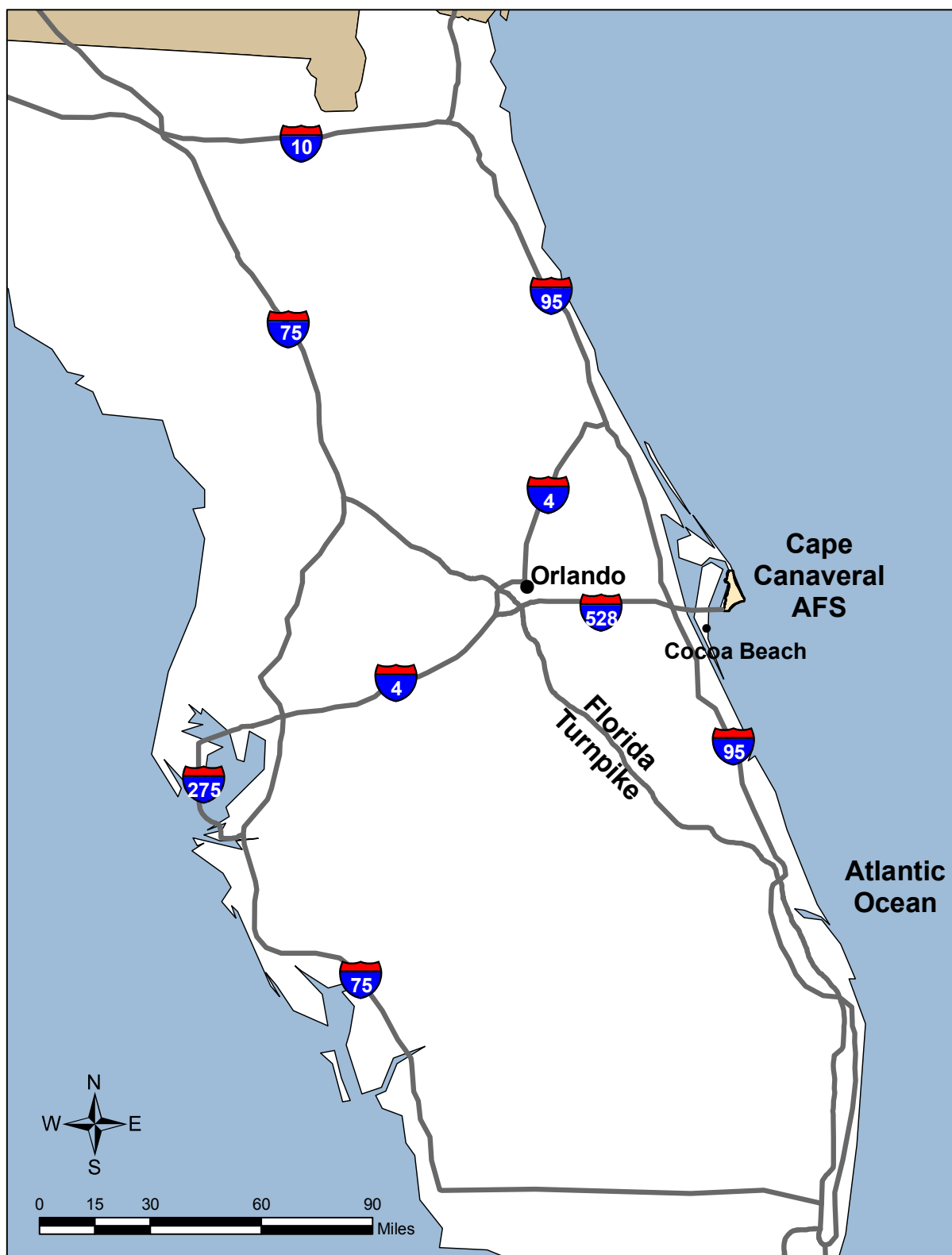


Figure 1-1. Cape Canaveral AFS location map.

Figure 1-2 depicts the location of EELV vehicles launch complexes (SLC-37 and SLC-41), other active launch complexes, and the location of the Skid Strip on Cape Canaveral AFS. Figures A-7 through A-9 of Appendix A depict the ILLs, FHAs, and BDAs for SLC-37, SLC-41, and SLC-17.

1.4 Need for the Proposed Action

At the present time, satellite vehicle processing for launch readiness is accomplished in different ways by the various programs. While some programs still use the old “factory to the pad” concept (i.e., staying on the launch complex for long periods of time), most programs make use of off-line satellite vehicle processing. The NRO presently processes payloads at the Spacecraft Processing and Integration Facility (SPIF) on Cape Canaveral AFS. However, this facility is no longer able to meet all requirements impeding the NRO from meeting launch processing requirements of their customers.

Over the last 20 years, the SPIF has transitioned from a facility designed and built to process “shuttle cargoes” to a facility supporting programs that use various expendable launch vehicle configurations (primarily Atlas and Titan). The role and purpose of the SPIF expanded to become an extension of the factory for some programs as they use the SPIF to assemble satellites before starting checkout/test operations. This concept taxes the capabilities of the SPIF and causes impacts when multiple missions are processed. Common SPIF areas become assembly areas, and a choke point to where other programs cannot move their satellites into and out of the SPIF.

Processing timelines have increased significantly with the inherent limitations of the SPIF and the changing support restrictions of the joint DoD commercial environment of the EELV Program era. The potential to impact multiple programs increases. The EELV Program recognizes the need for more than one launch provider and for reduced timelines of launch complex processing activities to increase the available launch rate. This concept has shifted work to the off-line satellite vehicle processing facility, which includes the payload processing facility being used to install the payload fairing. With the arrival of the new Delta IV and Atlas V launch vehicles, DoD now has the ability to launch multiple launch vehicles from multiple launch complexes (see Figure 1-2 for location of launch complexes). This represents a new challenge to manage the satellite vehicle processing, as they are no longer single string to the launch pad such as they were in the past. A delay on one system could result in the requirement to store a satellite, thus reducing processing capability for other programs.

In late 2003, the OSL identified seven alternate payload processing facilities to meet EELV launch requirements. Both government and commercial facilities were considered. A total of seven facilities were evaluated against requirements for an EELV payload processing facility, which included:

- 1) Reliability – operational availability of systems to meet current and future processing needs.
- 2) Control – ability of the OSL to maintain control of the facility.
- 3) Security – several disciplines integrated to provide protection of the space vehicle.
- 4) Mission risk – mission impact to cost, schedule, or capability of a space vehicle.

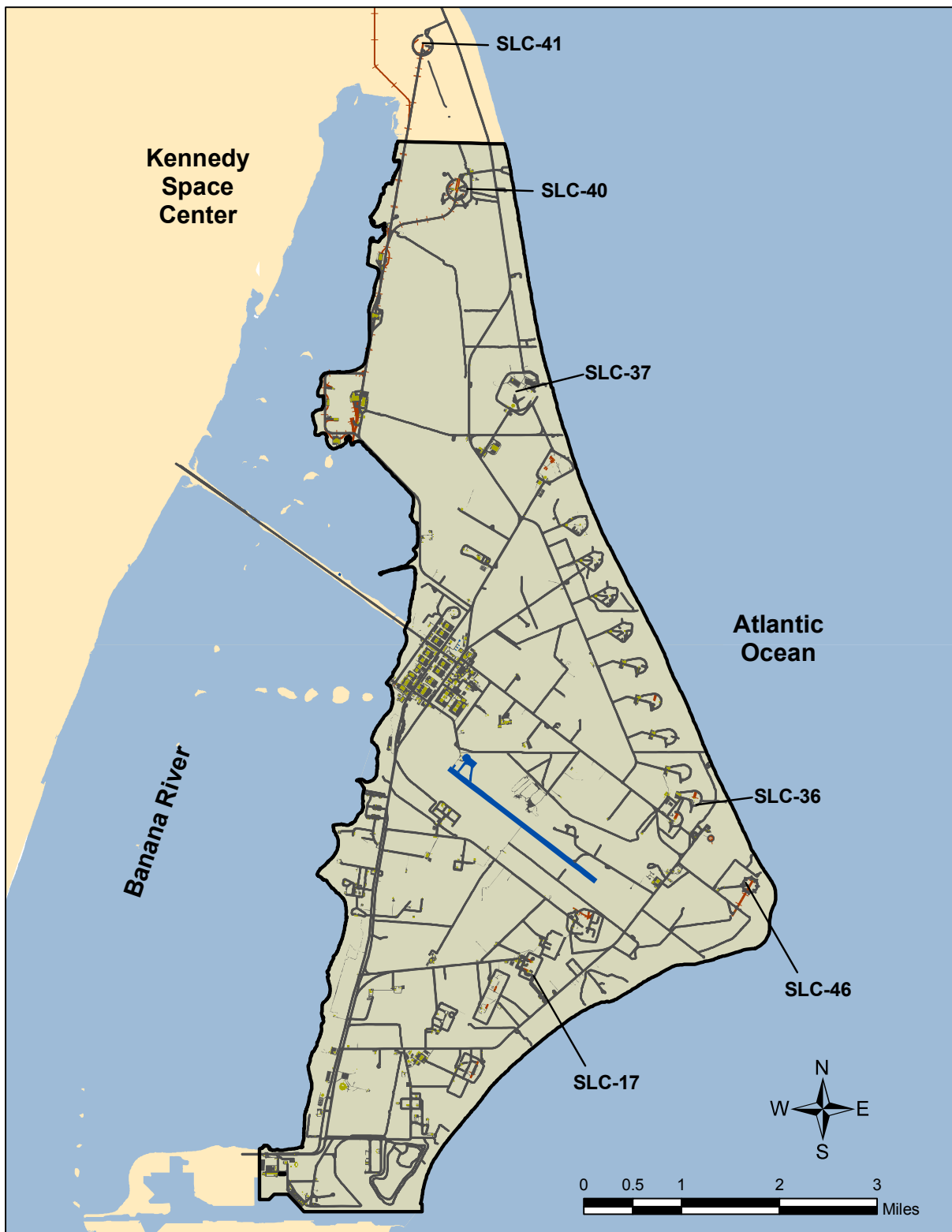


Figure 1-2. Locations of active launch complexes on Cape Canaveral AFS.

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- 5) Adequacy – capabilities of the facility systems to meet current and future processing needs.
 - 6) Capacity – three programs simultaneous processing and storage.
 - 7) Accessibility – Skid Strip, existing processing facilities, launch complexes, BDAs/FHAs and associated clear zones.

A new facility is the only alternative that meets all the criteria for EELV payload processing and is required to protect the future ability of the NRO to respond to all launch processing requirements of their customers. The new facility will be designed to meet the NRO processing requirements for the next three decades, which will ensure all NRO National Security priorities are achieved.

1.5 Scope of the Environmental Assessment

This EA is intended to support the NRO and U.S. Air Force decision to locate, construct and operate a new EPF in support of NRO programs at Cape Canaveral AFS. As such, it describes the potential environmental impacts associated with the construction and operation of the facility, and the mitigation measures developed to avoid, minimize, or offset adverse impacts as identified in this document.

Actions excluded from the scope of analysis provided in this document are listed below. The potential environmental effects associated with these actions were discussed in previous environmental documents prepared pursuant to NEPA (U.S. Air Force 1998, 2000).

- Actual launch of EELV vehicles.
- Transportation of propellants to Cape Canaveral AFS for use in the payloads.

This EA considered eleven environmental resources to provide a context for understanding the potential effects of the Proposed Action and a basis for assessing the significance of potential impacts. Federal and state environmental statutes, which set specific guidelines, regulations, and standards, regulate most resource areas (see Section 1.6). These standards provide benchmarks for determining the significance of the impacts. The resource areas considered in this analysis include:

- earth resources - topography, geology and soils;
- biological resources – vegetation and wildlife;
- water resources – surface waters, groundwater, hydrology and water quality;
- air quality;
- noise;
- socioeconomics;
- land use;
- utilities;
- traffic and transportation;
- hazardous materials and waste management;

-
- cultural resources; and
 - environmental justice.

Chapter 2 of this EA describes the proponent's Proposed Action, all alternatives considered, and the No-Action Alternative. Only one feasible alternative, the Proposed Action, was identified during the evaluation of various sites for construction and operation of a new NRO EPF. Adverse impacts associated with the implementation of the Proposed Action were identified for Biological Resources. Detailed examination and analyses of the Biological Resources that would be affected and impacts that would result are presented in Chapters 3 and 4. Chapter 3 provides an overview of the existing environmental conditions by resource area. Chapter 4 analyzes the consequences of implementing the Proposed Action and the No-Action Alternative by resource areas. Only resources with the potential to be adversely affected are analyzed in detail in Chapter 4. In addition, Chapter 4 discusses potential cumulative impacts associated with implementation of the Proposed Action when considered in conjunction with other past, present and future projects. Adverse Cumulative Impacts associated with the Proposed Action were identified for Biological Resources, and are discussed in more detail in Section 4.13.

1.6 Relevant Federal and State Regulations, Statutes and Permits

The representative federal and state regulations, statutes and permits that may be applicable for the proposed project are presented in Table 1-1.

Table 1-1. Federal and State regulations applicable to the implementation of the Proposed Action.

Federal Law	Regulatory Agency	Activity or Requirement
Clean Air Act (CAA) of 1970 (42 USC 7401 et seq.)	U.S. Environmental Protection Agency (EPA); Florida Department of Environmental Protection (FDEP)	Mandates that applicable state and national ambient air quality standards must be maintained during the operation of any emission source. National Ambient Air Quality Standards include primary and secondary standards for various pollutants. The primary standards are mandated by the CAA to protect public health, while the secondary standards are intended to protect the public welfare from adverse impacts of pollution, such as visibility impairment.
Clean Air Act Amendments of 1990	U.S. EPA, FDEP	Established new federal nonattainment classifications, new emissions control requirements, and new compliance dates for areas in nonattainment. The requirements and compliance dates are based on the nonattainment classification.
Clean Water Act (CWA) of 1977 as amended (33 USC 1251 et seq.)	U.S. EPA; FDEP; St. John's River Water Management District	Prohibits the discharge of pollutants from a point source into navigable Waters of the United States, except in compliance with a National Pollutant Discharge Elimination System (NPDES) permit (40 CFR Part 122). The navigable Waters of the United States are considered to encompass any body of water whose use, degradation, or destruction will affect interstate or foreign commerce.
Archaeological Resources Protection Act (ARPA) of 1979 (USC 470aa-mm), Supplemental Regulations of 1984	U.S. Department of the Interior, National Park Service	The ARPA secures protection of archaeological resources and sites on public and Indian lands; requires permitting for any excavation or collection of archaeological material from these lands; provides civil and criminal penalties for violations.
National Historic Preservation Act (NHPA) of 1966 as amended (16 USC 470 et seq.)	U.S. Department of the Interior, Advisory Council on Historic Preservation	The NHPA is the key federal law establishing the foundation and framework for historic preservation in the United States. The Act authorizes the Secretary of the Interior to expand and maintain a National Register of Historic Places (National Register); it establishes an Advisory Council on Historic Preservation (Council) as an independent federal entity; it requires federal agencies to take into account the effects of their undertakings on historic properties, and to afford the Council an opportunity to comment upon any undertaking that may affect properties listed, or eligible for listing, in the National Register; and it makes the heads of all federal agencies responsible for the preservation of historic properties owned or controlled by them.
Endangered Species Act (ESA) of 1973 (7 USC 136; 16 USC 460 et seq.)	U.S. Department of the Interior, Fish and Wildlife Service (USFWS)	Declares the intention of Congress to conserve threatened and endangered species and the ecosystems on which those species depend. The ESA requires that federal agencies, in consultation with the USFWS and the National Oceanic and Atmospheric Administration Fisheries Service (NOAA Fisheries), use their authorities in furtherance of its purposes by carrying out programs for the conservation of endangered or threatened species.
Section 7 of the ESA (16 USC 1536)	USFWS	Contains provisions that require federal agencies to consult with the Secretary of Interior and to take necessary actions to insure that actions authorized, funded, or carried out by them do not jeopardize the continued existence of endangered species and threatened species.
Migratory Bird Treaty Act (MBTA) of 1918 as amended (16 USC 703-712)	USFWS	The MBTA implements various treaties and conventions between the U.S. and Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. Under the Act, taking, killing or possessing migratory birds is unlawful.

Table 1-1 (continued)

Federal Law	Regulatory Agency	Activity or Requirement
Coastal Zone Management Act (CZMA) of 1972 (16 USC 2452-24645).	Florida Department of Community Affairs (FDCA)	The CZMA plays a significant role in water quality management. Under the CZMA, a Federal action that may affect the coastal zone must be carried out in a manner that is consistent with state coastal zone management programs.
Resource Conservation and Recovery Act (RCRA) of 1976 (42 USC 6901 et seq.); Title 40 CFR 270; Chapter 403.704, 403.721, 403.8055, Florida Statutes (FS); Chapter 62-730.180, Florida Administrative Code (FAC)	U.S. EPA; FDEP	This Act gives the U.S. EPA the authority to control hazardous waste from the "cradle-to-grave." This includes the generation, transportation, treatment, storage, and disposal of hazardous waste. RCRA also set forth a framework for the management of non-hazardous wastes.

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2 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

The proposed project has two aspects: 1) the construction, operation and components of the facility; and 2) the siting of the facility on Cape Canaveral AFS. Section 2.1 provides a general description of the payload processing operations. Elements associated with construction and operation of the facility and the site selection process are presented in Section 2.2. Section 2.3 presents all alternatives considered in this analysis.

2.1 Payload Processing

Payload processing operations comprise a set of activities performed on a spacecraft or satellite and assist motor(s) to ensure that the payload is flight-ready prior to its incorporation to the launch vehicle. Payload preparation and pre-launch activities take place in three operational areas: (1) Non-hazardous processing area; (2) hazardous processing area; and (3) launch complex.

2.1.1 Non-hazardous and Hazardous Payload Processing

Non-hazardous processing facilities are generally used for spacecraft receiving inspection and checkout to assure no damage to the spacecraft during shipment from the agency providing the payload. Hazardous processing facilities are used for activities such as liquid propellant transfer operations, installation of ignition and separation ordnance, and mating of the spacecraft with its upper stage. Non-hazardous activities may also be performed in this area. Operations are designated as hazardous when significant amounts of potential energy are present and loss of control could result in injury to personnel or equipment; a significant change in the ambient conditions of temperature, pressure or oxygen content could occur; or the presence of hazardous materials provides the potential for personnel exposure.

The proposed NRO EPF consolidates non-hazardous and hazardous processing activities into a single new facility. The procedures and operations considered potentially hazardous to personnel or to critical spacecraft equipment and/or systems, generally include:

- Transportation, short-term storage, sampling and loading of liquid propellants.
- Installation of explosive devices used in space to ignite motors and to separate the payload from the vehicle.
- Final assembly, lifting, and mating of liquid and/or solid propellant motors with the payload.

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- Preparation for and transportation of the fueled spacecraft to the launch facility.

2.1.1.1 Propulsion System Propellant

Mono-propellant fueled systems use a single fuel tank containing hydrazine while bi-propellant fueled systems use dual fuel tanks containing hydrazine and an oxidizer (i.e., nitrogen tetroxide). The amounts of propellants and oxidizer loaded onto a spacecraft are dependent on the spacecraft design, the functions it will perform, and the duration it is expected to perform.

2.1.1.2 Transportation of Fueled Payloads

Transporting fueled payloads from the hazardous checkout facility to the launch complex is considered a hazardous operation. Transportation of fueled payloads will comply with AFSPCMAN 91-710, *Range Safety User Requirements Manual*, Volume 6, *Ground and Launch Personnel, Equipment, Systems, and Material Operations Safety Requirements*, para 16.3 *Convoy Operations Requirements*, sub para 16.3.6: "When transporting hazardous commodities, the transfer route shall be chosen to minimize exposure to populated areas and critical facilities. Transfer should occur during off-peak traffic and population hours."

The encapsulated payload is hoisted and mated to the launch vehicle at the space launch complex.

2.1.2 Payload Processing Activities

Prior to the planned arrival date of the satellite vehicle, the mechanical and electrical equipment required to support launch base processing is shipped to the launch site. Once at the site, the equipment is offloaded, installed, and validated for satellite vehicle operational/test support. This activity can occur as late as two weeks and as early as three months prior to satellite vehicle arrival.

Satellite vehicle launch processing at Cape Canaveral AFS begins when the aircraft transporting the satellite vehicle lands at the Skid Strip. The satellite vehicle is offloaded from the aircraft and transported on specialized transporter vehicles to the payload processing facility.

Upon arrival to the payload processing facility, the satellite vehicle is transitioned into the facility's airlock. Once the airlock meets environmental requirements and the shipping container has been cleaned, the satellite vehicle is moved through the transfer aisle to an assigned processing bay. In the processing bay, the satellite vehicle contractor performs the following activities:

- Satellite vehicle removal from the shipping container.
- Receiving inspections.
- Propulsion system leak testing.
- Satellite vehicle integrated system level electrical testing.
- Ordnance install, harness connects and electrical test and verification.

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- Mechanical preparations and closeouts.
 - Propulsion system propellant loading.
 - Mechanical preparations for encapsulation.

Simultaneously to these activities, the launch vehicle contractor brings payload fairings and support equipment to the payload processing facility. In preparation for encapsulation, the payload fairings are removed from their shipping containers, set up vertically, and cleaned; and alignments to the encapsulation stand are accomplished.

Once the preparations for encapsulation are complete, the satellite vehicle is moved to the payload fairing location. In the proposed NRO EPF, encapsulation can occur in the same processing bay where the satellite is processed. This will be an operational programmatic decision made by each program as part of their Launch Base Operations planning process. The satellite vehicle is then installed on the launch vehicle adapter. Protective covers are removed, required closeouts are accomplished, and if required, the payload fairings radio frequency (RF) system is tested and verified. Lastly, the payload fairing is installed around the satellite vehicle.

With encapsulation complete, the encapsulated payload is moved back into the Transfer Aisle and installed on the transporter for delivery to the applicable launch complex, where it is positioned for hoisting onto the launch vehicle. Spacecraft and launch vehicle systems tests are performed after the satellite vehicle/payload fairing is mated to the launch vehicle at the launch complex. Preparations for launch countdown are accomplished, countdown occurs, and the launch vehicle/satellite vehicle are launched.

2.2 Description and Siting of the EPF

2.2.1 Description of Facility

The new EPF would be operationally configured to support the simultaneous independent processing of multiple satellites, and to provide sufficient space to process satellites and fairings launching/supporting EELV. To meet payload processing requirements, the site for the proposed EPF must incorporate the following components:

- Payload processing building occupying an area approximately 365 ft x 420 ft.
- 10-foot high chain-link security fence surrounding the building, approximately 200 ft from the building with a 30-foot clear zone on the outside. The area within the fence would be approximately 810,000 ft² (1,000 ft x 810 ft), and would be paved with asphalt or concrete to accommodate the EPF support buildings and maneuvering of transporter vehicles.
- Two 5,000-gallon minimum propellant spill containment tanks for hydrazine and nitrogen tetroxide.
- Two 1,250 Kw back-up generators for use during electrical power outages. These generators would also be run briefly to perform monthly maintenance.
- One 10,000-gallon fuel oil tank for back-up generators.

-
- Thirteen pressure vessels to support GN₂, GHe, and breathing air systems.
 - Storm water retention area.
 - A pervious pavement parking area (120 ft x 300 ft) adjacent to but outside the security fence.
 - External light fixtures – roadways, parking area and security lighting will be installed per the criteria listed in Appendix B. All external lighting will be low-pressure sodium (LPS).
 - Associated required infrastructure (i.e., electrical power supply, water supply, sewer system, communications lines) to support operations within the proposed facility.
 - 40-foot wide asphalt access roads.

In addition, the site would include a utility support building, an Access Control Building, and propellant scrubbers.

The facility would encompass approximately 165,000 square feet (ft²) of processing and support space, 100,000 ft² of cleanrooms (class 100,000 or better), and 108,000 ft² of support areas to be structured as follows:

- Four processing/encapsulation bays shall provide 100,000 class clean and explosive safe satellite processing space to support satellite vehicle launch processing, including post ship inspections and test, mechanical launch preps, electrical launch processing tests, propellant loading, ordnance installs and checkouts, preps for/and encapsulation, and required launch pad electrical test and launch countdown activities.
- Each processing/encapsulation bay will be supported with control room space, a conference room, a User's room, a break room, a trailer/logistics support room, a garment change room, and support space for oxidizer and fuel conditioning.
- Airlocks/transfer aisles shall provide 100,000 class clean and explosive safe processing space to support equipment arrivals and departures from the facility as well as transfers internal to the facility, e.g., moving between processing bays to support payload fairing installation (i.e., encapsulation).
- The remaining space will be allocated to security and access control, rest rooms, and facility support functions such as communication rooms.

The proposed facility would be classified as a hazardous processing facility where compounds such as hydrazine and nitrogen tetroxide, would be present during propellant loading operations in large quantities. Pre-launch processing of each satellite vehicle in the EPF is anticipated to take approximately 90 to 120 days.

2.2.2 Site Selection Process

The process followed to select the Proposed Action as the preferred alternative involved the identification of available sites and various assessments of these potential sites, along with an evaluation of required criteria for an NRO EPF.

Significant factors that required consideration in the selection process included the proponent's mission; environmental impacts; Skid Strip flight restrictions; range radar/instrumentation systems lines of sight; infrastructure availability; spaceport master planning; satellite launch processing requirements; and other launch programs. The site selected as the Proposed Action was chosen as a result of the evaluation of these criteria. Given the importance of the NRO mission to protect U.S. National Security, military and

civilian lives, and assets in the United States and abroad, this factor was critical in selecting a site that would best support the successful processing and launch of NRO National Assets with the lowest possible risk.

Requests for space to construct new facilities on Cape Canaveral AFS are subject to the 45 SW process for allocating land to support existing and new land use requirements. The 45 SW Facilities Board is responsible for reviewing and approving site plan requests. The 45th Civil Engineer Squadron (45 CES) is the organization that prepares the site plans for the Facilities Board. Comprehensive Planning within the 45 CES implements the following process to ensure the good stewardship of Wing assets.

When a new facility requirement is developed, the proponent is responsible for the preparation and submittal of a Base Civil Engineering Work Request to the 45 CES. This request along with any supporting documentation undergoes a review and assessment process that includes determination of its effect on – and how it would be affected by – existing and proposed operational and natural constraints and opportunities such as Explosive Safety Quantity Distance requirements, ILLs, FHAs, LOS for range instrumentation and radar systems, known wetlands, future land use plan, and airfield criteria restrictions. Out of this initial assessment, potential sites are identified and presented to various organizations and agencies (totaling 32) within the 45 SW, KSC, and the proponent for review. Each organization then provides comment and identifies potential concerns and issues. The proponent is then afforded the opportunity to address and resolve the identified concerns and issues. Unresolved concerns or issues are considered a “no-go” for the applicable site.

Lastly, a site assessment/transportation study of the sites identified as eligible was completed (BRPH 2004) based on the following criteria:

- Utilities – water; sewer; power and capacity; and communications and capacity.
- Transportation – road conditions and construction; turning radii (50 ft inside radius) and obstructions for transporters (approximately 17.5 ft wide by 109.5 ft long); overhead road obstructions (less than 140 ft in height); and proximity to Skid Strip.
- Explosives safety – Distance to inhabited buildings (minimum of 1,250 ft), public transportation routes (minimum of 750 ft), and interline (313 ft); toxic plumes; blast overpressures; fragmentation.
- Lines of sight – Air Force instrumentation; KSC instrumentation; KSC visual; miscellaneous instrumentation systems.
- Radio frequency emissions and electromagnetic interference (EMI).
- Air approach corridors – vertical and horizontal clearances.
- Launch impacts – ILL, FHA, BDA, tanking operations.
- Site development and environmental issues.
- Consideration for future launches from complexes located in the northern section of Cape Canaveral AFS.

This process was followed for selection of five potential sites for the proposed EPF. Appendix A contains graphic representations of how the initial assessments described above applied to each of the sites. Table 2-1 provides a comparison matrix of the selection criteria for the locations considered for the proposed EPF.

Table 2-1. Comparison of sites considered for proposed EPF.

Measurement	PROPOSED ACTION Phillips Pkwy/ Lighthouse Rd	ALTERNATIVE 3 Explosives Storage Area-60 (ESA-60)	ALTERNATIVE 4 Heavy Launch Rd	ALTERNATIVE 5 Contractors Rd (KSC)	ALTERNATIVE 6 Area 59 ^a
<i>Air Approach Corridors</i>	Does not interfere	Does not interfere	Does not interfere	Does not interfere	Interferes
<i>Launch Impacts</i>	Not within designated area	Within designated area	Within designated area	Within designated area	Not within designated area
<i>Transportation</i>					
Road condition and construction	Existing roads requiring some modification. Dual access.	Existing roads requiring some modification	Existing roads requiring some modification	Existing roads requiring some modification. Significant transport issues due its location on KSC.	
Turning radii and obstructions	Modifications needed	Modifications needed for one route	Modifications needed for two routes	Modifications needed	
Overhead obstructions	Non-existent	Some obstructions may affect activities	Obstructions present	Non-existent	
Proximity to Skid Strip	4.0 miles	2.9 miles	4.0 miles	Over 5 miles	Less than 5 miles
<i>Utilities</i>					
Water	Readily available – minimal installation work required	Available nearby – would require some installation work	Not available – would require new installation	Available nearby – would require some installation work	
Sewer	Readily available – minimal installation work required	Readily available – minimal installation work required	Not available – would require new installation	Available nearby – would require some installation work	
Power and Capacity	Readily available – minimal installation work required	Available nearby – would require some installation work	Not available – would require new installation	Available nearby – would require some installation work	
Communications and Capacity	Readily available – minimal installation work required	Available nearby – would require some installation work	Not available – would require new installation	Available nearby – would require some installation work	
<i>Explosives Safety</i>	Meets minimum requirements ^b	Meets minimum requirements	Meets minimum requirements	Meets minimum requirements	Meets minimum requirements ^c

Table 2-1 (continued)

Measurement	PROPOSED ACTION Phillips Pkwy/ Lighthouse Rd	ALTERNATIVE 3 ESA-60	ALTERNATIVE 4 Heavy Launch Rd	ALTERNATIVE 5 Contractors Rd (KSC)	ALTERNATIVE 6 Area 59 ^a
Lines of Sight					
Air Force Instrumentation	Meets minimum requirements	Does not meet minimum requirements	Meets minimum requirements	Does not meet minimum requirements	Does not meet minimum requirements
KSC Instrumentation	Meets minimum requirements	Meets minimum requirements	Meets minimum requirements	Meets minimum requirements	Meets minimum requirements
KSC Visual	Meets minimum requirements	Meets minimum requirements	Meets minimum requirements	Does not meet minimum requirements	Meets minimum requirements
Miscellaneous instrumentation systems	Meets minimum requirements	Meets minimum requirements	Does not meet minimum requirements	Meets minimum requirements	Does not meet minimum requirements
Other Cost Impacts					
Demo of existing structures	N/A	Demolition required	N/A	N/A	
Installation of new utilities	Source nearby	Moderate distance from source	Extensive distance from source	Source nearby	
Future launches from complexes in northern section of Cape Canaveral AFS	No impact expected	Probable impact	Probable impact	No impact	Probable impact

- a The site near Area 59 was eliminated from consideration early on in the process because of its interference with air approach corridors and its proximity to plans for future launch programs.
- b Although this site meets minimum requirements for Explosives Safety, it is in near proximity to Fuel Storage Area #1.
- c Although this site meets minimum requirements for Explosives Safety, it is in near proximity to Fuel Storage Area #2.

2.3 Alternatives Considered

Figure 2-1 shows the locations of all alternatives considered for potential siting of the new EPF, including the Proposed Action. These alternatives are described and discussed in the following sections.

2.3.1 Alternative 1 (Proposed Action) – New NRO EPF at Samuel C. Phillips Parkway and Lighthouse Road

The Proposed Action is to construct a new EPF that would incorporate the components described above, on the northeast corner of Samuel C. Phillips Parkway and Lighthouse Road (Figure 2-1). The Proposed Action would affect approximately 45 acres of land. Figure 2-2 illustrates the layout of the facility under the Proposed Action.

This site would meet all requirements and criteria described in Sections 1.3, and 2.2 for the EPF and location. The site can accommodate a building of up to 200 ft in elevation without interfering with airfield clearance requirements, and would meet the IBD, PTR, and IL requirements. Although this site would be within the ILL of SLC-17, it would be outside its FHA and BDA. Based upon 45 SW Range Safety long documented experience with Delta II vehicles, the proposed facility would not have to be evacuated during Delta II operations and launches.

During the 1960s, this site had concrete instrumentation pads. Records maintained by SGS Master Planning indicate that these pads were present until 1971, when they were removed from the records (J. Green, pers. comm.).

Infrastructure components are readily available in the vicinity of the site and would not entail excessive amounts of disturbance or construction to connect to the proposed facility. The site has access to two water mains – a 12-inch (in) water main along the north side of Lighthouse Road, and a 16-in water main in the median of Samuel C. Phillips Parkway. A jack and bore or directional drill would be required to connect to the 16-in water main.

The site also has access to two sewer lines. One 4-in force main along the north side of Lighthouse Road, and one 6-in force main along the east side of Samuel C. Phillips Parkway. An on site sanitary sewer lift station would be required to connect to either of the existing force mains.

Underground power is available along the south side of Lighthouse Road and the west side of Samuel C. Phillips Parkway. Numerous manholes are present that would allow tapping the primary lines.

Underground communications duct banks exist along the north side of Lighthouse road and west side of Samuel C. Phillips Parkway. A series of manholes would make it easy to provide service to the site.

The route from the Skid Strip to this site would begin at the Skid Strip and head west on Skid Strip Road to Samuel C. Phillips Parkway. It would then proceed south to Lighthouse Road in the northbound lane of Samuel C. Phillips Parkway to avoid any overhead power line conflicts. The total travel distance from the Skid Strip to the site would be 4.0 miles (Figure 2-3).

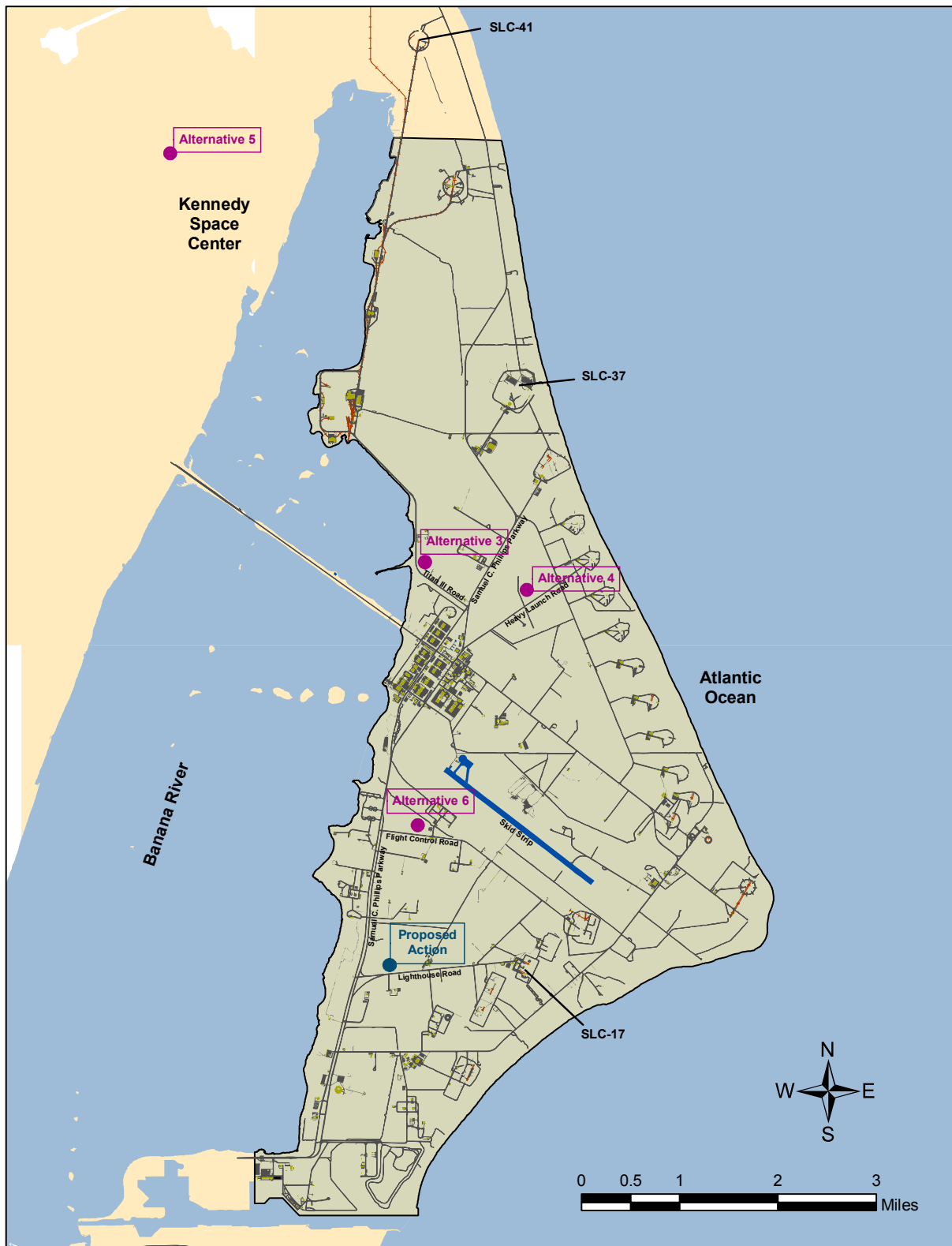


Figure 2-1. Location of the Proposed Action (Alternative 1) and Alternatives 3, 4, 5, and 6.

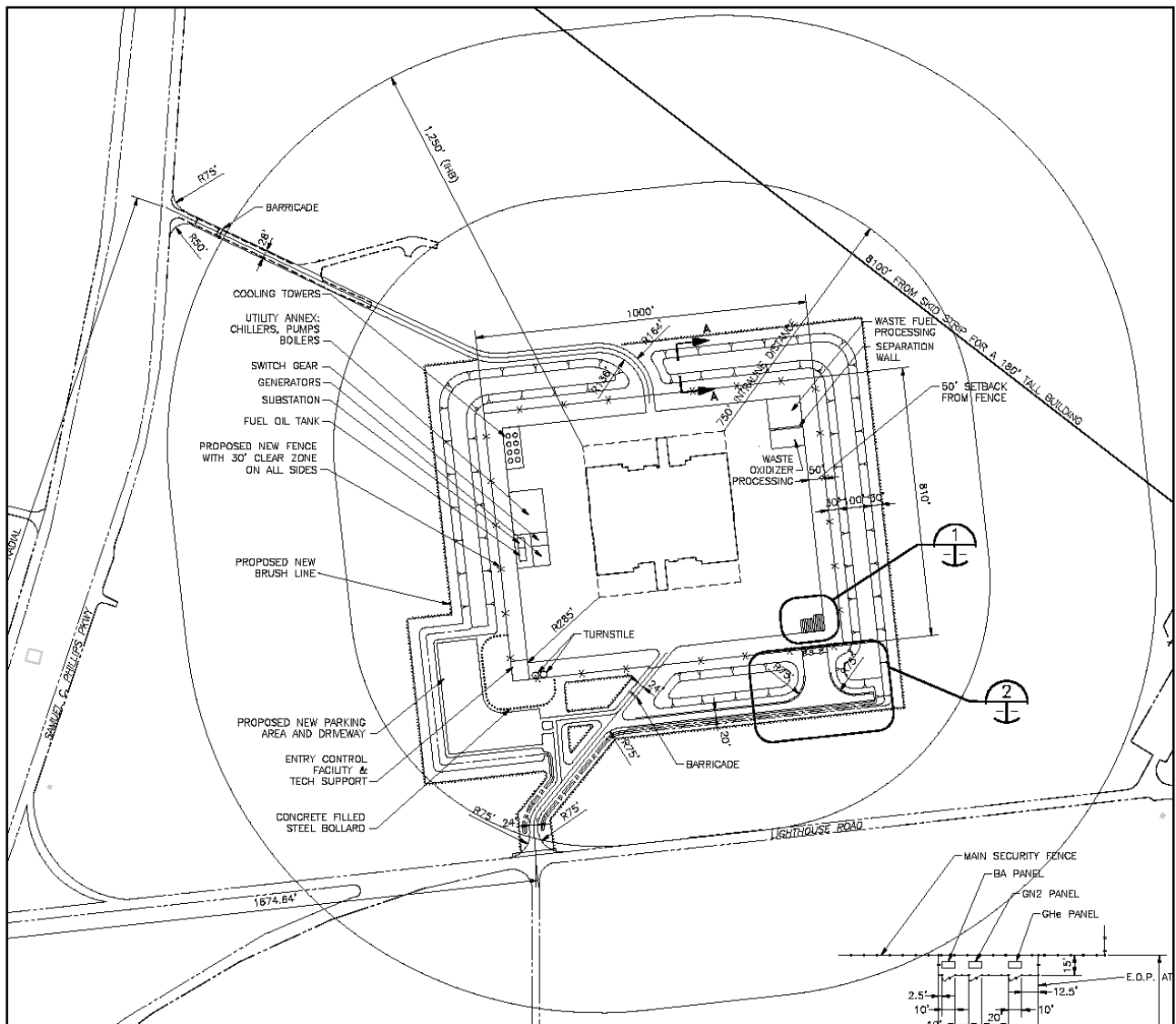


Figure 2-2. Layout of the proposed NRO EPF under the Proposed Action.

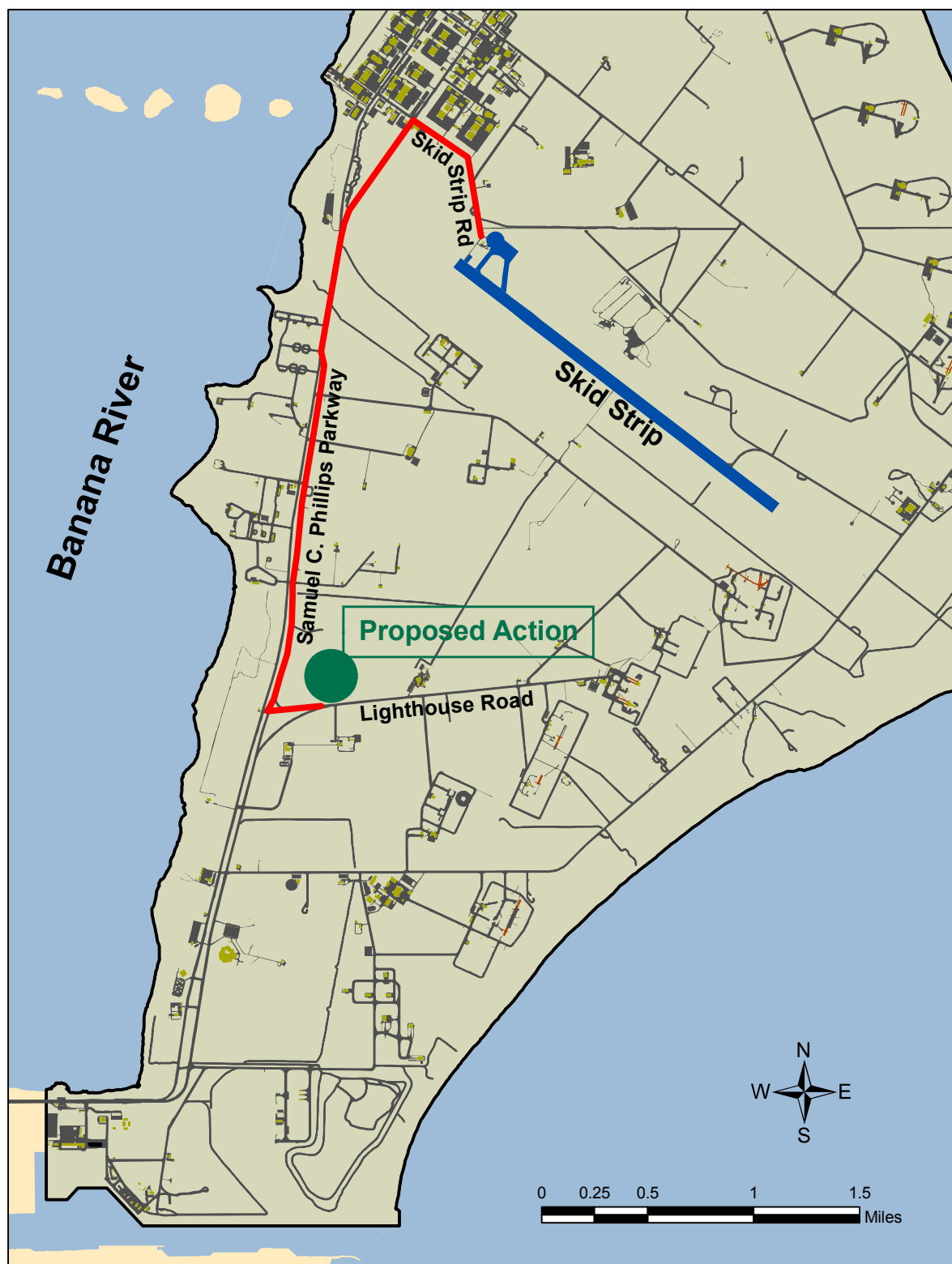


Figure 2-3. Transportation route from Skid Strip to proposed EPF under the Proposed Action.

Suggested routes from the site to the launch pads (SLC-37 and SLC-41) are depicted in Figure 2-4.

- SLC-37 – beginning at the site, travel west to Samuel C. Phillips Parkway; continue north on Samuel C. Phillips Parkway to the cross over to Hangar Road. Continue on Hangar Road through the industrial area until it converges back into Samuel C. Phillips Parkway. Proceed north to SLC-37.
- SLC-41 – beginning at the site, travel west to Samuel C. Phillips Parkway; continue north on Samuel C. Phillips Parkway to the cross over to Hangar Road. Continue on Hangar Road through the industrial area until it converges back into Samuel C. Phillips Parkway. Proceed north to SLC-41.

The required action to use these routes include widening the transition lane from Lighthouse Road to Samuel C. Phillips Parkway to accommodate the transporter, and providing a minimum 50-foot turning radius from the proposed road to the north of the site, onto Samuel C. Phillips Parkway.

The proposed site is located in an existing occupied Florida scrub-jay habitat area, it is within a treatment unit under the Scrub Habitat Restoration Plan, and has undergone burn treatment (see discussion in section 3.2 Biological Resources). In addition, plans for other planned future projects within Cape Canaveral AFS would add to the potential adverse effects on biological resources of using this site. Formal consultation under Section 7 of the Endangered Species Act (ESA) with the U.S. Fish and Wildlife Service (USFWS) was completed on August 1, 2005.

Other permits that would be required include:

- Environmental Resource Permit (ERP) from the Florida Department of Environmental Protection (FDEP) for the development of this site because the proposed facility exceeds 5,000 ft² in size.
- Storm water permit from St. John's River Water Management District (SJRWMD). The proposed facility exceeds permit threshold of 9,000 ft² for building and related impervious surfaces or 4,000 ft² for impervious surfaces subject to vehicular traffic.
- National Pollutant Discharge Elimination System (NPDES) construction permit (more than one acre of land would be disturbed by construction activities).
- Potable Water Distribution Permit from the FDEP for the installation of a new water main to more than one facility.
- Domestic Wastewater Collection/Transmission permit from the FDEP for the installation of a wastewater main and/or a lift station.

2.3.2 Alternative 2 – No-Action Alternative

Under the No-Action alternative, a new EPF would not be constructed. Thus, no infrastructure improvements or ground and habitat disturbances would result. The only existing payload processing facility at Cape Canaveral AFS that meets the criteria required to process EELV Program payloads is the SPIF. Under the No-Action Alternative, the NRO would continue processing payloads at the SPIF. However, the facility would have to undergo extensive modifications to fully meet the needs of the program, resulting in delays in meeting program requirements. This would represent a severe impact for NRO and DoD



Figure 2-4. Transportation routes from EPF under the Proposed Action to SLC-37 and SLC-41.

programs needing to launch during the modification period, as they would be impeded from doing so.

Implementation of the No-Action Alternative would preclude the processing of essential payloads to meet NRO program requirements from Cape Canaveral AFS. A decision to not construct the proposed new EPF would cause the NRO program to miss critical milestones and program objectives and may impact national security.

No adverse impacts on the environment would result from the implementation of the No-Action Alternative. No cumulative adverse impacts to biological resources would result from implementation of this Alternative and other projects identified by SGS Master Planning.

2.3.3 Alternative 3 – New NRO EPF Near Explosives Storage Area-60 (ESA-60)

Under this alternative, the project would entail all of the components described above except that the proposed facility would be located on the north side of Titan III Road near the ESA-60 Site, 0.6 miles west of the intersection at Samuel C. Phillips Parkway (Figure 2-1).

ESA-60 is an out of commission, abandoned-in-place facility built by NASA in the 1960s, which was used for spacecraft processing. The proposed facility would have to be built east of where the existing structure is located, to meet the 1,250 ft IBD and 750 ft PTR requirements from Titan III Road. Because the security clear zones for the proposed EPF, and external supporting structures and parking area would overlap with several of the buildings in the eastern half of the ESA-60 compound, it would be necessary to demolish the ESA-60 compound to support construction of the new EPF. Lastly, the site is within the ILL and FHA for SLC-37 and SLC-41 for certain vehicle configurations, which would pose operational restrictions, i.e., all personnel would have to evacuate the facility during launches and other launch critical activities such as “wet dress rehearsals”, and flight hardware would be at risk of damage or loss due to a launch failure.

This site has all infrastructure components readily available. There is an existing 12-in water main on the north side of the site. Extending this main to serve the site could be required.

There is an existing 8-in force main on the north side of Titan III Road. This main should be adequate to serve the sewer needs of the proposed facility. A submersible pump station would be required to connect to the force main.

An overhead 13.8 kilovolt (kV) power line is located along the north side of Titan III Road and 115kV power line along the south side of Titan II Road. Service from the 13.8 kV line is readily available.

An underground communications duct bank is located along the north side of Titan III Road. Service would be obtained from the nearest manhole and provide a duct bank to the site.

The route from the Skid Strip to this site would begin at the Skid Strip and head west on Skid Strip Road to Hangar Road. It would then proceed north on Hangar Road through the industrial area to Titan III Road. Travel west on Titan III Road approximately 0.6 miles to the site. The total travel distance from the Skid Strip to the site would be 2.9 miles.

Suggested routes from the site to the launch pads are:

- SLC-37 – beginning at the site, travel east 0.6 miles along Titan III Road to Samuel C. Phillips Parkway. Continue north on Samuel C. Phillips Parkway to SLC-37. Titan III Road has a pavement width of 21 ft and the turning radius at the intersection with Samuel C. Phillips Parkway is greater than 50 ft. No modifications are required to use this route.
- SLC-41 – Route A – beginning at the site, travel north along Titan III Road to SLC-41. Titan III Road has a pavement width of 21 ft and is lined by railroad tracks on both sides of the road. The distance from center of inside rail to center of inside rail is 22.7 ft. A 115 kV power line crosses Titan III Road. This power line would need to be routed underground to provide the required clearance to use this route. Additional modifications would include the relocation of roadway signs.
- SLC-41 – Route B – beginning at the site, travel east 0.6 miles along Titan III Road towards Samuel C. Phillips Parkway. Travel north on Samuel C. Phillips Parkway to SLC-41. Titan III Road has a pavement width of 21 ft and the turning radius at the intersection with Samuel C. Phillips Parkway is greater than 50 ft. No modifications are required to use this route.

An Environmental Resource Permit (ERP) from the FDEP would be required for the development of this site because the proposed facility exceeds 5,000 ft² in size. In addition, the site is situated in a low area that would require wet retention ponds, i.e., ponds that provide retention and treatment of contaminated storm water runoff, to meet storm water requirements. Criteria set forth by the St. Johns River Water Management District (SJRWMD) dictates that wet detention ponds be much larger than dry retention ponds that would serve the same facility. Excavated materials from wet detention ponds would not be available for use as fill material to raise the site due to the organic levels. Thus, large quantities of fill would need to be imported to raise the site to the required finished floor elevation.

Up to three payloads may be in process at any one time in the proposed facility. The value of these payloads is in the billions of dollars. Siting the proposed EPF within the ILL and FHA of any launch complex represents an unacceptable financial risk in the event of a launch incident. Alternative 3 was eliminated from further analysis in this process because it would be within the ILL and FHA for SLC-37 and SLC-41. In addition, this alternative was eliminated because of the cost to demolish the existing ESA-60 compound to support construction of the new EPF, and the delay in new construction until the existing compound is demolished and resolution of unknown environmental issues is accomplished.

2.3.4 Alternative 4 – New NRO EPF North of Heavy Launch Road

Under this alternative, the project would entail all of the components described above except that the proposed facility would be located north of Heavy Launch Road, east of Samuel C. Phillips Parkway (Figure 2-1).

Selection of this site would meet the IBD, PTR and IL requirements. This site would be within the ILL and FHA for SLC-37 and SLC-41.

This site is located in an undeveloped area where infrastructure components are not readily available. Water mains would need to be extended from the 18-in main along ICBM Road, or from the 12-in main along Samuel C. Phillips Parkway.

No sewer services are currently available at this site. A sanitary sewer lift station would be needed with a force main to existing sanitary sewer piping along Samuel C. Phillips Parkway to satisfy the sanitary sewer needs for this site.

An overhead 13.8 kV power line is located on the north side of Heavy Launch Road. Electrical power service would be obtained from this overhead line.

An underground communications duct bank is located on the south side of Heavy Launch Road. Service would be obtained from the nearest manhole and provide a duct bank under the road to the site.

Two routes are available to get from the site to the launch pads:

- SLC-37/41 – beginning on Heavy Launch Road, travel east to ICBM Road. Proceed northwest on ICBM Road to Samuel C. Phillips Parkway and then north on Samuel C. Phillips Parkway to SLC-37 and SLC-41. Use of this route would require the relocation of two 13.8 kV power line crossings, improve the intersections of Heavy Launch Road and ICBM Road and ICBM Road and Samuel C. Phillips Parkway to provide a minimum 50-foot turning radius, and the relocation of roadway signs.
- SLC-41 – beginning on Heavy Launch Road, travel east to ICBM Road. Proceed northwest on ICBM Road to Samuel C. Phillips Parkway; continue south on Samuel C. Phillips Parkway to Titan III Road, then travel north on Titan III Road to SLC-41. Use of this route would require the relocation of two 13.8 kV power line crossings and one 115 kV power line crossing, improve the intersections of Heavy Launch Road and ICBM Road and ICBM Road and Samuel C. Phillips Parkway to provide a minimum 50-foot turning radius, and the relocation of roadway signs.

Alternative 4 was eliminated from further analysis in this process because it would be within the ILL and FHA for SLC-37 and SLC-41, and construction of the proposed EPF at this site would require extensive work to bring utilities to the site and to accommodate routes to the launch pads.

2.3.5 Alternative 5 – New NRO EPF East of Contractors Road on Kennedy Space Center

Under this alternative, the project would entail all of the components described above except that the proposed facility would be located on the east side of Contractors Road between the existing equipment yard and the security training building (Figure 2-1).

This site was an approved site for a commercial satellite processing facility project undertaken by Lockheed-Martin Corporation in 2001. This project was, however, abandoned after completion of some work. Given that installation of infrastructure components was accomplished in 2001, consideration was given to the utilization of the site.

There is an existing 8-in water main on the east side of Contractors Road along the front of the site. However, an 8-in water main would not meet the needs of the proposed facility. A second water main 24-in in diameter is on the east side of SR 3. This water main would supply the required flows for the site. This 24-in main would need to be tapped and extended to the site.

A sewer force main is present on the west side of Contractors Road. A submersible pump station would be needed to connect to the force main.

An underground 13.8 kV duct bank is present along the east side of Contractors road. A manhole located just north of the site would be available to connect a new service.

An underground communications duct bank is present on the west side of Contractors Road. Service could be obtained from the nearest manhole and a duct bank under the road to the site could be installed

One route is available to reach SLC-37 and SLC-41. Beginning at the site, travel north to Saturn Causeway. Continue east on Saturn Causeway to Samuel C. Phillips Parkway. Proceed south on Samuel C. Phillips Parkway to SLC-37 and SLC-41. Required actions to use this route include the replacement of two culverts under Saturn Causeway; improve the intersections of Contractor's Road and Saturn Causeway and Saturn Causeway and Phillips Parkway to provide a minimum 50-foot turning radius, the relocation of guard shack and appurtenances; extension of a water main; and relocation of roadway signs.

This site was eliminated from further analysis for several reasons:

1. This site is located 8.4 miles north of the launch pads and approximately 14.0 miles from the Skid Strip. Because of this distance, several work shifts would be required to transport flight hardware and support equipment from the Skid Strip to this site.
2. The two culverts that would require replacement are presently old corrugated metal pipes that do not have sufficient earthen cover to support the projected loads from the spacecraft transporters. Structural damage and settlement of the roadbeds above the culverts is already occurring.
3. The site is within the secondary ILL and the FHA for the shuttle launch pads. In addition, return Shuttle flights may add further restrictions.

2.3.6 Alternative 6 – New NRO EPF Near Area 59

Under this alternative, the project would entail all of the components described above except that the proposed facility would be located east of Samuel C. Phillips Parkway and north of Flight Control Road (Figure 2-1).

This site would meet all listed criteria for the proposed facility and site with the exception that the height of the payload processing building would interfere with airfield clearance requirements. Thus, Alternative 6 was eliminated from further analysis in this process.

2.4 Comparison of Alternatives

Table 2-2 provides a comparison of the feasible alternatives (Proposed Action and No-Action Alternative) considered in this analysis. As presented in the preceding sections, many factors were considered in the process of site selection for the new NRO Eastern Processing Facility.

Table 2-2. Comparison of Alternatives.

Resource Area	Proposed Action	No-Action Alternative
AIR QUALITY	Construction Construction-related impacts could result from construction equipment (exhaust emissions) and construction activities (fugitive dust emissions). However, the scope of construction and resulting air emissions are not expected to be of a magnitude that would result in significant adverse impacts. Operations During the operational phase adverse impacts are not anticipated. Transportation of payloads from the Skid Strip to the facility and from the facility to launch complexes would not contribute significant emissions to the local air quality to result in adverse effects.	The proposed facility would not be constructed. No impacts to air quality would result from construction activities or operation of a new facility.
BIOLOGICAL RESOURCES	Construction Construction activities would necessitate the permanent removal of approximately 45 acres of oak scrub vegetation, with no opportunity for restoration. This plant community is not considered sensitive and no special status plant species are present within the area. The federally threatened Florida scrub-jay inhabits the site, which is within an area previously restored for the scrub-jay. The loss of this habitat would be considered a significant adverse effect. Two other federally threatened species within the area, i.e., Eastern indigo snake, and Southeastern beach mouse have the potential to be adversely affected during clearing of vegetation and grading. Section 7 Consultation with the USFWS was completed on August 1, 2005, to address the potential adverse effects on these special status species. All terms and conditions contained in the Biological Opinion would be implemented to minimize adverse effects to these species. ▪ If clearing of habitat occupied by Florida scrub-jays is to occur within scrub-jay nesting season (March 1 through June 30), the area would be surveyed prior to clearing to determine if there are any active scrub-jay nests located within the vegetation. If an active scrub-jay nest is located, to the maximum extent practicable, clearing activities cannot take place within 150 feet of the nest site until nestlings have fledged or until it has been determined that the nest has failed. ▪ The 45 SW will develop an eastern indigo snake protection/education plan to be followed by all construction personnel. The USFWS will review and approve the plan at least 30 days prior to the start of clearing activities (see Appendix E for details). ▪ Only individuals authorized by a section (10)(a)(1)(A) permit issued by the USFWS, or authorized by the Florida Fish and Wildlife Conservation Commission (FWCC) for such activities are permitted to come in contact with or relocate eastern indigo snakes. ▪ If necessary, eastern indigo snakes shall be held in captivity only long enough to transport them to a release site; at no time shall two snakes be kept in the same container during transportation. ▪ In the event that more than one Eastern indigo snake is encountered within the boundaries of the work area, the FWCC would be contacted. ▪ An eastern indigo snake monitoring report must be submitted to the USFWS Jacksonville Field Office within 60 days of the conclusion of clearing activities. The report should be submitted when any eastern indigo snakes are observed or relocated (see Appendix E for details). ▪ If during the course of the project a dead Florida scrub-jay, southeastern beach mouse or eastern indigo snake is found on the project site, the specimen should be thoroughly soaked in water and frozen, and the USFWS Jacksonville Field Office contacted immediately (see Appendix E for details).	The proposed facility would not be constructed. No impacts to air quality would result from construction activities or operation of a new facility.

Table 2-2 (continued)

Resource Area	Proposed Action	No-Action Alternative
BIOLOGICAL RESOURCES (continued)	Construction (continued) ▪ The Proponent will provide funding to the 45 SW to clear 166 acres of Compartment 6 for Florida scrub-jay habitat. A prescribed burn of this compartment will follow as soon as it is deemed ready for burning. ▪ The Proponent will provide funding for a 5-year study to determine the effectiveness of different land management practices as a temporary management tool when prescribed burning has not occurred on Florida scrub-jay habitat. Other special status species within the area, i.e. Gopher tortoise (Florida Species of Special Concern), could be adversely impacted during clearing of vegetation and grading. Pre-construction surveys immediately preceding the removal of vegetation and monitoring during this activity and grading, would prevent accidental crushing by equipment and reduce the potential for adverse impacts to less than significant. Wildlife species in the vicinity of the construction activities would be subject to disturbances. However, the short-term temporary nature of these disturbances would not be considered significant. Operations During the operational phase of the facility, wildlife species that occur in the vicinity of the facility or along the roadways that would be used for transportation of payloads may be temporarily disturbed by noise. This effect would not be considered significant. Cumulative Impacts Two projects have been identified that when considered in conjunction with the Proposed Action, would result in cumulative adverse effects on the Florida scrub-jay as a result of loss of habitat.	
CULTURAL RESOURCES	Construction Two sites recognized under the Florida Office of Cultural and Historical Programs and four additional cultural sites occur within or in the vicinity of the project area. A Phase I cultural resources survey completed within the area of potential effects (APE) indicates that no adverse effects would occur on any archaeological sites or historic properties listed or eligible for listing on the National Register (New South Associates 2005). Operations No adverse effects are anticipated from the operational phase of this project.	The proposed facility would not be constructed. No impacts to air quality would result from construction activities or operation of a new facility.
EARTH RESOURCES	Construction Minor short-term disturbances to soils and the topography of the site are likely as a result of construction activities. However, given the limited area that would be impacted, they would not be considered significant. Operations Activities associated with the operation of the facility would have no impacts on earth resources.	The proposed facility would not be constructed. No impacts to earth resources would result from construction activities or operation of a new facility.
ENVIRONMENTAL JUSTICE	The Proposed Action would occur within the boundaries of Cape Canaveral AFS. No minority or low-income populations reside within this area. Thus no impacts would occur.	The proposed facility would not be constructed. No impacts would result from construction activities or operation of a new facility.

Table 2-2 (continued)

Resource Area	Proposed Action	No-Action Alternative
HAZARDOUS MATERIALS AND WASTE MANAGEMENT	Construction The construction contractor would develop and comply with a Hazardous Materials and Hazardous Waste Management Plan to prevent potential adverse impacts of these substances on the environment. Compliance with the Pollution Prevention Management Plan and implementation of the recommended measures for air quality and hazardous waste management would enhance pollution prevention and reduce the potential adverse effects to less than significant. Operations The Cape Canaveral AFS Risk Management Plan under 40 CFR 68 would be amended and updated as required. Implementation of these measures would ensure potential adverse effects are less than significant.	The proposed facility would not be constructed. No adverse impacts would result from construction activities or operation of a new facility.
LAND USE	The Proposed Action would occur within the boundaries of Cape Canaveral AFS and would not result in a conversion of prime agricultural land, cause a decrease in the utilization of land, nor adversely affect recreation or aesthetics. No adverse impacts on land use are anticipated. The site does not lie within the Florida Coastal Management Act no-development zone. Therefore, construction of this facility is consistent with this Act.	The proposed facility would not be constructed. No impacts to current land use would result from construction activities or operation of a new facility.
NOISE	Construction Based on the magnitude of the construction activities and estimated noise levels that would be generated, the maximum noise level exposures established by OSHA, and the anticipated exposure time to the construction noise, it is anticipated that no adverse impacts would occur. Operations During the operational phase of the project, facility equipment would not generate noise levels above maximum noise level exposures established by OSHA. Vehicles transporting payloads and accompanying convoys would not generate noise that would significantly increase the present noise levels in the area.	The proposed facility would not be constructed. No adverse impacts would result from construction activities or operation of a new facility.
SOCIOECONOMICS	Construction Since the magnitude of this project is small, it is anticipated that all work would be accomplished by already employed personnel working the local or nearby areas. No impacts to the local population and employment are expected. Operations Personnel presently employed at existing facilities would be employed at the new facility during its operational phase. No impacts to the local population and employment are expected.	The proposed facility would not be constructed. No adverse impacts would result from construction activities or operation of a new facility.
TRAFFIC AND TRANSPORTATION	Construction Construction traffic is not expected to adversely affect local traffic given the magnitude of the project. Some traffic restriction would occur during installation of utilities and during road modifications. However, because these restrictions would be short-term they would not be of a magnitude to result in significant adverse effects. Operations Some traffic restrictions would occur during transportation of fueled payloads to launch complexes due to the hazardous nature of this operation. These operations would occur during off-peak hours for traffic, minimizing inconveniences to commuters and workers within the installation.	The proposed facility would not be constructed. No adverse impacts would result from construction activities or operation of a new facility.

Table 2-2 (continued)

Resource Area	Proposed Action	No-Action Alternative
UTILITIES	Construction Increases in electricity and water consumption, and wastewater generation during the construction period are not expected to adversely affect existing systems. The contractor would dispose of and/or recycle solid waste generated during the scope of the construction project. Operations Electricity consumption, water usage, and wastewater generation during the operational phase would not result in a significant increase from current levels and capacities. Thus, no adverse effects are anticipated. The amount of solid waste generated is not expected to exceed allowable amounts.	The proposed facility would not be constructed. No adverse impacts would result from construction activities or operation of a new facility.
WATER RESOURCES	No surface bodies of water are present within the region of influence and groundwater is not used as a source of potable drinking water. Construction activities are not expected to adversely impact groundwater quality or alter the hydrogeologic characteristics of the surficial aquifer. Implementation of storm water management measures would reduce potential adverse impacts to a less than significant level.	The proposed facility would not be constructed. No adverse impacts would result from construction activities or operation of a new facility.

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3 AFFECTED ENVIRONMENT

This chapter describes the environmental setting where the Proposed Action is planned. For each resource area, a region of influence (ROI) was established. The ROI is the geographic area within which a federal action, program, or activity may cause impacts in the natural or man-made environment. The ROIs are described under each of the resources analyzed in this chapter.

3.1 Air Quality

Air quality for Cape Canaveral AFS is regulated under Title 40 CFR 50 (National Ambient Air Quality Standards [NAAQS]), Title 40 CFR 61 and 63 (National Emission Standards for Hazardous Air Pollutants), Title V of the Clean Air Act (CAA), 42 U.S.C. 7401-7671 (Operating Permits), 40 CFR 82 (The Federal Stratospheric Ozone Protection Program), and FAC 62-204.240 seq. (Florida Ambient Air Quality Standards),.

Existing air quality is defined as either being “in attainment” or “in non-attainment” with respect to the NAAQS established by 40 CFR 50, and FAC 62-204.240. An area with ambient air quality better than the NAAQS is designated as being in attainment, whereas areas that do not meet the minimum standards are classified as being in non-attainment.

In Florida, regional air quality is assessed at the county level. Cape Canaveral AFS is located within Brevard County. The U.S. EPA and the FDEP have designated Brevard County as being in attainment for all criteria pollutants. Ambient air monitoring records from monitoring stations maintained by the appropriate state and/or local agency for the affected environment were reviewed to characterize the existing air quality. Information about pollutant concentrations measured for short-term (24 hours or less) and long-term (annual) averaging periods was extracted from the monitoring station data. Table 3-1 shows recent monitored air concentrations near Cape Canaveral AFS.

Emission inventory information for the affected environment was obtained from the FDEP and from Cape Canaveral AFS to describe baseline conditions in the area (U.S. Air Force 2002). The most recent emission inventories for Cape Canaveral AFS and Brevard County are presented in Table 3-2.

Table 3-1. Ambient air concentrations near Cape Canaveral AFS.

Pollutant	Station	2001	2002	2003
Carbon Monoxide (CO) – ppm				
EPA Standards: 1-hour=35ppm 8-hour=9ppm				
1-hour 1 st max	Winter Park, Orange County	8.0	3.8	2.6
1-hour 2 nd max	Winter Park, Orange County	2.7	3.5	2.3
8-hour 1 st max	Winter Park, Orange County	2.1	2.8	1.5
8-hour 2 nd max	Winter Park, Orange County	2.0	2.5	1.5
Nitrogen Dioxide (NO₂) – ppm				
EPA Standards: Annual Mean=0.053ppm				
Annual Mean	Winter Park, Orange County	0.144	0.062	0.065
Ozone (O₃) – ppm				
EPA Standards: 1-hour=0.012ppm 8-hour=0.08ppm				
1-hour 1 st max	Cocoa Beach, Brevard County	0.099	0.09	0.09
	Melbourne, Brevard County	0.102	0.089	0.096
	Winter Park, Orange County	0.1	0.106	0.095
1-hour 2 nd max	Cocoa Beach, Brevard County	0.086	0.085	0.088
	Melbourne, Brevard County	0.094	0.086	0.09
	Winter Park, Orange County	0.093	0.1	0.091
Particulate Matter (PM₁₀) – µg/m³				
EPA Standards: Annual Mean=50µg/m ³				
Annual Mean	Titusville, Brevard County	19	17	19
	Winter Park, Orange County	20	17	18
Sulfur Dioxide (SO₂) – ppm				
EPA Standards: 3-hour=0.5ppm 24-hour=0.14ppm Annual Mean=0.030ppm				
3-hour 1 st max	Winter Park, Orange County	0.032	0.013	0.012
3-hour 2 nd max	Winter Park, Orange County	0.027	0.011	0.011
24-hour 1 st max	Winter Park, Orange County	0.014	0.005	0.006
24-hour 2 nd max	Winter Park, Orange County	0.008	0.005	0.004
Annual Mean	Winter Park, Orange County	0.002	0.001	0.001

Source: U.S. EPA AirData website <http://www.epa.gov/air/data/geosel.html> (1 July 2004).

ppm: parts per million

PM₁₀: particulate matter equal to or less than 10 microns in diameter

µg/m³: micrograms per cubic meter

Table 3-2. Cape Canaveral AFS and Brevard County emissions (tons/year) (U.S. Air Force 2002).

	VOC	NO _x	CO	SO ₂	PM ₁₀
Cape Canaveral AFS 2000 Air Emissions Inventory Report ^a (stationary sources only)	114.57	41.01	584.44	1.58	78.32
1998 Brevard County Point Source Emissions ^b	610	8,067	1,648	25,320	1,842
1998 Brevard County Area Source Emissions ^c	31,918	18,706	198,814	2,275	21,002
1998 Brevard County Total Emissions	32,528	26,773	200,462	27,595	22,844

a. Source: U.S. Air Force 45th Space Wing Environmental Flight (45 CES/CEV), 2000.

b. Source: FDEP database Air Resources Management Systems (ARMS), personal communication.

c. Source: U.S. EPA database National Emission Trends (NET), personal communication.

VOC: volatile organic compounds

NO_x: nitrogen oxides

CO: carbon monoxide

SO₂: sulfur dioxide

PM₁₀: particulate matter equal to or less than 10 microns in diameter

3.2 Biological Resources

Cape Canaveral AFS occupies 15,804 acres of coastal habitat on a barrier island that parallels the mid-Atlantic coast of Florida. The most prominent geographical features at Cape Canaveral AFS, besides the cape itself, are a series of ridges and swales that parallel ancient and current coastlines and support ecologically significant natural communities.

Barrier islands are ecosystems that support many species of plants and animals. Along the Atlantic coast of the United States, barrier islands are especially important to nesting sea turtles, populations of small mammals, and as foraging and roosting habitat for a variety of resident and migratory birds.

The ROI for biological resources under the Proposed Action would cover the land area directly affected by construction activities associated with the project and extend 50 feet beyond the construction disturbance limit, to account for potential effects on wildlife species within the vicinity of the project area.

3.2.1 Vegetation

Cape Canaveral AFS has a series of relic dune ridges and swales parallel to the coastline that support several ecologically significant natural communities, even though the communities are highly fragmented by mission-related construction and clearing. Eleven high-quality natural communities have been documented on the installation (Florida Natural Areas Inventory [FNAI] 1996a): Beach dune, coastal grassland, scrub, xeric hammock, hydric hammock, maritime hammock, coastal strand, coastal interdunal swale, shell mound, estuarine tidal swamp, and estuarine tidal marsh. The topographic position of these natural communities reflects the various erosional and depositional processes of coastal land formation. Generally, older communities are found on the westward margin of the Canaveral Peninsula, along the Banana River; newer and successional communities are forming along the eastern coast.

The most common vegetative communities on Cape Canaveral AFS are the indigenous Florida coastal scrub (including oak and rosemary scrub), and xeric and maritime hammocks. Coastal strand, coastal dune, and grasslands can be found along the 13 miles of shoreline along the Atlantic Ocean. Seagrasses are found in the nearby rivers. Numerous wetlands and associated vegetation communities including hydric hammock, interdunal swales, and estuarine tidal swamps and marshes can be found on Cape Canaveral AFS and its 12-mile shoreline along the Banana River. The remaining areas are associated with the cleared launch complexes and support facilities (45 SW 2001).

The dominant habitat in the area proposed for the new EPF is oak scrub. However, in March 2005, 38 of the 45 acres of oak scrub that occupied the site for the proposed EPF were cut with a hydro axe and subsequently mulched. A few small oaks and palm trees remain on the site. Oak scrub covers the remaining seven acres. Oak scrub on Cape Canaveral AFS occupies the highest, driest habitats. It consists of densely growing shrubs that include myrtle oak (*Quercus myrtifolia*), sand live oak (*Quercus geminata*), saw palmetto (*Serenoa repens*), and Chapman oak (*Quercus chapmanii*). Other plant species that can occur in scrub are sand pine (*Pinus clausa*) and Florida hickory (*Carya floridana*). Sand pine does not occur in any other community on Cape Canaveral AFS and is therefore considered indicative of scrub.

Saw palmetto is abundant in oak scrub, forming a dense shrub layer in many areas. Other shrub species found frequently in oak scrub are rusty lyonia (*Lyonia ferruginea*), wax myrtle (*Myrica cerifera*), hog plum (*Ximenia americana*), and shiny blueberry (*Vaccinium myrsinites*). Herb species diversity is high along the edges of scrub and in open clearings. Such areas frequently contain herbs such as silky golden aster (*Pityopsis graminifolia*), October-flower (*Polygonella polygama*), clammy weed (*Polanisia tenuifolia*), gopher apple (*Licania michauxii*), partridge pea (*Chamaecrista fasciculata*), and false foxglove (*Agalinis setacea*). Vines are often abundant in oak scrub. Muscadine grape (*Vitis rotundifolia*), Calusa grape (*V. shuttleworthii*), catbrier (*Smilax auriculata*), and Virginia creeper (*Parthenocissus quinquefolia*) are found in most scrubs.

Oak scrub is a fire-maintained community with hot, intense fires occurring every 20 to 80 years. Fire suppression over the years has resulted in a densely vegetated scrub that, if burned, would result in a catastrophic fire that would completely remove the vegetation from the area. The Integrated Natural Resources Management Plan for Cape Canaveral AFS includes a burn plan to manage scrub oak.

Openings and edges in oak scrub, where fire or mechanical removal of trees has exposed bare sand, can support a number of rare plant species (FNAI 1996b). No rare or special status plant species have been documented within the ROI for the Proposed Action.

3.2.2 Wildlife

An abundant number of wildlife species inhabit, use and/or frequent Cape Canaveral AFS. Common wildlife species that would be expected to occur within the oak scrub habitat of Cape Canaveral AFS include Virginia opossum (*Didelphis virginiana*), raccoon (*Procyon lotor*), Eastern spotted skunk (*Spilogale putorius*), bobcat (*Lynx rufus*), gray fox (*Urocyon cinereoargenteus*), Southeastern pocket gopher (*Geomys pinetis*), Eastern cottontail rabbit (*Sylvilagus floridanus*), brown anole (*Anolis sagrei*), and Southern black racer (*Coluber constrictor*). In addition, numerous species of birds that are federally protected by the Migratory Bird Treaty Act (MBTA) of 1918, as amended (16 USC 703-712) occur on or near the site for the proposed project. The MBTA provides federal protection to all native avian species, their nests, eggs, and unfledged young. Bird species that are likely to occur include mourning dove (*Zenaida macroura*), house wren (*Troglodytes aedon*), loggerhead shrike (*Lanius ludovicianus*), brown thrasher (*Toxostoma rufum*), and eastern towhee (*Pipilo erythrophthalmus*).

3.2.2.1 Special Status Wildlife Species

Openings and edges in oak scrub, where oaks have been mechanically removed and bare sand is exposed, support a number of rare animal species. The oak scrub within the proposed project area supports three special status wildlife species: Florida scrub-jay (*Aphelocoma coerulescens*), Eastern indigo snake (*Drymarchon corais couperi*) and gopher tortoise (*Gopherus polyphemus*) (Table 3-3). In addition, recent surveys at Cape Canaveral AFS suggest that the southeastern beach mouse (*Peromyscus polionotus vieiventris*) also has the potential to occur within the proposed project area (A. Chambers, pers. comm.).

Table 3-3. Special status wildlife species known to occur or with potential to occur within the site proposed for the NRO EPF on Cape Canaveral AFS.

Common Name Scientific Name	Designated Status*		Potential for Occurrence at Site
	USFWS	FWCC	
Eastern indigo snake <i>Drymarchon corais couperi</i>	T	T	Known to occur
Florida scrub-jay <i>Aphelocoma coerulescens</i>	T	T	Known to occur
Southeastern beach mouse <i>Peromyscus polionotus niveiventris</i>	T	T	Potential to occur
Gopher tortoise <i>Gopherus polyphemus</i>		SSC	Known to occur

* USFWS = U.S. Fish and Wildlife Service FWCC = Florida Fish and Wildlife Conservation Commission T = Threatened SSC = Species of Special concern

Eastern indigo snake

The longest of North American snakes (up to 8.6 ft), the Eastern indigo snake is locally abundant in parts of Florida, but as a top carnivore, population densities are typically low. The Eastern indigo snake has been found on Cape Canaveral AFS and likely occurs throughout the station. This primarily diurnal snake is known to occur in most types of habitat and is often associated with gopher tortoise burrows, which it occupies when inactive. The reproductive season encompasses copulation (November through April), egg laying (May through June), and hatching (late July through October). Home ranges for male indigos range from 191 to 360 acres and female home ranges vary between 14 and 130 acres (U.S. Air Force 2002). Major threats to the indigo snake on Cape Canaveral AFS are habitat loss and vehicle traffic. The Eastern indigo snake is expected to occur within the proposed project area.

Florida scrub-jay

The Florida scrub-jay was listed as a Federal threatened species under the ESA in 1987. It is restricted mostly to scrub ridges of central peninsular Florida, with a few scattered occurrences on Gulf and Atlantic coastal ridges. The scrub-jay is a year-round resident that is territorial and displays strong site fidelity. Its habitat requirements include low, dense oak thickets with numerous interspersed open sand areas (Woolfenden 1978). As little as five to 10 acres of suitable habitat may support a mated pair. Scrub-jays have a cooperative breeding system where the young may remain in natal territory as helpers at nests of older birds up to several years (Woolfenden 1973). Except where subject to habitat loss and fragmentation, most scrub-jays disperse short distances (one to three territory widths) and occupy a territory for life after becoming breeders (Breininger et al. 1996).

The scrub-jay population on Cape Canaveral AFS is believed to be one of the largest populations currently in existence (Cox 1984, 1987, Stevens and Hardesty 1998), and is considered part of a larger metapopulation that includes birds on KSC and Canaveral National Seashore (CNS) (U.S. Air Force 2001). The Air Force contracts with Florida Natural Areas Inventory, Florida State University to study the demography of Florida scrub-jays on Cape Canaveral AFS. All suitable accessible jay habitat is censused on a yearly basis between January and March, and nesting activity is monitored from February to July of each year. The numbers of groups (breeding pair and non-breeding helpers) has dropped

from 157 with a total of 418 birds in 1996, to 106 groups with a total of 276 birds in 2004 (Stevens and Knight 2004).

It is generally accepted that scrub-jay numbers on Cape Canaveral AFS could be declining as a result of various factors, including lack of suitable habitat. The most common loss of habitat results from new construction. Although most new construction typically requires less than five acres, the cumulative impact of several new construction projects could be significant for the scrub-jay population at Cape Canaveral AFS. Another significant threat to scrub-jays on Cape Canaveral AFS is the disruption of fire ecology within the ecosystem. Historically, fires started by lightning were an important factor in maintaining the sparse, low scrub vegetation needed by the scrub-jay. Fire suppression over the last 40 years on Cape Canaveral AFS has influenced the vegetative structure. Exclusion of fire in these communities eliminates open sandy areas and can lead to succession from low scrub to xeric hammock (Veno 1976). Because of the loss of scrub habitat due to disruption of natural fire cycles and clearing for homes and agriculture, the populations that remain are small, demographically isolated, and likely to decline (U.S. Air Force 2001). Based on the nine years of study of scrub-jays on Cape Canaveral AFS, Stevens and Knight (2004) conclude that if the Cape Canaveral AFS population of Florida scrub-jays is to persist, it must grow; the only avenue for this to occur is by increasing the amount of optimal scrub habitat on the installation.

At the present time, there is no optimal scrub habitat on Cape Canaveral AFS (Stevens and Knight 2004). Management actions for scrub-jays on Cape Canaveral AFS are primarily oriented toward habitat improvement. Since the majority of Cape Canaveral AFS is or could be scrub-jay habitat, many land clearing activities have the potential to adversely impact scrub-jays and their habitat. The USFWS has designated Cape Canaveral AFS as part of a core scrub-jay area, indicating that all scrub habitat on Cape Canaveral AFS is highly valuable to the recovery of the species. Consultations between the USFWS and the Air Force led to the development of a *Scrub-Jay Management Plan* for Cape Canaveral AFS in 1991. The current version of this plan is included in Appendix C. A *Scrub Habitat Restoration Plan* was developed subsequent to the management plan, and provides a strategy for restoring the scrub habitat needed by this Federally threatened species on Cape Canaveral AFS (Appendix C). The objective of scrub habitat restoration on Cape Canaveral AFS is to restore the over-mature scrub to a condition suitable to support the Florida scrub-jay. The main methods used for habitat restoration are mechanical treatment to reduce height of the scrub and prescribed burning of mechanically treated sites to provide open patches of sand and prevent accumulation of fuels. Currently the Air Force uses prescribed fires in selected portions of the coastal scrub. Stevens and Knight (2004) reported that because suitability of scrub in restored plots declines rapidly after only three to five years, follow-up burns, or treatments where burns are not feasible, should be done with frequency to reduce the density and height of scrub re-growth following initial treatment.

The site selected under the Proposed Action is located within the Phillips Parkway corridor, an area targeted for scrub restoration (see maps in Appendix C). Furthermore, the proposed site is within Compartment 100, an area that was treated in 2000, with Compartment 99 adjacent to the north, Compartment 101 to the west of Phillips Parkway, and Compartment 116 to the south of Lighthouse Road (see maps in Appendix C). Breeding surveys conducted between 1999 and 2004 document the continuous presence of scrub-jays in the habitat within the proposed project area and its vicinity (i.e., Compartments 99 and 100). During the 2004 census, five groups totaling 12 individuals were documented within this area (Stevens and Knight 2004). However, the number of groups present during the breeding season increased to 11, with six confirmed nests throughout the 2004 breeding

season (Stevens and Knight 2004). In March 2005, the vegetation in 38 of the 45 acres where the proposed EPF would be constructed were cut with a hydro axe and subsequently mulched. While a few small oaks and palm trees remain and oak scrub still covers the remaining seven acres, it is anticipated that scrub-jay use of this area would be reduced.

Southeastern beach mouse

The Southeastern beach mouse is a subspecies of the widely distributed beach mouse (*Peromyscus polionotus*). Originally occurring on coastal dunes and coastal strand communities along the Atlantic coast of Florida, this beach mouse generally occurs along the primary dune line for a distance of approximately 24 kilometers, and is presently known from six sites in Brevard, Indian River, and St. Lucie Counties. Trapping has shown the beach mouse to be present in a discontinuous pattern (J. Stout, pers. comm.). Most breeding activity occurs November through January, and females can produce two or more litters per year, and litters averaging three to four (USFWS 1988). The extirpation of the beach mouse from most of its historical range is a result of human development of the coastal barrier islands. It is suspected that coastal populations fluctuate in abundance from site to site, but reoccupy dunes should local numbers decline to zero (J. Stout, pers. comm.).

The most viable populations of this species of mouse are now present only at Canaveral National Seashore, KSC and Cape Canaveral AFS. Cape Canaveral AFS is the only remaining unfragmented section of coastal dune and strand that still supports large numbers of the beach mouse. On Cape Canaveral AFS, the mice occur from the coastal dunes inland to the west side of Samuel C. Phillips Parkway, and are generally found where the sand is suitable for burrows, coastal scrub is present, and the water table is not close to the surface. (Oddy et al. 1999; J. Stout, pers. comm.). While inland populations may be more stable, their abundance varies from site to site inland of the dune system. However, nearly every coastal scrub site surveyed on Cape Canaveral AFS, supports the beach mouse (J. Stout, pers. comm.).

Although the Proposed Action site has not been surveyed, the abundance of beach mice present at a site approximately one mile south (at Pier Road and Samuel C. Phillips Parkway) suggests that this species is likely to also be present at the Proposed Action site (J. Stout, pers. comm.).

Gopher tortoise

The gopher tortoise is a relatively large (carapace length up to 1.2 ft) terrestrial turtle that is active year round but spends a limited amount of time above ground. Gopher tortoises occur in habitats with a well-drained sandy substrate, ample herbaceous vegetation for food, and sunlit areas for nesting. These habitat types include sandhill, sand pine scrub, xeric hammock, pine flatwoods, dry prairie, coastal grasslands, and dunes, and mixed hardwood-pine communities. Gopher tortoises are highly fossorial and construct extensive burrow systems (approximately 15 ft long and 6.5 ft deep [Diemer 1989]), where they spend much of the time. Nesting occurs from late April to mid-July. Clutches averaging 5-6 eggs, hatch from August through September. Nests may be located in any open sunny area near the burrow of the female, but most often, nests are placed in the spoil mound immediately outside the female's burrow. Adult females produce one clutch per year, with some adults not nesting every year.

The primary reason for the decline of this species throughout the southeast is habitat loss. The gopher tortoise is afforded protection by the Air Force due to its State ranking and

the commensal use of its burrow by other federally protected species (i.e., Eastern indigo snake). Gopher tortoises are known to reside within the proposed project area. In addition, this management unit served as a recipient site for 17 tortoises relocated in support of another project during 2001 (A. Chambers, pers. comm.).

Although no surveys were completed prior to the clearing of vegetation that occurred in March 2005, a post clearing survey did not document the presence of any burrows. It is possible that burrows were covered and entombed as a result of the presence of heavy equipment or that no burrows were present within the site.

3.2.2.2 Other Special Status Wildlife Species Affected by the Proposed Action

Three species of special status sea turtles have been documented as nesting on Cape Canaveral AFS: The federal and Florida state threatened loggerhead sea turtle (*Caretta caretta*), and the federal and Florida state endangered green sea turtle (*Chelonia mydas*), and leatherback sea turtle (*Dermochelys coriacea*). While sea turtles spend much of their lives roaming ocean waters, females come ashore each year to nest. Research has demonstrated that females will avoid highly illuminated beaches and postpone nesting (Witherington 1992). Artificial lights have also resulted in hatchling mortality as disoriented hatchlings move towards these light sources and dunes rather than ocean waters. In 1988, in compliance with Section 7 of the Endangered Species Act (ESA), the U.S. Air Force and the USFWS developed Light Management Plans (LMP) for various areas and facilities on Cape Canaveral AFS to protect nesting sea turtles. A Biological Opinion issued by the USFWS on 9 April 1999, and updated on 2 May 2000 requires that all new facilities develop a Light Management Plan. The 45th Space Wing Instruction (45 SWI) 32-7001, *Exterior Lighting Management*, of 1 April 2003, implements the Biological Opinion and explains management responsibilities, exterior lighting restrictions and reporting requirements necessary for the 45 SW to remain in compliance with Federal, State, and local standards. This 45 SWI requires that an area LMP be developed for new, large construction projects within 45 SW jurisdiction to ensure that lighting issues for that particular site are addressed from design through post-construction. Specifically, 45 SWI 32-7001 mandates that exterior lighting that is not mission-, safety-, or security-essential, be extinguished during the sea turtle nesting season, 1 April through 31 October, between the hours of 2100 and 0600. It further mandates that mission-essential operations that require artificial lighting will be accomplished using LPS light fixtures, and allows for the use of well-shielded, high-pressure sodium (HPS) lights only where color rendition or explosion-proof fixtures are required, and only with prior approval from the 45th Environmental Flight (45 CES/CEV).

3.3 Cultural Resources

Cultural resources include prehistoric and historic sites, structures, districts, artifacts, or any other physical evidence of human activity considered important to a culture, subculture, or community for scientific, traditional, religious, or any other reasons.

Numerous laws and regulations require that possible effects to cultural resources be considered during the planning and execution of federal undertakings. These laws and regulations stipulate a process of compliance, define the responsibilities of the federal agency proposing the action, and prescribe the relationship among other involved agencies

(e.g., the State Historic Preservation Officer [SHPO] and the Advisory Council on Historic Preservation). In addition to the NEPA, the primary laws that pertain to the treatment of cultural resources during environmental analysis are the National Historic Preservation Act (NHPA) (especially Sections 106 and 110) the Archaeological Resources Protection Act (ARPA), the American Indian Religious Freedom Act (AIRFA), and the Native American Graves Protection and Repatriation Act (NAGPRA).

Only those cultural resources determined to be potentially significant under the above-cited legislation are subject to protection from adverse impacts resulting from an undertaking. To be considered significant, a cultural resource must meet one or more of the criteria established by the National Park Service that would make that resource eligible for inclusion in the National Register of Historic Places [National Register]). The term "eligible for inclusion in the National Register" includes all properties that meet the National Register listing criteria, which are specified in the Department of the Interior regulations Title 36 CFR 60.4 and National Register Bulletin 15.

Therefore, sites not yet evaluated may be considered potentially eligible for inclusion in the National Register and, as such, are afforded the same regulatory consideration as nominated properties. Whether prehistoric, historic, or traditional, significant cultural resources are referred to as "historic properties."

Archaeological investigations at Cape Canaveral AS indicate that human occupation of the area first occurred approximately 4,000 years ago. Early settlement was focused within the Banana River salt marsh environment; however, over time, site distribution and size fluctuated, and there is archaeological evidence that the entire peninsula was exploited for a wide variety of marine, estuarine, and terrestrial resources.

European exploration and contact with native populations of the Florida coast began in the 15th century. Numerous Spanish treasure ships navigated the area throughout the 1500s, and in 1564, a French colony was established near the mouth of the St. John's River. Hostilities developed between the French and Spanish, and although the native populations remained somewhat independent of these activities, displacement from their native lands, European diseases, and slavery ultimately resulted in their dispersal and demise. By the 1760s, the Cape Canaveral area was inhabited by only a few Spaniards and, according to historical accounts, the area remained sparsely populated until 1843 when a lighthouse was established. Historic homesteading followed, and by 1880, several citrus farms existed along the Banana River. Maritime activities increased during the early 1900s, and additional homesteads and roads were established between the Banana River and the Atlantic coastline. Fishing, gardening, berry gathering, beekeeping, and fruit farming all flourished until the late 1940s when the U.S. government began purchasing land on the peninsula for the establishment of a long-range proving ground and missile test center.

For the purposes of this analysis, the term ROI is synonymous with the "area of potential effect" (APE) as defined under cultural resources legislation. In general, the ROI for cultural resources encompasses all areas requiring ground disturbance.

3.3.1 Cultural Resources Studies in the Project Vicinity

Numerous archaeological surveys have been conducted at Cape Canaveral AS (Bense and Philips 1990; Cantley et al. 1994; Le Baron 1884; Levy et al. 1984; Long 1967; Moore 1922; Rouse 1951; Stirling 1935; USACE 1988, 1989, 1990, 1991; and Wiley 1954). In 1992, the USACE synthesized data from several of these studies and developed a

cultural resources sensitivity map for Cape Canaveral AFS (New South Associates 1996). A follow-on archaeological survey in 1993 revealed 51 Native American sites on Cape Canaveral AFS (New South Associates 1994). Eleven of these sites have been determined to be eligible for listing in the National Register.

3.3.2 Cultural Resources Within and in the Vicinity of the Project Area

Two sites recognized under the Florida Office of Cultural and Historical Programs, Florida Master Site File, occur near the site of the Proposed Action (8BR557 and 8BR558). A Phase I cultural resources survey was completed at the proposed EPF site in March 2005 (New South Associates 2005; see Appendix D). This survey found limited evidence of 8BR558 remains in the southeast corner of the proposed project area, outside the area of direct effects. In addition, four small shell and artifact scatter sites (8BR1894, 8BR1895, 8BR1896, and 8BR1897) were identified within the APE.

8BR557

Site 8BR557 is on a sandy ridge that has experienced severe disturbance as a result of construction of a road that parallels the top of the ridge crest. The site was first described by the USACE in 1989 as a small ceramic and shell midden scatter located almost entirely within the disturbed area of the ridge, not extending eight meters on either side beyond the ridge crest. A re-evaluation of the site in 1993 by New South Associates revealed the site to be approximately 150 m long. Shovel test pits excavated in a cruciform pattern across the site failed to reveal additional cultural material or midden deposits beyond the areas identified during the previous survey. The low output of cultural materials indicates the site was most likely a special purpose activity locus occupied for a brief period of time. Due to the degree of disturbance, the site is not considered eligible for inclusion on the National Register, and no additional work is recommended (Cantley et al. 1994).

8BR558

Site 8BR558 is on a sandy ridge partially destroyed by the construction of a missile range control complex in 1957. The USACE first described the site in 1989 as a ceramic and shell midden scatter covering approximately 2,812 m. The presence of an intact midden deposit and the potential for providing information pertaining to the prehistoric use of this environment resulted in the determination that the site was potentially eligible for inclusion in the National Register. New South Associates revisited the site in 1993 to re-evaluate its status and determined the site to be approximately 4,050 m². Shovel test pits excavated in a cruciform pattern west of the disturbed area where the range control complex once existed encountered soils with shell but failed to detect any additional prehistoric ceramics. It appeared that a large portion of the site was destroyed in 1957 with the construction of the range control complex, with only a portion of the site remaining intact. A recommendation was made that the site be considered not eligible for inclusion in the National Register and further work is not recommended (Cantley et al. 1994).

8BR1894

This site was discovered during the Phase I cultural resources survey for the Proposed Action. Eleven shovel tests produced one small turtle bone and one fish vertebra, one fish otolith, a thin lens of spare coquina shell, and a St. Johns Plain ceramic sherd. A thorough surface examination of exposed ground in the vicinity failed to identify any

artifacts. Based on the single sherd in one shovel test and the lens of coquina in another, the finds were considered an archaeological site (New South Associates 2005).

8BR1895

This site was discovered during the Phase I cultural resources survey for the Proposed Action. Six shovel tests produced seven St. Johns Plain ceramic sherds (from the same vessel), a thin coquina shell lens, and a sparse quantify of faunal remains. A thorough surface examination of exposed ground in the vicinity failed to identify any artifacts. Based on the presence of the one sherd in one shovel test and the thin coquina shell lens, the remains were considered an archaeological site (New South Associates 2005).

8BR1896

This site was discovered during the Phase I cultural resources survey for the Proposed Action. Six shovel tests produced one large unmodified knobbed whelk shell, a thin coquina shell lens with associated faunal remains, and a light coquina lens with one fish oolith. A thorough surface examination of exposed ground in the vicinity failed to identify any artifacts. Based on the scant cultural evidence identified, the site is considered a locus of limited activity and its function is indeterminate (New South Associates 2005).

8BR1897

This site was discovered during the Phase I cultural resources survey for the Proposed Action. Four of thirteen shovel tests produced thin coquina shell lens with sparse faunal remains. A thorough surface examination of exposed ground in the vicinity failed to identify any artifacts. The site is considered a small, temporary, limited-activity area site of unknown function (New South Associates 2005).

Concrete Remains

Several small concrete pads were identified during the Phase I cultural resources survey in the northeast corner of the proposed EPF footprint, within and outside of the APE. Only two pairs of pads are located within the APE. These remains were identified as instrument pads used in the 1960s and removed in 1971. The remains are not considered historically significant and were not recorded on the Florida Master Site File (New South Associates 2005).

Samuel C. Phillips Parkway Entrance Road

The proposed access to the EPF facility from Samuel C. Phillips Parkway follows an existing road for a short distance. That road is believed to be from the Cape Canaveral AFS years and not from an earlier historic homestead. A thorough surface examination of exposed sandy surfaces in the area did not identify historic artifacts and the road was not recorded on the Florida Master Site File.

3.4 Earth Resources

3.4.1 Topography

Cape Canaveral AFS is on the Canaveral Peninsula, a barrier island along the eastern coast of Florida. The Canaveral Peninsula is composed of relict beach ridges formed over the past 8,000 years by wind and wave action. The island is 4.5 miles wide at its widest point. Its land surface ranges from sea level to 20 ft above mean sea level (MSL). The average land surface elevation is approximately 10 ft above MSL. The higher naturally occurring elevations occur along the eastern portion of Cape Canaveral AFS, with a gentle slope to lower elevations toward the wetlands fringing the Banana River.

3.4.2 Geology and Soils

Four stratigraphic units generally define the geology underlying Cape Canaveral AFS: the surficial sands, the Caloosahatchee Marl, the Hawthorn Formation, and the limestone formations of the Floridan aquifer (U.S. Air Force 1991). The surficial sands immediately underlying the surface are marine deposits that typically extend to depths of approximately 10 to 30 ft below the surface. The Caloosahatchee Marl underlies the surficial sands and consists of sandy shell marl that extends to a depth of 70 ft below the surface. The Hawthorn Formation, which consists of sandy limestone and clays, underlies the Caloosahatchee Marl and is the regional confining unit for the Floridan aquifer. This formation is generally 80 to 120 ft thick, typically extending to a depth of approximately 180 ft below the surface (U.S. Air Force 1991). Beneath the Hawthorn Formation lie the limestone formations of the Floridan aquifer, which extend several thousand feet below the surface at Cape Canaveral AFS (U.S. Air Force 1991).

The principal geologic hazard in central Florida is sinkholes that develop when overlying soils collapse into existing cavities. Cape Canaveral AFS is not located in an active sinkhole area. An in-depth review completed in 1998 did not reveal the presence of any sinkholes (U.S. Air Force 1998). The Canaveral Peninsula is not prone to sinkholes, since the limestone formations are over 100 ft below the ground surface, and confining units minimize recharge to the limestone (45 SW 1996a).

A seismological investigation conducted by the U.S. Department of Commerce shows that the underground structure in the heavy launch area is free of anomalies, voids, and faults (45 SW 1995). Cape Canaveral AFS is located in Seismic Hazard Zone 0 as defined by the Uniform Building Code (International Conference of Building Officials 1991). Seismic Zone 0 represents a very low potential risk for large seismic events.

The three most prominent soil types at Cape Canaveral AFS comprise the Canaveral-Palm Beach-Welaka Association. This association is made up of nearly level and gently sloping ridges interspersed with narrow wet sloughs that generally parallel the ridges. The soils have rapid permeability and low available water capacity due to the near-surface water table. This permeability rate allows water to rapidly dissipate into the ground. According to the General Plan (45 SW 1996a), limitations to development are slight to moderate for light industrial uses. No problems associated with previous construction activities at launch complexes have been identified. There are no prime or unique farmland soils on Cape Canaveral AFS (Pan Am World Services, Inc. 1989).

3.5 Environmental Justice

The President issued EO 12898, *Environmental Justice*, on February 11, 1994. A Presidential Transmittal Memorandum accompanying this EO states that “Each Federal agency shall analyze the environmental effects, including human health, economic and social effects, of Federal actions, including effects on minority communities and low-income communities, when such analysis is required by the NEPA 42 USC Section 4321, et seq.” Under 32 CFR Part 989.33, environmental justice analyses, as specified in the EO, are to be included in U.S. Air Force NEPA documents.

The 2000 Census of Population and Housing reports numbers of both minority and property residents. Minority populations included in the census are identified as Black or African American, American Indian and Alaska Native, Asian, Native Hawaiian and Other Pacific Islander, Hispanic or Latino, and Other. Poverty status is reported as the number of families with income below the federal poverty level. The federal poverty level in 1999 for a family of four in the lower 48-states was \$17,029.

Most environmental impacts resulting from the Proposed Action at Cape Canaveral AFS would be expected to occur within Brevard County, Florida. Based upon the 2000 Census of Population and Housing, Brevard County had a population of 476,230 persons. Of this total, 77,625 persons, or 16.3 percent, were minority, and 45,242 persons, or 9.5 percent, were below the poverty level.

3.6 Hazardous Materials and Waste Management

3.6.1 Hazardous Materials Management

Hazardous materials are those substances defined as hazardous by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 USC Sections 9601-9675), the Toxic Substances Control Act (TSCA) (15 USC Sections 2601-2671), and the Hazardous Materials Transportation Act (HMTA) (49 USC Section 1801, Parts 172-173). In general, this includes substances that, because of their quantity, concentration, or physical, chemical, or infectious characteristics, may present substantial danger to public health or welfare, or to the environment, when released. AFI 32-7086, *Hazardous Materials Management*, establishes procedures and standards that govern management of hazardous materials on Air Force installations.

Numerous types of hazardous materials are used to support the various missions and general maintenance operations at Cape Canaveral AS. These materials range from common building paints to industrial solvents and hazardous fuels. Management of hazardous materials, excluding hazardous fuels, is the responsibility of each individual or organization.

Spills of hazardous materials are covered under the 45 SW Operations Plan (OPlan) 32-3, *Hazardous Materials Response Plan*, which ensures that adequate and appropriate guidance, policies, and protocols regarding hazardous material incidents and associated emergency response are available to all installation personnel (45 SW 1996b).

3.6.2 Hazardous Waste Management

Management of hazardous waste must comply with the Resource Conservation and Recovery Act (RCRA), as amended by the Hazardous and Solid Waste Amendments of 1984 (HSWA) (42 USC Sections 6901-6992), which is administered by the U.S. EPA, unless otherwise exempted through CERCLA actions. Title C Part 261 identifies which solid wastes are classified as hazardous waste. RCRA requires that hazardous wastes be treated, stored, and disposed of to minimize the present and future threat to human health and the environment. Air Force guidance in AFI 32-7042, *Solid and Hazardous Waste Compliance*, provides a framework for complying with environmental standards applicable to hazardous waste. Hazardous waste materials on Cape Canaveral AFS are handled according to 45 SW OPLAN 19-14, *Petroleum Products and Hazardous Waste Management Plan*.

3.6.3 Pollution Prevention

The federal Pollution Prevention Act (PPA) of 1990 established pollution prevention as a national objective. It is DoD acquisition policy to eliminate and reduce the use of hazardous materials during a system's acquisition (DoD 5000.2-R, Mandatory Procedures for Major Defense Acquisition Programs [MDAPs] and Major Automated Information System [MAIS] Acquisition Programs, Sections 4.3.7.4 and 4.3.7.5). Air Force Policy Directive (AFPD) 32-70, *Environmental Quality*, outlines the Air Force policy for pollution prevention and references AFI 32-7080, *Pollution Prevention Program*, which defines the Air Force's Pollution Prevention Program requirements. AFI 32-7080 instructs all Air Force installations to implement a hierarchy of actions into daily operations to reduce the use of hazardous materials and the release of pollutants into the environment. In addition, Executive Order (EO) 13101, *Greening the Government Through Waste Prevention, Recycling and Federal Acquisition*, requires the use of sustainability concepts during the planning, design, construction, operation, and demolition of all Air Force facilities. Sustainable design techniques include designing for HAZMAT reduction, disassembly and recyclability, durability and life extension, reduced maintenance, energy conservation, or water conservation. EO 13101 further requires the use of Environmentally Preferred Products (EPP) which have reduced toxicity and hazardous characteristics or reduced embodied energy in its manufacturing. The Federal EPA provides comprehensive on-line EPP training in the "Tools and Resources" section of their EPP web site (www.epa.gov/opptintr/epp/toolspage.htm).

The hierarchy of actions to prevent pollution is as follows: source reduction, waste reuse, waste recycling and, as a final option, waste disposal.

3.6.4 Installation Restoration Program

The Installation Restoration Program (IRP) is an Air Force program that identifies, characterizes, and remediates past environmental contamination on Air Force installations. The program has established a process to evaluate past disposal sites, control the migration of contaminants, and control potential hazards to human health and the environment. In response to CERCLA and Section 211 of Superfund Amendments and Reauthorization Act (SARA) requirements, DoD established the Defense Environmental Restoration Program (DERP) to facilitate clean up of past hazardous waste disposal and spill sites nationwide. Section 105 of SARA mandates that response actions follow the National Oil and Hazardous

Substances Pollution Contingency Plan, as promulgated by the U.S. EPA. AFI 32-7020, *The Environmental Restoration Program*, implements the DERP as outlined in DoD Manual 5000.52-M, Environmental Restoration Program Manual.

IRP sites at 45 SW facilities include abandoned launch complexes and support facilities, fire-fighter training areas, fuel storage and dispensing areas and several abandoned landfills. Most sites either used hazardous materials or were used to dispose of hazardous and typical municipal wastes from the 1940's through the early 1980's. To date, 199 Solid Waste Management Units (SWMU) are identified on Cape Canaveral AFS. Of these, 126 SWMUs are approved for no further action; 20 SWMUs are in long-term management or undergoing remediation, and 53 SWMUs are undergoing investigation.

No SWMUs are present within the Proposed Action area.

3.7 Land Use

Cape Canaveral AFS encompasses approximately 15,804 acres, representing approximately two percent of the total land area of Brevard County. Land uses at Cape Canaveral AFS include launch operations, launch and range support, airfield, port operations, station support area, and open space. The launch operations land use category is present along the Atlantic Ocean shoreline and includes the active and inactive launch sites and support facilities. The launch and range support area is west of the launch operations land use area and is divided into two sections by the airfield. The airfield includes a single runway, taxiways, and apron, and is in the central part of the installation. The port operations area is in the southern part of the installation and includes facilities for commercial and industrial activities. The major industrial area is located in the center of the western portion of the installation, near the Banana River. Although many of the activities are industrial in nature, this land use area includes administrative, recreational, and range support functions. Open space is dispersed throughout the station. Because of its technical characteristics, Cape Canaveral AFS lacks the commerce, community, housing, and recreational amenities that are found on most U.S. Air Force installations. There are no public beaches located on Cape Canaveral AFS.

3.7.1 Coastal Zone Management

Federal activity in, or affecting, a coastal zone requires preparation of a Coastal Zone Consistency Determination, in accordance with the federal Coastal Zone Management Act (CZMA) of 1972, as amended (P.L. 92-583), and implemented by the National Oceanic and Atmospheric Administration (NOAA). This act was passed to preserve, protect, develop and, where possible, restore or enhance the nation's natural coastal zone resources, which include wetlands, floodplains, estuaries, beaches, dunes, barrier islands, coral reefs, and fish and wildlife and their habitat. The act also requires the management of coastal development to minimize the loss of life and property caused by improper development in a coastal zone. Responsibility for administering the Coastal Zone Management Program (CZMP) has been delegated to states that have developed state-specific guidelines and requirements. A federal agency must ensure that activities within the coastal zone are consistent with that state's coastal zone management program.

The Florida Coastal Management Program, formed by the Florida Coastal Management Act (FCMA), applies to activities occurring in or affecting the coastal zone in Brevard County. The entire state of Florida is defined as being within the coastal zone. For planning purposes, a “no development” zone has been established. In Brevard County, the no development zone extends from the mean high water level inland 75 feet. Cape Canaveral AFS has additional siting and facility design standards for construction near the coast, which require that facilities be set back at least 150 feet from the coast. The Florida Department of Community Affairs (FDCA) is the lead coastal management agency in the state. The U.S. Air Force is responsible for making the final coastal zone consistency determinations for its activities within the state, and the FDCA reviews coastal zone consistency determinations.

3.7.2 Recreation

Recreational activities near Cape Canaveral AFS center mainly around the coastal beaches and large expanses of inland waters in the Indian and Banana rivers, the St. John’s River, and large freshwater lakes. Boating, surfing, water skiing, and fishing are common activities. Brevard County provides several parks within the area surrounding the station. Jetty Park is situated immediately south of Port Canaveral on the beach and is the only park in the area that allows overnight camping. Public parks in the region are not affected by launch activities from Cape Canaveral AFS. The beaches along Cape Canaveral AFS are used for launch operations and are therefore restricted from public use. Recreational fishing is allowed at Camera Road A for KSC and Cape Canaveral AFS personnel and their guests.

3.7.3 Aesthetics

The ROI for aesthetics at Cape Canaveral AFS includes the general visual environment surrounding the station and areas of the station visible from off-station areas. The barrier island on which it is located characterizes the visual environment in the vicinity of Cape Canaveral AFS. The Indian and Banana rivers separate the barrier island from the mainland. Topography of the island is generally flat, with elevations ranging from sea level to approximately 20 feet above sea level. The landscape is dominated by Florida coastal strand, coastal scrub, and coastal dune vegetation. The most visually significant aspect of the natural environment is the gentle coastline and flat island terrain. The area has a low visual sensitivity because the flatness of the area limits any prominent vistas.

Cape Canaveral AFS is fairly undeveloped. The most significant man-made features are the launch complexes and various support facilities. These developed areas are surrounded by disturbed grasses, oak hammocks, and scrub vegetation. Most of Cape Canaveral AFS outside of the developed areas is covered with native vegetation. Since public access to the station is prohibited, viewpoints are primarily limited to marine traffic on the east and west and distant off-site beach areas, and small communities to the south. Approximately 15 miles of the Atlantic coastline on the east and approximately 12 miles of shoreline on the west border the installation. However, marine traffic is limited and public observation of the coastline is infrequent. Marine traffic consists mainly of transportation and fishing vessels, pleasure boats, and cruise ships. From the south, launch complexes can be viewed from various beach areas and small communities including Port Canaveral and the cities of Cape Canaveral and Cocoa Beach. From KSC (north and west of the

station), views of the launch complexes are available to a limited population. Tour buses from the KSC Visitor Center also have access to Cape Canaveral AFS.

3.8 Noise

Noise is usually defined as unwanted sound. It may be undesirable because it interferes with speech communication and hearing, is intense enough to damage hearing, or is simply annoying. High-amplitude noise can be unwanted because of potential structural damage. Noise is usually thought of as coming from man-made activities, but some natural sounds (e.g., from insects, animals, wind, waves) are considered to be noise.

The characteristics of sound include parameters such as amplitude, frequency, and duration. Sound can vary over an extremely large range of amplitudes. The decibel (dB), a logarithmic unit that accounts for the large variations in amplitude, is the accepted standard unit for the measurement of sound.

Different sounds may have different frequency content. When measuring sound to determine its effects on a human population, it is common to adjust the frequency content to correspond to the frequency sensitivity of the human ear. This adjustment is called A-weighting (American National Standards Institute 1988). Sound levels that have been so adjusted are referred to as A-weighted sound pressure level (AWSPL). The unit is still dB, but the unit is sometimes written dBA for emphasis. Figure 3-1 illustrates typical A-weighted sound levels.

Most of the region surrounding Cape Canaveral AFS is open water, with the Atlantic Ocean to the east and the Banana River to the west. Immediately north of Cape Canaveral AFS is KSC; Port Canaveral is to the south. This relative isolation of the station reduces the potential for noise to affect adjacent communities. The closest residential areas to Cape Canaveral AFS are to the south, in the cities of Cape Canaveral and Cocoa Beach. Industrial areas (Port Canaveral) and along transportation corridors. Residential areas and resorts along the beach would be expected to have low overall noise levels, normally about 45 to 55 dBA. Infrequent aircraft flyovers from Patrick AFB and rocket launches from Cape Canaveral AFS would be expected to increase noise levels for short periods of time. Noise levels at KSC probably approximate those of any urban industrial area, reaching levels of 60 to 80 dBA. The launch of satellite vehicles from KSC does generate intense, but relatively short-duration, noise levels of low frequencies. The highest recorded levels are those associated with the space shuttle, which in the launch vicinity (i.e., on the pad and its supporting facilities) can exceed 160 dBA. Noise levels at Port Canaveral would be expected to be typical of those at an industrial facility, reaching levels of 60 to 80 dBA.

An additional source of noise in the area is the Cape Canaveral AFS Skid Strip. Because of the infrequent use of the Skid Strip, noise generally does not affect public areas. Other less frequent but more intense sources of noise in the region are space launches from Cape Canaveral AFS and explosive ordnance detonations (EOD) conducted by the Army and Air Force on Cape Canaveral AFS at a frequency of approximately 55 detonations per year, ranging from 2-10 pounds.

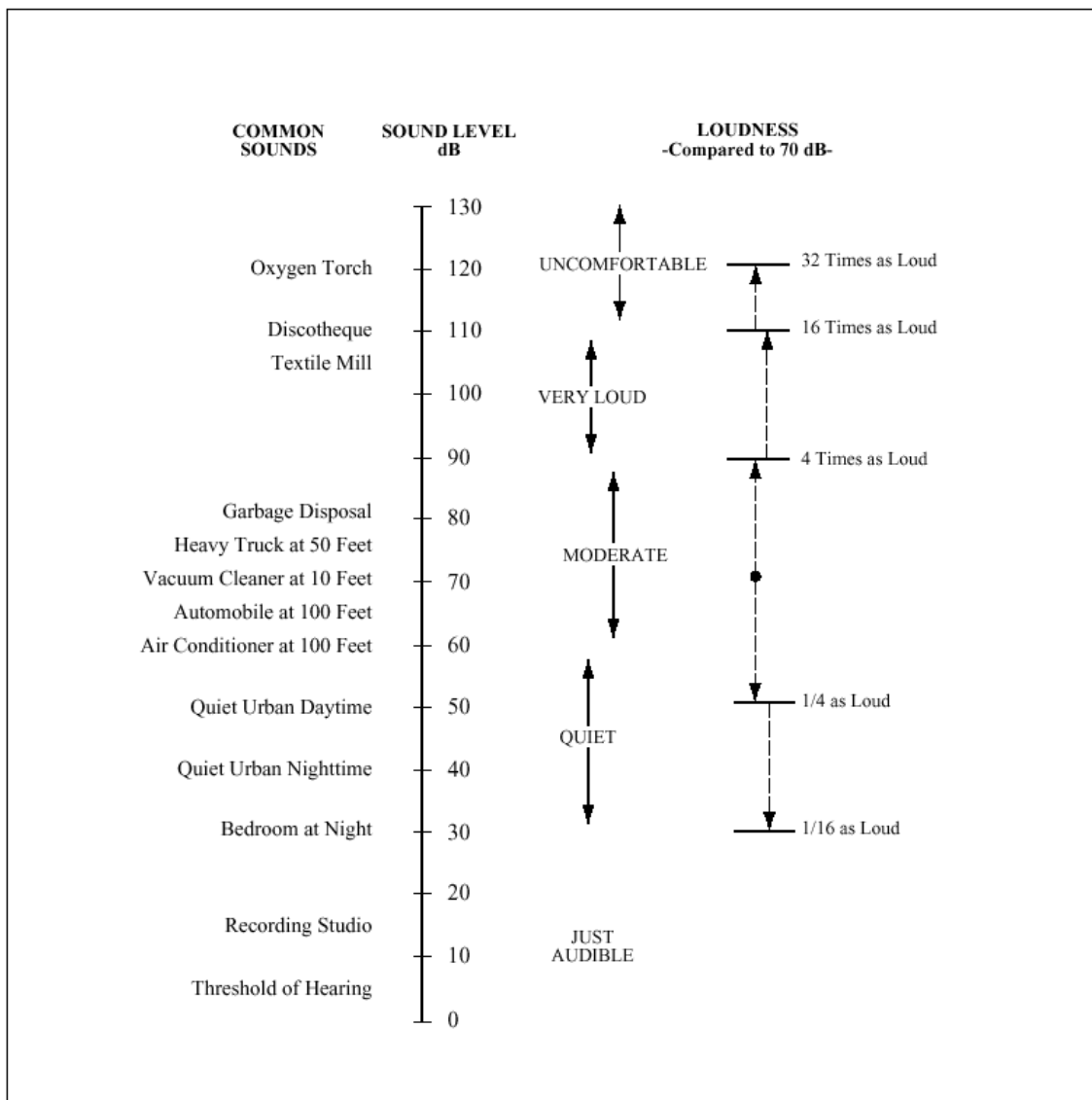


Figure 3-1. A-weighted sound levels of common sounds (U.S. Air Force 1998).

3.9 Socioeconomics

Cape Canaveral AFS is situated on the Canaveral Peninsula along the east-central Atlantic Coast in Brevard County, Florida. Incorporated cities within Brevard County include Cape Canaveral, Titusville, Cocoa, Melbourne (including Melbourne Beach and Melbourne Village), West Melbourne, Palm Bay, Cocoa Beach, Indialantic, Indian Harbor Beach, Malabar, Satellite Beach, and Rockledge. Cape Canaveral AFS has no military housing. The nearest military housing is located at Patrick AFB, where 1,500 military family housing units support 3,500 military personnel and their dependents.

The total population of Brevard County increased from 398,978 in 1990 to 476,230 in 2000 to 495,576 in 2002 (Table 3-4; University of Florida 1997; U.S. Census Bureau 2004). Employment in Brevard County has also experienced an increase (Table 3-4). In 1990 there were approximately 205,128 total jobs within the county. By 1997, this figure was approximately 231,553 total jobs, and in the year 2000 the number of jobs had risen to a total of 244,498. U.S. Bureau of Economic Analysis, 1996a, 1996b, 2004.

The Cape Canaveral AFS General Plan (45 SW 1995), indicates a total employed population on the installation of 6,767 personnel (Table 3-5). The 45 SW and other Cape Canaveral AFS and Patrick AFB organizations, including host and tenant activities, contractors, and the military retiree community, make up an employment population of more than 13,000 with a collective income exceeding \$240 million (45 SW 1995).

Cape Canaveral AFS employees contribute to the local economy through salaries, payroll taxes and spending. According to the 45 SW, Cape Canaveral AFS Commander's World Wide Web homepage, approximately 10,000 people are employed by Cape Canaveral AFS, for a total economic result from employees' salaries of \$430 million. With a combined budget of \$326.8 million, the 45 SW, which includes Cape Canaveral AFS, Patrick AFB, the Jonathan Dickinson Missile Tracking Annex, Malabar Tracking Annex, Antigua Air Station, and Ascension Island, directs government spending on these installations that translates into the local economy. While an estimate of economic impact based only on the salary of Cape Canaveral AFS workers is a small portion of total spending, and does not include items such as purchase of construction materials, it does show the importance of Cape Canaveral AFS within the Brevard County economy.

Table 3-4. Population and employment in Brevard County, Florida.

	1975	1990	1997	2000	2002
Total Population	NA	398,978	460,824	476,230	495,576
Total Jobs	97,084	205,128	231,553	244,498	NA

Source: U.S. Census Bureau 2004.

Table 3-5. Cape Canaveral AFS employed population.

Organization	Number of Personnel
45th Space Wing (Officers, Enlisted, Civilian)	534
Air Force Tenants (Officers, Enlisted, Civilian)	214
Other Tenant Agencies (Army, Navy, U.S. Coast Guard, NASA, Other Government Agencies)	704
Range Contractors	5,315
Total	6,767

Source: 45 SW 1995.

3.10 Traffic and Transportation

The majority of the employees and other related support services providers for Cape Canaveral AFS reside within the unincorporated areas of Brevard County and in the cities of Cape Canaveral, Cocoa, Cocoa Beach, and Rockledge, which are all within 14 miles of the installation. The key local roads providing access to Cape Canaveral AFS from KSC and the local communities include State Route (SR) A1A, SR 520, SR 528, SR 401, SR 3, and SR 405. The NASA Causeway and Beach Road connect KSC and Cape Canaveral AFS.

The major on-site roadway on Cape Canaveral AFS is Samuel C. Phillips Parkway, a 4-lane divided highway that accommodates most of the north-south traffic. At its intersection with Skid Strip Road, Samuel C. Phillips Parkway becomes a one-way northbound arterial, with Hangar Road serving as the southbound arterial. To the south of Cape Canaveral AFS, Samuel C. Phillips Parkway becomes SR 401.

The internal road network and access roads were designed to support a larger population than is currently present on the installation. Exact specifications on the load-bearing capability of the roads are still considered classified (U.S. Air Force 2002).

A public transit bus system exists in Brevard County, known as the Space Coast Area Transit (SCAT). The Brevard County Board of County Commissioners sponsors the service at a nominal charge. Public transportation does not exist on Cape Canaveral AFS due to the secure nature of the federal installation.

3.11 Utilities

3.11.1 Water

The water delivered to Cape Canaveral AFS comes from the Florida aquifer and is delivered by the water distribution system of the City of Cocoa, which has a capacity of 37 million gallons per day (MGD). In 1995 Cape Canaveral AFS used an average of 0.75 MGD, including deluge water. Cape Canaveral AFS has a system capacity of 3 MGD. Installation of a new water main to more than one facility requires a Potable Water Distribution Permit from FDEP.

Cape Canaveral AFS treats both domestic and industrial wastewater on site. The wastewater treatment plant has a permitted capacity of 0.8 MGD and a peak daily flow of approximately 0.3 MGD. Cape Canaveral AFS has an industrial wastewater permit to discharge deluge water to grade or to pump to the Waste Water Treatment Plant for treatment. Maximum total flow of wastewater from domestic use allows a residual wastewater capability of approximately 500,000 gallons per day (gpd) for treatment of deluge water, if required. At the present time, Cape Canaveral AFS peak daily flows exceed 0.6 MGD, with an average daily flow of approximately 0.5 MGD, since adding KSC flows to this Plant. Installation of a wastewater main and or a lift station requires a Domestic Wastewater Collection/Transmission permit from FDEP.

3.11.2 Solid Waste

The Joint Base Operations Support Contractor (JBOSC) provides solid waste collection and onsite Class III landfill for the disposal of construction and demolition debris and separate cells for the disposal of asbestos containing materials. Class I and II materials must be taken off-site to the Brevard County Landfill, a 192-acre landfill near the city of Cocoa. Class I and II landfills receive general, non-hazardous household, commercial, industrial, and agricultural wastes, subject to the restrictions of Rule 62-701.300 and 62-701.520, Florida Administrative Code (FAC).

3.11.3 Electricity

Florida Power and Light provide power and lighting transmission systems for both Cape Canaveral AFS and KSC. Together, Cape Canaveral AFS and KSC have a total capacity of 216,000 kilovolt-amperes. (kVA) The Air Force owns the distribution system. Transmission lines enter the installation at three locations. The capacity of the three substations is 55 megawatts (MW), and they are capable of providing 1,320 MWH/day. There are also 170 substations on Cape Canaveral AFS that convert the voltage to user voltages.

3.12 Water Resources

Water resources include groundwater and surface water and their physical, chemical, and biological characteristics. This section addresses the physical and chemical factors that influence water quality and surface runoff.

The federal Clean Water Act (CWA) is the primary law regulating water pollution. The CWA, as amended (P.L. 92-500), is administered by the U.S. Environmental Protection Agency (EPA), which delegates authority to the appropriate state agency. The CWA defines the primary and secondary standards for water quality. Treated water discharged to surface water or to the ocean is subject to the requirements of a National Pollution Discharge Elimination System (NPDES) permit, which ensures that the water discharged meets water quality standards at the point of discharge. In addition, projects disturbing one acre or more are subject to NPDES permit requirements for storm water discharges during construction.

This permit requires the preparation of a Storm Water Pollution Prevention Plan. Section 319 of the CWA requires states to assess nonpoint water pollution problems and to develop nonpoint source pollution management programs with controls to improve water quality. Section 404 of the CWA requires a permit from the U.S. Army Corps of Engineers (USACE) in order to locate a structure, excavate, or discharge dredged or fill material into Waters of the United States.

3.12.1 Groundwater

The ROI for groundwater includes the local aquifers that are directly or indirectly used by Cape Canaveral AFS. The ROI for surface water is the drainage system/watershed in which the station is located. The SJRWMD issues the ERP, which includes storm water

and wetlands management, in coordination with the FDEP and the USACE. The U.S. EPA is responsible for management of the NPDES permit process and wastewater discharges.

Two aquifer systems underlie Cape Canaveral AFS: the surficial and the Floridan aquifer systems. The surficial aquifer system, which comprises generally sand and marl, is under unconfined conditions and is approximately 70 ft thick. The water table in the aquifer is generally a few feet below the ground surface. Recharge to the surficial aquifer is principally by percolation of rainfall and runoff. Groundwater in the surficial aquifer at Cape Canaveral AFS generally flows to the west, except along the extreme eastern coast of the peninsula.

A confining unit composed of clays, sands, and limestone separates the surface aquifer from the underlying Floridan aquifer. The confining unit is generally 80 to 120 ft thick. The relatively low hydraulic conductivity of the confining unit restricts the vertical exchange of water between the surface aquifer and the underlying confined Floridan aquifer. The Floridan aquifer is the primary source of potable water in central Florida and is composed of several carbonate units with highly permeable zones. The top of the first carbonate unit occurs at a depth of approximately 180 ft below ground surface, and the carbonate units extend to a depth of several hundred feet. Groundwater in the Floridan aquifer at Cape Canaveral AFS is highly mineralized.

Cape Canaveral AFS receives its potable water from the city of Cocoa, which pumps water from the Floridan aquifer. According to the General Plan (45 SW 1995), this water supply is more than adequate to meet usage demands and water quality standards.

3.12.2 Surface Water

Cape Canaveral AFS is situated on a barrier island that separates the Banana River from the Atlantic Ocean. The station is within the Florida Middle East Coast Basin. This basin contains three major bodies of water in proximity to the station: the Banana River to the immediate west, Mosquito Lagoon to the north, and the Indian River to the west, separated from the Banana River by Merritt Island. All three water bodies are estuarine lagoons, with circulation provided mainly by wind-induced currents, and are part of the Indian River Lagoon.

Surface drainage at Cape Canaveral AFS generally flows to the west into the Banana River, even near the eastern side of the peninsula.

Several water bodies in the Middle East Coast Basin have been designated as Outstanding Florida Water (OFW) in Florida Administrative Code (FAC) 62-3, including most of Mosquito Lagoon and the Banana River, Indian River Aquatic Preserve, Banana River State Aquatic Preserve, Pelican Island National Wildlife Refuge, and Canaveral National Seashore. These water bodies are afforded the highest level of protection, and any compromise of ambient water quality is prohibited. The Indian River Lagoon System has also been designated an Estuary of National Significance by the U.S. EPA. Estuaries of National Significance are identified to balance conflicting uses of the nation's estuaries while restoring or maintaining their natural character. The Banana River has been designated a Class III surface water, as described by the CWA. Class III standards are intended to maintain a level of water quality suitable for recreation and the production of fish and wildlife communities. There are no wild and scenic rivers located on or near Cape Canaveral AFS.

Floodplains are lowland and relatively flat areas adjoining inland and coastal waters that are subject to flooding. The 100-year floodplain is subject to a 1-percent or greater

chance of flooding in any given year. On Cape Canaveral AFS, the 100-year floodplain extends seven feet above MSL on the Atlantic Ocean side, and four feet above MSL on the Banana River side. The site of the Proposed Action is not within the 100-year floodplain.

3.12.3 Water Quality

Surface water quality near Cape Canaveral AFS and KSC is monitored at 11 long-term monitoring stations that are maintained by NASA. The FDEP has classified water quality in the Florida Middle East Coast Basin as “poor to good” based on the physical and chemical characteristics of the water, as well as whether they meet their designated use under FAC 62-3. The upper reaches of the Banana River adjacent to Cape Canaveral AFS and the lower reaches of Mosquito Lagoon have generally good water quality due to lack of urban and industrial development in the area. Nutrients and metals, when detected, have generally been below Class II standards (NASA 1995). Areas of poor water quality exist along the western portions of the Indian River, near the city of Titusville, and in Newfound Harbor in southern Merritt Island. In the past, fair and poor water quality areas were influenced primarily by wastewater treatment plant effluent discharges and urban runoff. The Indian River Lagoon Act prohibits wastewater treatment plant effluent discharges to the Indian River Lagoon.

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4 ENVIRONMENTAL CONSEQUENCES

This chapter presents the results of the analysis of potential environmental consequences associated with the proposed project activities. Each section within this chapter discusses a separate resource area and describes the potential impacts resulting from implementation of the Proposed Action and No-Action Alternative. Mitigation measures are described, where applicable.

Means of mitigating substantial adverse environmental impacts that may result from implementation of the Proposed Action or No-Action Alternative are discussed as required by NEPA. Potential mitigation measures are described for those components likely to experience substantial and adverse changes under the Proposed Action or No-Action Alternative. Potential mitigation measures depend upon the particular resource affected. In general, however, mitigation measures are defined in CEQ regulations as actions that include:

- Avoiding the impact altogether by not taking an action or by not performing certain aspects of the action.
- Minimizing the impacts by limiting the degree or magnitude of the action and its implementation.
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
- Reducing or eliminating the impact over time through preservation and maintenance operations during the life of the action.
- Compensating for the impact by replacing or providing substitute resources or environments.

Mitigation measures that are clearly required by law or standard industry practices are generally considered to be part of the Proposed Action. Additional potential mitigation measures beyond those clearly required by law or standard practices are described under each resource area, where impacts have been identified. Such measures include those the Air Force could implement or those discretionary mitigations or choices available to other governmental bodies (such as permit conditions, etc.).

4.1 Air Quality

4.1.1 Proposed Action

Construction-related impacts could result from construction equipment (exhaust emissions) and construction activities (fugitive dust emissions) over the 24-month construction period. Emissions generated by facility construction activities would be in the

form of either gaseous or particulate pollutant emissions. Gaseous emissions would occur from heavy-duty construction equipment and vehicle travel to and from the site by construction workers. Emissions would consist primarily of combustion products. Particulate matter in the form of dust emissions would also be generated during the construction phase from excavation, earth moving, construction of buildings, and traffic on unpaved surface areas.

The disturbed area would total approximately 45 acres. The scope of construction and resulting air emissions are not expected to be of a magnitude that would result in significant adverse impacts. Cape Canaveral AFS is located in an area that is in attainment for all criteria air pollutants; therefore, a conformity determination is not required.

Although no impacts have been identified, implementing standard procedures, such as vigorous water application during ground-disturbing activities, could reduce emissions. Decreasing the time period during which newly graded sites are exposed to the elements, coupled with the use of windbreaks, could further minimize airborne dust concentrations. Efficient scheduling of equipment use, implementation of a phased construction schedule to reduce the number of units operating simultaneously, and performance of regular vehicle engine maintenance could reduce combustive emission impacts. Implementation of these measures could reduce combustive emission and air quality effects from construction activities associated with the Proposed Action by 10 to 25 percent. Selecting coatings with low volatile organic compounds (VOC) content could reduce emissions of VOC from architectural coatings.

Operation of the EPF is not anticipated to result in adverse impacts to the air quality of Cape Canaveral AFS or the region. Vehicles transporting payloads from the Skid Strip to the facility and from the facility to the launch complexes and accompanying convoys would not contribute significant emissions to the local air quality to result in adverse effects. Additional requirements resulting from the presence of hazardous materials and operations at this new facility are addressed in Section 4.10, Hazardous Materials and Waste Management.

4.1.2 No-Action Alternative

Under the No-Action alternative, the proposed EPF would not be constructed. Thus, no impacts to air quality would result from construction activities or operation of a new facility.

4.2 Biological Resources

Federal agencies are required by Section 7 of the Endangered Species Act of 1973, as amended (16 USC 1531 *et seq.*), to assess the effect of any project on federally listed threatened or endangered species. Under Section 7, consultation with the USFWS and NOAA Fisheries Service is required for federal projects if such actions could directly or indirectly affect listed species or destroy or adversely modify critical habitat. It is also Air Force policy to consider listed and special status species recognized by state agencies when evaluating impacts of a project.

Adverse impacts to biological resources can be short- or long-term impacts, for example, short-term impacts from noise and dust during construction, and long-term impacts from the permanent loss of vegetation and, consequently, loss of the capacity of habitats to support wildlife populations. Adverse impacts are considered significant if the project would result in permanent adverse effects, either directly or indirectly, to special status species (endangered, threatened, rare, or candidate) or their habitats, as designated by federal and state agencies.

Impacts to jurisdictional waters of the United States and wetlands are considered significant if the project would result in net loss of wetland area or habitat value, either through direct or indirect impacts to wetland vegetation, loss of habitat for wildlife, degradation of water quality, or alterations in hydrological function.

Noise, ground disturbances and other disturbances associated with infrastructure improvements and operations could impact plant communities, wildlife and habitats.

4.2.1 Proposed Action

Potential impacts to biological resources associated with the Proposed Action include:

- short-term (temporary) and long-term (permanent) loss of habitat from construction related activities such as access, excavation, grading, and paving;
- loss of individuals within the work area due to excavation, crushing or burial;
- loss of individuals in habitats adjacent to work areas due to soil erosion;
- abandonment of breeding and/or roosting sites due to project related noise and associated disturbance; and
- disruption of foraging or roosting activities due to project related noise and associated disturbance.

4.2.1.1 Vegetation

Construction activities will necessitate the clearing of 45 acres of vegetation to accommodate construction of facilities, roadways, parking areas and fences. Areas that would be affected by construction activities include the 38 acres of Oak scrub that were cut and subsequently mulched in March 2005, and the remaining seven acres of Oak scrub. All vegetation within this area would be permanently removed, with no opportunity for restoration. Although this plant community is not considered sensitive, the 45-acre site is located in an area previously restored for the federally threatened Florida scrub-jay, and which was considered prime habitat for the species (see Section 4.2.1.3). The site can still be considered suitable habitat for Florida scrub-jay. However, there are not trees to support nesting. The area surrounding the site is still considered suitable nesting habitat.

With the exception of transportation, all activities associated with the operation of the facility would occur within buildings and would not result in any adverse effects on native plant communities or plant species. Likewise, because transportation of payloads from the Skid Strip to the facility and from the facility to launch complexes would occur on existing paved roadways, no adverse effects are expected to occur to native plant communities or plant species.

4.2.1.2 Wildlife Species

Construction activities associated with the Proposed Action would occur over 24 months, which would include the breeding season for many wildlife species, including birds. The MBTA of 1918, as amended (16 USC 703-712), provides federal protection to all migratory avian species, their nests, eggs, and unfledged young.

Because construction would occur on 45 acres of primarily oak scrub, adverse impacts to wildlife species have the potential to occur. Potential adverse impacts to wildlife species from construction activities include:

- Short-term (temporary) and long-term (permanent) loss of habitat from construction related activities such as access and excavation;
- loss of individuals within the work area due to excavation, crushing or burial;
- loss of individuals in habitats adjacent to work areas due to soil erosion;
- abandonment of breeding and/or roosting sites due to project related noise and associated disturbance; and
- disruption of foraging or roosting activities due to project related noise and associated disturbance.

Biological monitoring during clearing of vegetation would provide the opportunity to relocate any individuals that are in the path of the construction vehicles to suitable habitat adjacent to but outside the construction limits.

With the exception of transportation of payloads from the Skid Strip to the facility and from the facility to the SLCs, most activities associated with the operation of the facility would occur within buildings and would not result in any adverse effects on wildlife species. The increased noise and night lighting could discourage use of surrounding habitat by wildlife species sensitive to human activity. This disturbance would not represent an adverse impact due to the extent of the surrounding habitat. All hazardous and toxic materials that would exist within the boundaries of the facility would be maintained in closed enclosures, preventing any direct contact of wildlife species with these materials.

Because transportation of payloads from the Skid Strip to the facility and from the facility to launch complexes would occur on existing paved roadways, no adverse effects are expected to occur to wildlife species. The noise generated by the vehicle transporting the payloads and accompanying convoy is not expected to exceed the level of noise generated by normal vehicular traffic that occurs routinely on all these roads.

Construction Noise

Wildlife, including mammals, amphibians, reptiles, and birds, present in the area could be affected by construction noise. Wildlife response to noise can be physiological or behavioral. Physiological responses can range from mild, such as an increase in heart rate, to more damaging effects on metabolism and hormone balance. Behavioral responses to man-made noise include attraction, tolerance, and aversion. Each has the potential for negative and positive effects, which vary among species and among individuals of a particular species due to temperament, sex, age, and prior experience with noise. Responses to noise are species-specific; therefore, it is not possible to make exact predictions about hearing thresholds of a particular species based on data from another species, even those with similar hearing patterns.

Reptile and amphibian hearing is poorly studied. However, reptiles and amphibians are sensitive to vibrations, which provide information about approaching predators and prey. Vibration and noise associated with construction activities would potentially cause short-term disturbance to amphibians and reptiles. These impacts would be considered short-term and would not be considered of a magnitude to result in adverse impacts to populations within the vicinity of the project area.

Potential adverse impacts to birds resulting from construction and human generated noise include disruption in foraging, roosting, and courtship activities. Birds would be expected to move away from the area of disturbance during construction activities. The MBTA provides federal protection to all native avian species, their nests, eggs, and unfledged young. Construction activities associated with the Proposed Action would result in short-term noise disturbances, which may temporarily disrupt foraging and roosting activities of individual birds. If the construction occurs during the breeding season for avian species, it has the potential to disrupt breeding activities including courtship, incubation and brooding. These impacts would be considered short-term and would not be considered of a magnitude to result in adverse impacts to populations within the vicinity of the project area. Avian surveys immediately preceding the initiation of construction activities would identify the presence of any nests. Monitoring during construction would identify any potential disturbance so measures could be implemented to avoid adverse effects.

Potential noise related impacts to mammalian species during construction activities would include disruption of normal activities due to noise and ground disturbances. These impacts would be short-term and, therefore, would not be considered of a magnitude to result in adverse impacts to populations within the vicinity of the project area.

4.2.1.3 Special Status Wildlife Species

Three federally threatened wildlife species and one Florida species of special concern occur or have the potential to occur within the project area of the Proposed Action. Potential project related impacts to these species are listed in Table 4-1. Construction activities have the potential to result in the take of some special status wildlife species from activities such as disturbance, excavation, crushing or burial.

Construction specific measures to reduce adverse impacts to special status wildlife species and mitigate for habitat losses are presented below. Formal Section 7 consultation with the USFWS was completed on August 1, 2005. Appendix E contains the Biological Opinion issued by the USFWS as a result of this consultation. In implementation of the Proposed Action, the proponent would meet the terms and conditions indicated in the Biological Opinion, and summarized in Section 4.2.1.6 of this EA.

Subsequent to the construction of the facility, and as a result of the removal of vegetation from the area where the facility would be developed, special status wildlife is not expected to occur within the area of operations. All hazardous and toxic materials that would exist within the boundaries of the facility would be maintained in closed enclosures, preventing any direct contact of wildlife species with these materials. Therefore, routine operations of the new EPF are not expected to result in any direct adverse effects on special status species. The increased noise and night lighting could discourage use of surrounding habitat by wildlife species sensitive to human activity. This disturbance would not represent an adverse impact due to the extent of the surrounding habitat.

Table 4-1. Potential impacts to federal special status wildlife species that occur or with potential to occur within the project area of the Proposed Action.

Common Name Scientific Name	Status ¹		Occurrence ²	Potential Impacts
	USFWS	FWCC		
Eastern indigo snake <i>Drymarchon corais couperi</i>	T	T	O	Crushing by equipment. Loss of habitat. Disruption due to noise.
Florida scrub-jay <i>Aphelocoma coerulescens</i>	T	T	O	Loss of breeding habitat. Disruption due to noise.
Southeastern beach mouse <i>Peromyscus polionotus niveiventris</i>	T	T	P	Crushing by equipment. Disruption due to noise.
Gopher tortoise <i>Gopherus polyphemus</i>		SSC	O	Crushing by equipment. Disruption due to noise.

1 USFWS – U.S. Fish and Wildlife Service FWCC – Florida Fish and Wildlife Conservation Commission

T – Threatened SSC –Species of Special Concern

2 P – Potential O – Documented

Because transportation of payloads from the Skid Strip to the facility and from the facility to launch complexes would occur on existing paved roadways, no adverse impacts expected to occur to wildlife species. The noise generated by vehicles transporting payloads and accompanying convoys is not expected to exceed the level of noise generated by normal vehicular traffic that occurs routinely on all these roads.

Herpetofauna

Construction activities have potential to result in incidental take of some individuals of Eastern indigo snake and Gopher tortoise from disturbance and possible mortality during project activities, and during capture and relocation efforts prior to and during construction. Incidental take in the form of mortality to Eastern indigo snakes and Gopher tortoises would be avoided through preconstruction surveys and relocation of any individuals present within the boundaries of the work area.

Eastern indigo snakes and Gopher tortoises would be vulnerable to mortality as a result of injuries sustained during activities such as vegetation clearing and grading. Individuals also have the potential to be crushed by vehicles. Monitoring during vegetation clearing and grading activities would provide the opportunity to relocate individuals found within the construction site to adjacent suitable habitat. The U.S. Air Force has authorization from the Florida Fish and Wildlife Conservation Commission (FWCC) to relocate one Eastern indigo snake at Cape Canaveral AFS if encountered during gopher tortoise relocation activities. If more than one Eastern indigo snake is encountered, the Air Force is required to notify the FWCC. Compliance with the recommended project constraints and monitoring measures (Section 4.2.1.6) would minimize adverse effects to these species by decreasing the chance for injury and mortality, and reduce potential adverse impacts to a less than significant level.

Birds

The federally threatened Florida scrub-jay inhabits the Proposed Action site and its vicinity (Figure 4-1). Disturbances associated with the construction activities of the Proposed Action have the potential to result in short-term disturbances to this species. In addition, this site is a restored site for Florida scrub-jays and the Proposed Action would

result in the permanent loss of 45 acres of previously restored scrub that was considered prime habitat for this species (Figure 4-1). The habitat loss could be further adversely impacted by temporary restrictions on prescribed burning as part of habitat restoration management for this species in the vicinity of the site.

The NRO at Cape Canaveral AFS (NRO Cape), as the proponent of the project, would design and implement, within budget constraints, facility systems to allow maximum flexibility in scheduling controlled burns in space and time. However, operational and security constraints may require the designation of areas surrounding the proposed EPF to be temporarily excluded from the management practice of controlled burn. NRO Cape would be part of the Burn Management Working Group at Cape Canaveral AFS to ensure coordination and operational scheduling of controlled burns. As a result of the formal Section 7 consultation with the USFWS, the NRO would fund a 5-year study to assess the effectiveness of different land management practices as a temporary management tool when prescribed burning has not occurred on the Florida scrub-jay habitat. If acceptable mechanical clearing methods are discovered during the course of this study, and are agreed upon by the 45 SW and the USFWS, they would be used in the immediate vicinity of the EPF as a means to temporarily delay prescribed burn treatment.

In addition to the loss of breeding habitat with the permanent removal of 45 acres of scrub within the project area, increased levels of human activity and associated noise generated during construction could potentially displace birds present in nesting habitat adjacent to but outside the work area boundaries. The severity of the impact would depend in a large part on the timing of the activity relative to the stage of the breeding cycle. If disturbance occurs after nesting has already been initiated, construction-related noise could adversely impact reproductive success. However, if disturbance is initiated before nesting begins, the birds may move to other suitable habitat further away from the project site. If construction activities associated with the Proposed Action were to begin between March 1 and July 15, avian surveys of the project site and surrounding areas immediately preceding the initiation of construction activities would identify the presence of any nests and provide an opportunity for implementing measures to minimize or avoid adverse impacts. Compliance with the recommended project constraints and monitoring measures (Section 4.2.1.6) would minimize adverse effects to this species.

Other avian species protected under the MBTA, have the potential to occur within the project area and vicinity. Avian species present during construction activities would be subject to disturbance that could result in disruption of roosting and foraging activities. Implementation of the measures to reduce adverse impacts to Florida scrub-jays would also benefit other migratory birds present within the project area during construction activities, and would reduce the potential for adverse impacts. Given that disturbances to these species would be indirect and short-term, and that construction activities would be limited in area, with additional suitable habitat in the vicinity, adverse impacts would be less than significant.

Formal Section 7 consultation under the ESA with the USFWS was completed on August 1, 2005, to address adverse effects on the Florida scrub-jay. The proponent, as part of this project would implement all terms and conditions as outlined in the resulting Biological Opinion (see Appendix E and Section 4.2.1.6) to minimize the adverse effects on this special status species.

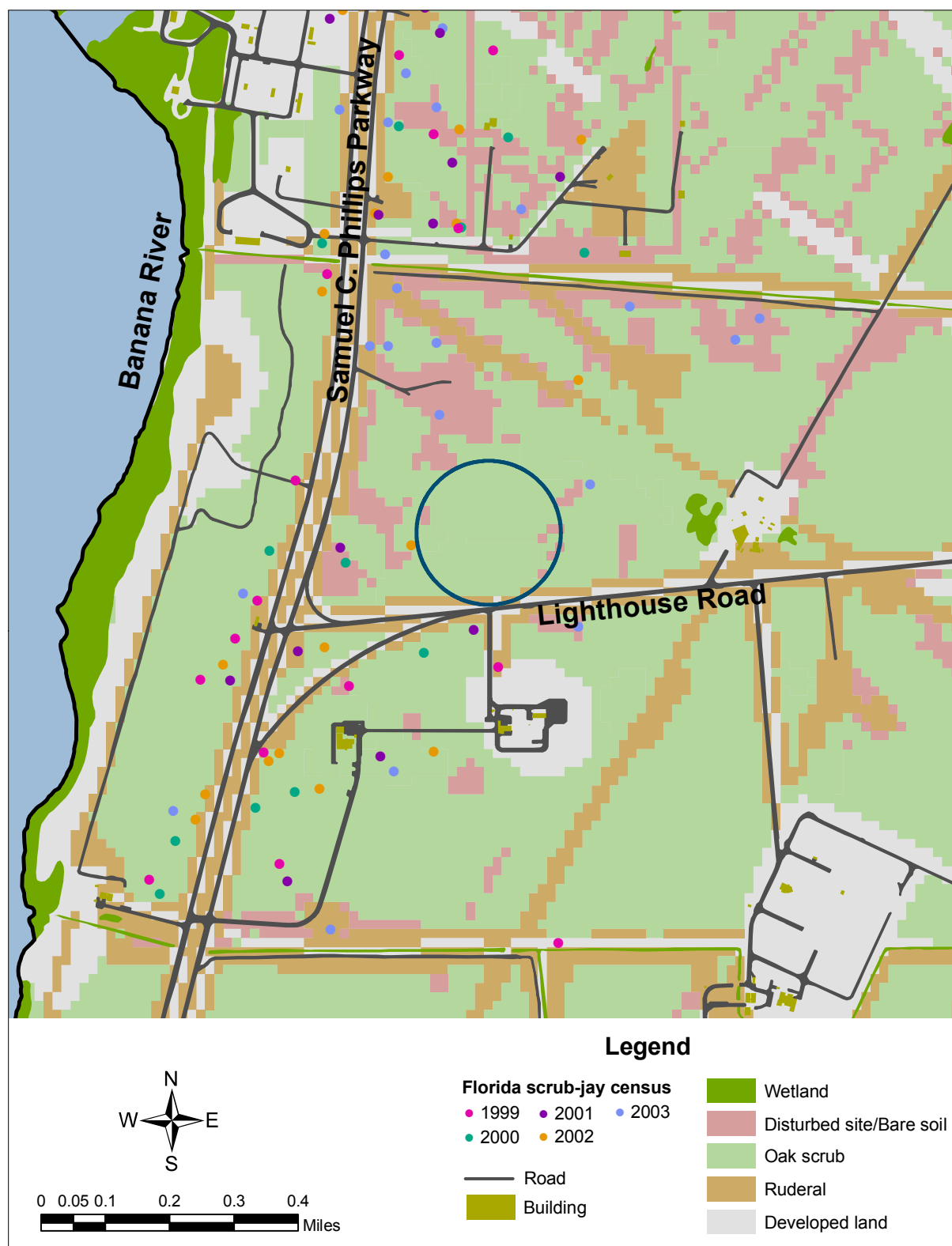


Figure 4-1. Florida scrub-jay census data and habitats at the Proposed Action site.

Mammals

No special status mammal species are known to occur within the project area of the Proposed Action. However, recent surveys approximately one mile south of the Proposed Action site, indicate that Southeastern beach mice are likely to be present within the project area. Adverse impacts to this mammal species as a result of vegetation clearing and grading activities could occur if this species were present in the area. Pre-construction surveys would provide an opportunity to verify the presence of this species within work area boundaries. If the species is found to be present, monitoring during vegetation clearing and grading activities would provide the opportunity to relocate any individuals found within the construction site to suitable habitat outside the construction area. Compliance with the recommended project constraints and monitoring measures (Section 4.2.1.6), and with the terms and conditions included in the Biological Opinion for the Proposed Action (Appendix E) would minimize the potential for injury and mortality, and reduce potential adverse impacts to a less than significant level.

4.2.1.4 EPF Light Management Plan

The attributes that can make a light source harmful to sea turtles are complex. However, Witherington and Martin (1996) summarized it best by stating that “...*an artificial light source is likely to cause problems to sea turtles if light from the source can be seen by an observer standing anywhere on the beach.*” Any glowing portion of a lamp, globe or reflector that is directly visible on the beach can be construed as a source of light likely to be a problem for sea turtles. In addition, light that reaches the beach indirectly by reflecting off buildings or trees that are visible from the beach can also be considered a source of light likely to pose a problem.

Per 45 SWI 32-7001 of 1 April 2003, *Exterior Lighting Management*, the proponent for the proposed EPF would incorporate a Light Management Plan for construction activities and operation of the new facility, specific to the site, that will include the following components:

- Exterior lighting that is not mission, safety, or security essential, will be extinguished from April 1 through October 31, between the hours of 2100 and 0600.
- All exterior lights will be controlled by either individual or cluster light-specific switches, or an Energy Management Control System (EMCS).
- Mission essential operations that require artificial lighting will be accomplished using LPS light fixtures. Where color rendition or explosion-proof fixtures are required, well-shielded, HPS lights may be used; however, a letter of justification must be submitted to the 45 CES/CEV.
- Interior lighting that creates an incidental glow visible outside the facility must be extinguished or shielded to prevent the light from being visible external to the facility. If interior lighting is required for safety or security reasons and is visible outside the facility, the facility manager must work with the 45 CES/CEV office to identify alternative light types.
- Use of photocells is not permitted unless lighting is a security requirement. Programmable timers may be used for area lighting, if essential for personnel safety. Requests to 45 CES/CEV for the installation of photocells must be accompanied by written justification.

The 45 CES/CEVP Office would coordinate USFWS approval of the Light Management Plan. With the implementation of the above measures, adverse impacts would be reduced to a less than significant level.

4.2.1.5 Cumulative Impacts to Biological Resources

Cumulative effects result from the incremental effect of an action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. The following proposed projects identified by SGS Master Planning (J. Green, pres. Comm.) were considered in the cumulative impacts analysis:

- **Project 1** – Activation of three facilities for the long term bulk storage of hypergols, at Fuel Storage Area 1, located west of Samuel C. Phillips Parkway between Mission Control Road and Lighthouse Road. These facilities presently exist but their activation for storage of hypergols would require their evaluation under the Environmental Impact Analysis Process (EIAP). Construction for the activation of these facilities could start as early as 2006. (See Appendix F, Figures F-1 through F-6).
- **Project 2** – Construction of various facilities at the Cape Canaveral AFS Skid Strip. Construction is estimated to occur in the year 2010. The plan includes two locations for a new apron (sized to accommodate four “heavy” launch vehicles), a 97-foot high air traffic control tower, a Base Operations building, and a 90-foot high hangar. Two locations are under consideration for this project: 1) south of the Skid Strip, would result in the paving of approximately 59 acres; and 2) north of the Skid Strip and existing apron, would require the paving of approximately 60 acres. Option 2) would impact the serviceable life of the landfill. Both options would require approximately 24 cubic acres of stormwater retention. This project would adversely impact Florida scrub-jay habitat and would be added into the total cost for scrub-jay mitigation (see Appendix C for maps of Scrub Restoration Burn Plan and Treated Burn Units). (See Appendix F, Figures F-7 through F-9).
- **Project 3** – Construction of a new Navy Administration Facility to support Navy activity at the port. Construction is planned for the year 2007. The project consists of constructing a new two-story 65,000 ft² building to house the Navy Fleet Ballistic Missile Program government and contract employees, a concrete pad for the navy Antenna Gallery, and a parking area. This facility is proposed on the west side of Samuel C. Phillips Parkway, south of Pier Road. (See Appendix F, Figures F-10 and F-11). This site is adjacent to a scrub habitat restoration area and within one of the Florida scrub-jay study sites (see maps in Appendix C).

While the potential environmental impacts of these three projects have not been fully analyzed, a preliminary evaluation of these projects suggests that potential cumulative adverse impacts would occur for biological resources. The Proposed Action would result in the permanent loss of approximately 45 acres of Florida scrub jay habitat. Project 2 would result in the permanent loss of up to 59 acres of scrub jay habitat, which has undergone restoration under scrub restoration guidelines. Project 3 is not within scrub jay habitat or a scrub restoration compartment, however it is adjacent to compartment 118 (immediately north of the proposed site). Construction and operation of this facility could result in the disturbance of breeding birds in the vicinity during construction activities and subsequent

operation. In addition, the proximity of the facility to the restored area may prevent future treatment due to safety concerns.

When evaluated together, the Proposed Action, Project 2 and Project 3, would result in a reduction of available breeding habitat and reduction in the availability of scrub habitat for restoration. Thus, cumulative adverse impacts on the federally threatened Florida scrub-jay would occur. Through the formal Section 7 consultation with the USFWS, mitigation measures would be developed to reduce these adverse impacts to a less than significant level.

4.2.1.6 Project Constraints and Monitoring Measures and Terms and Conditions of Biological Opinion

Potential adverse impacts to biological resources would be avoided or minimized during construction activities associated with the Proposed Action through implementation of the project constraints and monitoring measures outlined below, and the terms and conditions in the Biological Opinion for the Proposed Action (Appendix E), also summarized below.

- If clearing of habitat occupied by Florida scrub-jays is to occur within scrub-jay nesting season (March 1 through June 30), the area would be surveyed prior to clearing to determine if there are any active scrub-jay nests located within the vegetation. If an active scrub-jay nest is located, to the maximum extent practicable, clearing activities cannot take place within 150 feet of the nest site until nestlings have fledged or until it has been determined that the nest has failed.
- The 45 SW will develop an eastern indigo snake protection/education plan to be followed by all construction personnel. The USFWS will review and approve the plan at least 30 days prior to the start of clearing activities (see Appendix E for details).
 - Only individuals authorized by a section (10)(a)(1)(A) permit issued by the USFWS, or authorized by the FWCC for such activities are permitted to come in contact with or relocate eastern indigo snakes.
 - If necessary, eastern indigo snakes shall be held in captivity only long enough to transport them to a release site; at no time shall two snakes be kept in the same container during transportation.
 - An eastern indigo snake monitoring report must be submitted to the USFWS Jacksonville Field Office within 60 days of the conclusion of clearing activities. The report should be submitted when any eastern indigo snakes are observed or relocated (see Appendix E for details).
- A qualified biologist would conduct pre-construction surveys up to two weeks before the start of any vegetation clearing or construction March 1 through July 30, to determine if nesting birds are present. If active native bird nests were found within the project area, construction activities would not commence until after the young have fledged or until it has been determined that the nest has failed. If territorial or nesting native birds are found within 50 ft of the construction area, disturbance would be minimized and they would be monitored to determine construction related impacts. If nesting or native birds are found with eggs or unfledged chicks within 50 ft of the construction area, they would be monitored and disturbance would be minimized until after the young have fledged or

until it has been determined that the nest has failed. Depending on the nest location, this may necessitate delaying working at the site.

- Throughout the length of vegetation clearing and grading activities, a qualified biologist would conduct daily pre-construction surveys immediately preceding commencement of construction activities, to identify special status wildlife species within the work site and relocate them as necessary. Equipment left at the site overnight would be inspected before the start of activities each morning to ensure no wildlife species are trapped underneath. Any species found underneath the equipment would be moved to suitable habitat outside the construction area. Individuals found during these surveys would be moved to suitable habitat outside the construction site.
- If during the course of the project a dead Florida scrub-jay, southeastern beach mouse or eastern indigo snake is found on the project site, the specimen should be thoroughly soaked in water and frozen, and the USFWS Jacksonville Field Office contacted immediately (see Appendix E for details).
- The Proponent will develop a LMP and obtain concurrence from the USFWS through the 45 CES/CEVP prior to final design of the facility and initiation of construction activities.
- The Proponent will provide funding to the 45 SW to clear 166 acres of Compartment 6 for Florida scrub-jay habitat. A prescribed burn of this compartment will follow as soon as it is deemed ready for burning.
- The Proponent will provide funding for a 5-year study to determine the effectiveness of different land management practices as a temporary management tool when prescribed burning has not occurred on Florida scrub-jay habitat.

4.2.2 No-Action Alternative

Under the No-Action alternative, the proposed EPF would not be constructed. Thus, no impacts to biological resources would result from either construction or operation of a new facility.

4.3 Cultural Resources

Cultural resources would be adversely affected if the Proposed Action would cause loss of the value or characteristics that qualify the resource for listing on the National Register, or if the Proposed Action substantially alters the natural environment or access to it in such a way that traditional cultural or religious activities are restricted. Cultural resources could also be adverse affected if important traditional viewsheds are altered. The criteria used to evaluate the significant of cultural resources and to assess potential adverse project effects are set forth in the NHPA of 1966 (as amended). Associated implementing regulations include 36 CFR 60 and 800.

4.3.1 Proposed Action

Six cultural resources are within or near the APE for the proposed project. Two of these sites are recognized under the Florida Office of Cultural and Historical Programs. Five of the sites are within the APE. None of these resources are significant (i.e., eligible for the

National Register), and thus the Proposed Action will have no environmental consequences for cultural resources.

8BR557

8BR557 is not eligible for the National Register (Cantley et al. 1994). Furthermore, it is outside the APE of the Proposed Action. Consequently, there would be no environmental consequences resulting from the Proposed Action.

8BR558

8BR558 lies at the edge of the Proposed Action APE. Given the degree of previous disturbances, the site is not eligible for the National Register (Cantley et al. 1994). Consequently, there would be no environmental consequences resulting from the Proposed Action.

8BR1894

Based on the scant amount of cultural material identified, this site is not considered eligible for inclusion on the National Register. Consequently, there would be no environmental consequences resulting from the Proposed Action.

8BR1895

Based on the scant amount of cultural material identified, this site is not considered eligible for inclusion on the National Register. Consequently, there would be no environmental consequences resulting from the Proposed Action.

8BR1896

Based on the scant amount of cultural material identified, this site is not considered eligible for inclusion on the National Register. Consequently, there would be no environmental consequences resulting from the Proposed Action.

8BR1897

Based on the scant amount of cultural material identified, this site is not considered eligible for inclusion on the National Register. Consequently, there would be no environmental consequences resulting from the Proposed Action.

4.3.2 No-Action Alternative

Under the No-Action alternative, the proposed EPF would not be constructed. Thus, no impacts to cultural resources would occur.

4.4 Earth Resources

4.4.1 Proposed Action

Activities associated with the proposed project would require construction of a new facilities at a site not developed in the past, some modifications at one existing road intersection (Lighthouse Road and Samuel C. Phillips Parkway), and construction of one new road intersection (Samuel C. Phillips Parkway and new road to north of EPF facility). Major construction would include changing the existing site topography through excavation and grading, as required, for new construction. This type of construction would alter the topography of the site beyond changes that result from natural erosion or deposition. Construction of these facilities would not change the physiography of the region, nor would it impact any unique geologic features or geologic features of unusual scientific value.

Construction would occur primarily within a previously undisturbed site and along existing road corridors. The existing on-site soils appear to be clean sands with no wetlands on site, thus dry retention ponds could be used to meet storm water requirements. Since these soils appear to be good material, and pending verification by a geotechnical investigation, excavated soils from the retention areas would be used as fill for raising the site to the required finished floor elevation. Excess excavated soil would be removed from the project area to pre-approved locations.

The earthwork required to construct the EPF would uncover and disturb soils and increase the potential for wind and water erosion of these exposed soils. Appropriate measures to reduce wind and water erosion would be implemented. Grading and construction procedures would be designed to minimize topographic changes. The design would include balancing the amount of cut and fill to maximize the use of local material, where possible. Additional measures for erosion control may include permanent seeding, mulching, sod stabilization, and vegetative buffer strips. Sediment and erosion controls can also include engineered structures to divert or store flow, or limit runoff.

The ERP and Storm Water Pollution Prevention Plan (SWPPP) would include specific measures that would be implemented to control both wind and water erosion of soils before and during construction activities. Sediment and erosion controls generally address pollutants in storm water generated from the site during construction. Storm water management measures are generally implemented before and during construction and primarily result in reductions of pollutants in storm water. Additional measures include best management practices.

Minor short-term adverse impacts to soils are likely. However, long-term adverse impacts to soils would not be significant. Standard construction practices and adherence to permit requirements would minimize adverse impacts to geology and soils.

Activities associated with the operation of the EPF, including transportation of payloads from the Skid Strip to the facility and from the facility to the launch complexes, would have no impacts on Earth Resources.

4.4.2 No-Action Alternative

Under the No-Action alternative, the proposed EPF would not be constructed. Thus, no short-term or long-term impacts to earth resources would result from construction activities or operation of this facility.

4.5 Environmental Justice

An adverse impact to environmental justice in minority or low-income populations would occur if:

- There was an impact to the natural or physical environment or to health that resulted in a disproportionately high and adverse environmental effect on a minority or low-income population or children;
- There was an adverse environmental impact on minority or low-income populations or children that was disproportionately high or adverse when compared with adverse effects on the general population or other comparison group;
- The risk or rate of environmental hazard exposure by a minority or low-income population exceeded those on the general population or other comparison group; or
- There was a disproportionately high or adverse health or environmental effect on a minority or low-income population, resulting from cumulative or multiple adverse exposures from environmental hazards.

4.5.1 Proposed Action

The Proposed Action would occur within the boundaries of Cape Canaveral AFS. No minority or low-income populations reside within these areas. Thus, the project would not result in adverse impacts to environmental justice.

4.5.2 No-Action Alternative

Under the No-Action alternative, the proposed EPF would not be constructed. Thus, no impacts to environmental justice would occur.

4.6 Hazardous Materials and Waste Management

4.6.1 Proposed Action

Regulatory standards and guidelines exist to determine the potential impacts associated with the use of hazardous materials and the generation of hazardous wastes.

The potential for adverse impacts to the natural environment exists for the reasons outlined below.

Hazardous materials, primarily in the form of petroleum, oil and lubricants (POL), would be used for operating the construction equipment. The potential exists for unexpected releases of POL used for the equipment, which would generate hazardous waste. In addition, construction contractors would be transporting hazardous materials. If hazardous waste were encountered during construction, a permitted hazardous waste hauler would transport them to an appropriate facility. Strict compliance with all applicable regulations would avoid the potential for adverse impacts as a result of the presence, use and transportation of hazardous materials, wastes and substances within project areas and on Cape Canaveral AFS.

The construction contractor will develop a Hazardous Materials and Hazardous Waste Management Plan that will address the proper containment, storage, and disposal of hazardous materials and hazardous wastes used and generated by construction activities, to prevent potential adverse impacts of these substances on the environment.

The construction operations would create pollution in the air and water and would generate hazardous and solid waste. Compliance with the Pollution Prevention Management Plan and implementation of the recommended measures for air quality (see Section 4.4) and hazardous waste management (see above) would enhance pollution prevention.

Per EO 13101, *Greening the Government Through Waste Prevention, Recycling, and Federal Acquisition*, and EO 12902, *Energy Efficiency and Water Conservation at Federal Facilities*, contractors are required to employ sustainability concepts during the planning, design, construction, operation, and demolition of all Air Force facilities. Sustainable design techniques include designing for HAZMAT reduction, disassembly and recyclability, durability and life extension, reduced maintenance, energy conservation, or water conservation. Specific affirmative procurement are detailed at the AFCEE web site (<http://www.afcee.brooks.af.mil/eq/ap/gg/default.asp>).

In addition, EO 13101 requires the use of EPP which have reduced toxicity and hazardous characteristics or reduced embodied energy in it's manufacturing. The U.S. EPA provides comprehensive on-line EPP training in the "Tools and Resources" section of their EPP World Wide Web site. Case studies, guides, and purchasing tips are also included (www.epa.gov/opptintr/epp/toolspage.htm).

During the operational phase of the EPF, hazardous materials would be present at the site and hazardous operations would occur within the facility. The Cape Canaveral AFS Risk Management Plan under 40 CFR 68 would be amended and updated as required.

4.6.2 No-Action Alternative

Under the No-Action alternative, the proposed EPF would not be constructed. Thus, no impacts would occur as a result of hazardous materials use or hazardous waste generation.

4.7 Land Use

4.7.1 Proposed Action

The Proposed Action would occur within the boundary of Cape Canaveral AFS. It would not result in a conversion of prime agricultural land or cause a decrease in the utilization of land. In addition, the proposed EPF is not expected to adversely affect recreation or aesthetics. Therefore, no adverse impacts on land use are anticipated.

The site for the proposed EPF does not lie within the FCMA no-development zone. Therefore, construction of this facility is consistent with the FCMA. In addition, the contractor would coordinate with 45 CES prior to design of facilities to ensure adherence to all siting standards.

4.7.2 No-Action Alternative

Under the No-Action alternative, the proposed EPF would not be constructed. Thus, no impacts to land use would occur.

4.8 Noise

4.8.1 Proposed Action

There are many methods for quantifying noise, depending on the potential impacts in question and on the type of noise. One useful noise measurement in determining the effects of noise is the one-hour average sound level, abbreviated L_{eq1H} . The L_{eq1H} can be thought of in terms of *equivalent* sound, i.e., a L_{eq1H} is 45.3 dB is what would be measured if a sound measurement device were placed in a sound field of 45.3 dB for one hour. However, this is not what happens during real sound measurements. When a L_{eq1H} level of 45.3 dB is measured, the sound level has fluctuated above and below 45.3 dB, but the *average* during that hour is 45.3 dB. The L_{eq1H} is usually A-weighted, unless specified otherwise. A-weighting is a standard filter used in acoustics that approximates human hearing and in some cases is the most appropriate weighting filter when investigating the impacts of noise on wildlife and humans. L_{eq} measurements can also be specified for other time periods, e.g., 8- or 24-hour periods. Examples of A-weighted noise levels for various common noise sources are shown in Table 4-2.

Predictions of noise levels for different construction activities for a stationary observer were developed for distances of 50, 100, and 300 ft (Table 4-3). The equipment and machinery selected for each activity is typical for each type of construction activity.

As a sound source gets further away, the sound level decreases. This is called the attenuation rate. The rate used in these estimates was a decrease in level of 4.5 dB per doubling of distance. This average rate has been shown to be an accurate estimate from field data on grassy surfaces (Harris 1998).

Table 4-2. Comparative A-weighted sound levels.

Noise Level (dBA)	Common Noise Levels	
	Indoor	Outdoor
100 - 110	Rock band inside New York subway	Jet flyover at 304 meters
90 - 100	Food blender at one meter	Gas lawnmower at one meter
80 - 90	Garbage disposal at one meter	Diesel truck at 15 meters Noisy urban daytime
70 - 80	Shouting at one meter Vacuum cleaner at three meters	Gas lawnmower at 30 meters
60 - 70	Normal speech at one meter	Commercial area heavy traffic at 100 meters
50 - 60	Large business office Dishwasher next room	
40 - 50	Small theater (background) Large conference room (background)	Quiet urban nighttime
30 - 40	Library (background)	Quiet suburban nighttime
20 - 30	Bedroom at night	Quiet rural nighttime
10 - 20	Broadcast and recording studio (background)	
0 - 10	Threshold of hearing	

(modified from U.S. Department of Transportation 1980)

Table 4-3. L_{eq1h} noise levels as a result of construction activities.

Distance from Construction area (feet)	Structural Work (dB)	Concrete Work (dB)	Road Construction (dB)
50	89.1	89.6	80.6
100	84.6	85.1	76.1
300	77.4	77.9	69.0
500	74.1	74.6	65.6

According to Occupational Safety and Health Administration (OSHA) regulations, employees should not be subjected to sound exceeding an L_{eq} of 90 dB for an 8-hour period. This sound level increases by 5 dB for with each halving of time (e.g. 4-hour period at 95 dB). Exposure up to an L_{eq} of 115 dB is permitted for a maximum of only 15 minutes during an 8-hour work day and no exposure above 115 dB is permitted. For this analysis, OSHA standards are used as the “not to exceed” significance criteria as they are the most appropriate standards available, however in this assessment “employees” would refer instead to personnel working on or visiting Cape Canaveral AFS that may be affected by the Proposed Action but are not associated with its construction activities.

The construction associated with the Proposed Action would temporarily increase the ambient noise levels in the project areas. All areas affected are adjacent to buildings and along roadways, and there would be sensitive receptors in the vicinity of the construction. However, based on the magnitude of the construction activities and estimated noise levels that would be generated (Table 4-3), the maximum noise level exposures established by OSHA, and the anticipated exposure time to the construction noise, it is anticipated that no adverse impacts would result.

During the operational phase of the project, facility equipment would not generate noise levels above maximum noise level exposures established by OSHA. Likewise, vehicles transporting payloads and accompanying convoys would not generate noise that would significantly increase the present noise levels in the area.

4.8.2 No-Action Alternative

Under the No-Action alternative, the proposed EPF would not be constructed. Thus, no noise related impacts associated with construction or operation would occur.

4.9 Socioeconomics

4.9.1 Proposed Action

The proposed construction project is expected to employ approximately 20 to 25 construction workers for a period of approximately 24 months. Since the magnitude of this project is small, it is anticipated that all work would be accomplished by already employed personnel working the local or nearby areas. Personnel presently employed at existing facilities would be employed at the new facility during its operational phase. Therefore, no adverse impacts to the local population and employment are expected to result from implementation of the Proposed Action.

4.9.2 No-Action Alternative

Under the No-Action alternative, the proposed EPF would not be constructed. Given the small magnitude of the project and that personnel that would be employed in a new facility would remain at existing facilities, no adverse impacts to the local population and employment would result.

4.10 Traffic and Transportation

4.10.1 Proposed Action

Construction traffic associated with the Proposed Action is not expected to adversely affect traffic within Cape Canaveral AFS given the magnitude of the proposed project. Some traffic restrictions would occur during installation of utilities (i.e., water, sewer, electricity and communications), and during road intersection modifications and construction. However, because these restrictions would be short-term they would not be of magnitude to result in a significant adverse impact to local traffic.

During the operational phase of the facility, some traffic restrictions would occur during transportation of payloads from the facility to launch complexes due to the hazardous nature of this operation. However, these operations would occur during off-peak hours for traffic, which would minimize the inconveniences to commuters and workers within the installation.

4.10.2 No-Action Alternative

Under the No-Action alternative, the proposed EPF would not be constructed. Thus, no impacts to traffic and transportation would occur.

4.11 Utilities

4.11.1 Proposed Action

During construction, potable water usage would be greater than that required under the No-Action Alternative. As a result, average daily water consumption on Cape Canaveral AFS would increase slightly during the 24-month construction period. The current average demand on Cape Canaveral AFS is approximately 0.75 MGD, and the system has a capacity of three MGD. No adverse impacts are anticipated during construction. It is anticipated that water usage during the operational phase would not result in a significant increase from current usage. Installation of a new water main to more than one facility would require a Potable Water Distribution Permit from the FDEP.

Construction activities associated with the Proposed Action would increase wastewater generation during the construction period of 24 months. The current system has a permitted capacity of 0.8 MGD and a peak daily flow of approximately 0.3 MGD. The expected increase can be absorbed by the existing system, and no adverse impacts are anticipated. During the operational phase, wastewater would not be generated in quantities that would exceed the permitted capacity. Thus, no adverse effects are anticipated. Installation of a wastewater main and or a lift station would require a Domestic Wastewater Collection/Transmission permit from the FDEP.

Solid waste generated over the duration of the construction associated with the Proposed Action would include packaging from materials (cardboard and plastic), scrap rebar, and miscellaneous waste generated by onsite construction workers. The contractor would be responsible for the disposal and/or recycling of all waste generated during the scope of the construction project. Miscellaneous unrecyclable wastes generated during construction will be disposed of off-base by the contractor. Soils removed from the project site would be transported to a designated site. Falsework used during the project would be reused or recycled by the contractor. During the operational phase of the facility, solid waste would include packaging from materials and miscellaneous waste generated by onsite personnel. However, the amount of solid waste generated is not expected to exceed allowable amounts. Therefore, the Proposed Action would have no adverse impacts on solid waste management at Cape Canaveral AFB.

Per EO 13101, *Greening the Government Through Waste Prevention, Recycling, and Federal Acquisition*, and EO 12902, *Energy Efficiency and Water Conservation at Federal Facilities*, contractors are required to employ sustainability concepts during the planning, design, construction, operation, and demolition of all Air Force facilities. Sustainable design techniques include designing for HAZMAT reduction, disassembly and recyclability, durability and life extension, reduced maintenance, energy conservation, or water conservation. Specific affirmative procurement are detailed at the Air Force Center for Environmental Excellent (AFCEE) World Wide Web site (<http://www.afcee.brooks.af.mil/eq/ap/gg/default.asp>).

In addition, EO 13101 requires the use of EPP which have reduced toxicity and hazardous characteristics or reduced embodied energy in it's manufacturing. The U.S. EPA provides comprehensive on-line EPP training in the "Tools and Resources" section of their EPP World Wide Web site. Case studies, guides, and purchasing tips are also included (www.epa.gov/opptintr/epp/toolspage.htm).

Increases in electrical consumption during construction are expected to be minimal. During operation, electrical consumption would increase. However, this increase is not expected to result in an undue burden to the existing electrical capacity and usage of Cape Canaveral AFS. Therefore, no adverse impacts to electrical consumption are expected.

4.11.2 No-Action Alternative

Under the No-Action alternative, the proposed EPF would not be constructed. Thus, no impacts to utilities would occur.

4.12 Water Resources

4.12.1 Proposed Action

There are no surface bodies of water within the ROI. Groundwater within the ROI is not used as a source of potable drinking water. The water quality is considered poor due to elevated levels of total dissolved solids, which exceed secondary drinking water regulations; high levels of chlorides and sulfates, and the presence of volatile chlorinated solvents. Furthermore, the surficial aquifer is not capable of producing large volumes of water. The Proposed Action is not expected to adversely impact groundwater quality or alter the hydrogeologic characteristics of the surficial aquifer. Because there are no wetlands on the site, dry retention ponds would be used to meet the storm water requirements. Stormwater facilities shall meet SJRWMD Criteria for retention volumes, treatment methods, and pond design criteria.

The ERP and SWPPP would include specific measures that would be implemented to control both wind and water erosion of soils before and during construction activities. Sediment and erosion controls generally address pollutants in storm water generated from the site during construction. Storm water management measures are generally implemented before and during construction and primarily result in reductions of pollutants

in storm water. Additional measures include best management practices. Implementation of these measures would reduce potential adverse impacts to a less than significant level.

4.12.2 No-Action Alternative

Under the No-Action alternative, the proposed EPF would not be constructed. Thus, no impacts to water resources would result from construction activities.

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APPENDIX A

Initial Assessments of Potential Sites for the NRO EPF

The following figures depict initial assessments applied to the selection of potential sites for the EPF by organizations and agencies within the 45 SW, KSC, and the NRO.

Figure A-1: **LOS** – considered to determine potential sites.

Figures A-2 through A-5: **Site Locations** – depicts potential sites with LOS impacts.

Figure A-6: **Skid Strip Vertical Height Restrictions** – this requirement eliminated Alternative 6 from further consideration.

Figure A-7 through A-10. **BDA, FHA and ILL.** Safety requirements for protection against potential loss of a National Asset being processed in the facility as a result of a launch failure require that the site for the EPF be located outside the ILL of any launch facility. Operational requirements of the EPF require that the facility not be within the BDA or FHA of any launch complex. These figures show typical launch complex BDA, FHA, and ILL for the Shuttle, Delta IV (SLC-37), Delta II (SLC-17), and Atlas V (SLC-41). Because these are new launch vehicles with little operational data or history, the ILL is equal to the FHA. Atlas V eliminates Alternative 3 and Delta IV (SLC-37) eliminates Alternative 3 and Alternative 4. The proposed EPF would be within the ILL of SLC-17. However, evacuation of the EPF during launch activities would not be required. All four sites are within the Shuttle Secondary ILL, which at this time is not a constraint.

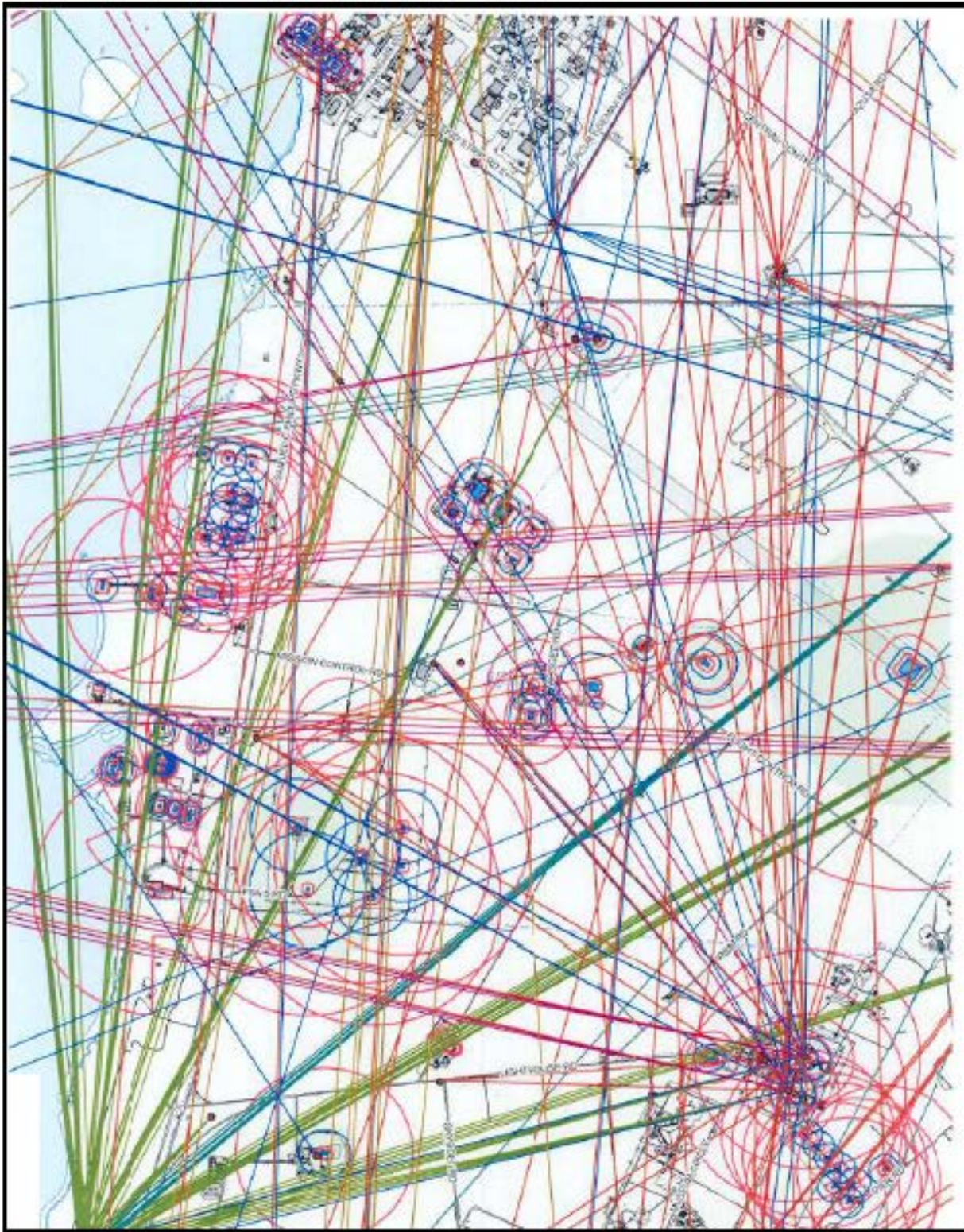


Figure A-1. LOS considered during the process to select potential sites.

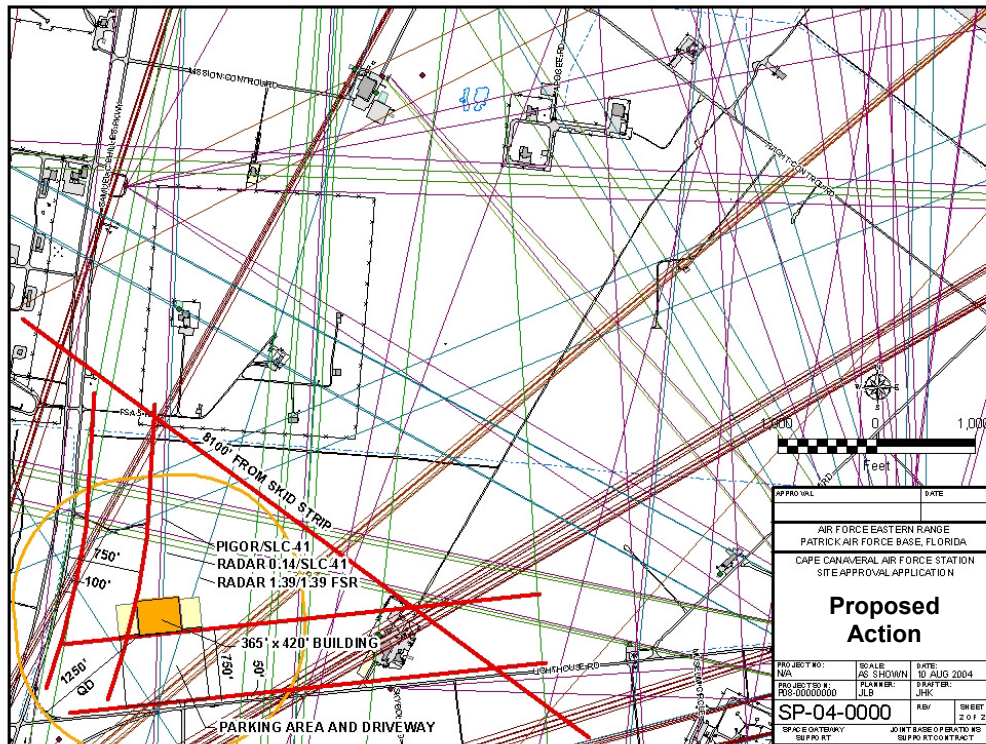


Figure A-2. Location of Proposed Action and LOS restrictions.

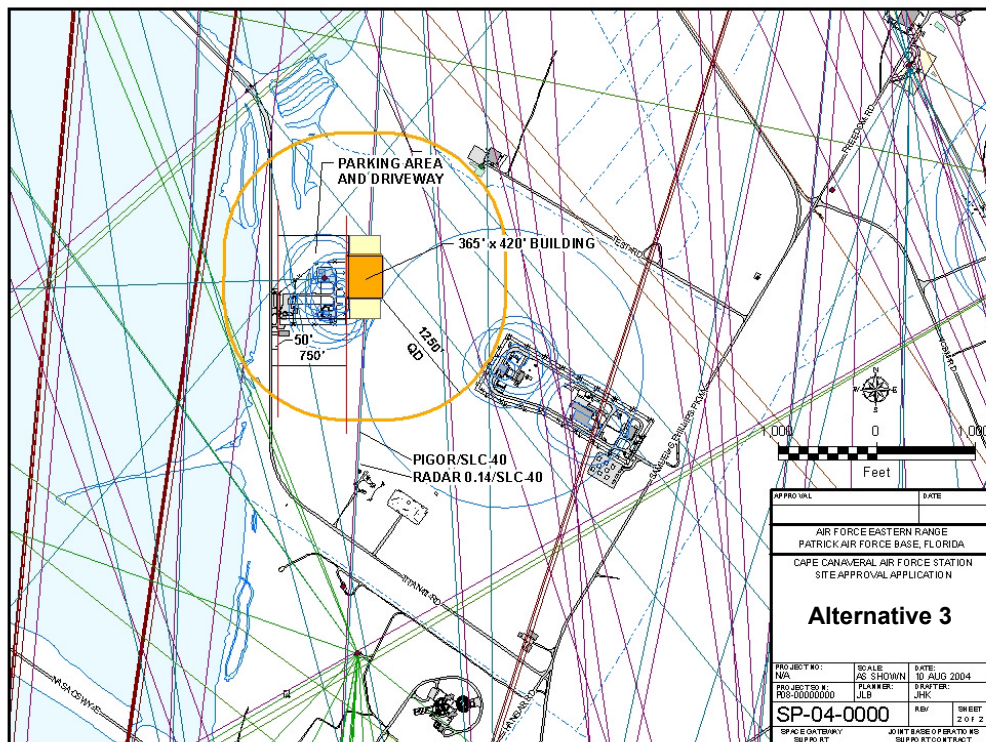


Figure A-3. Location of Alternative 3 and LOS restrictions.

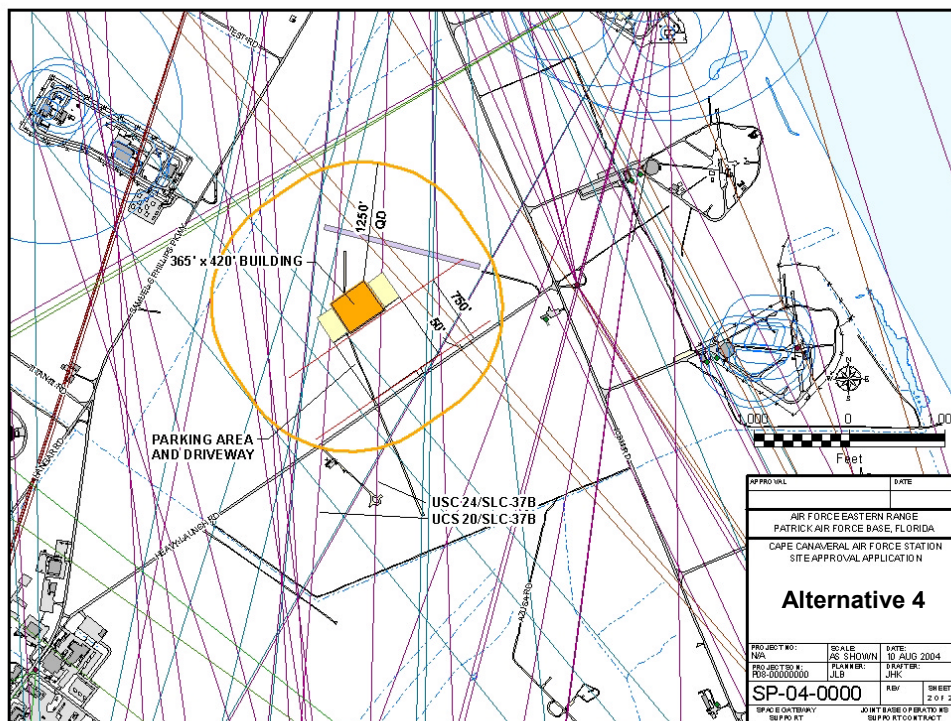


Figure A-4. Location of Alternative 4 and LOS restrictions.

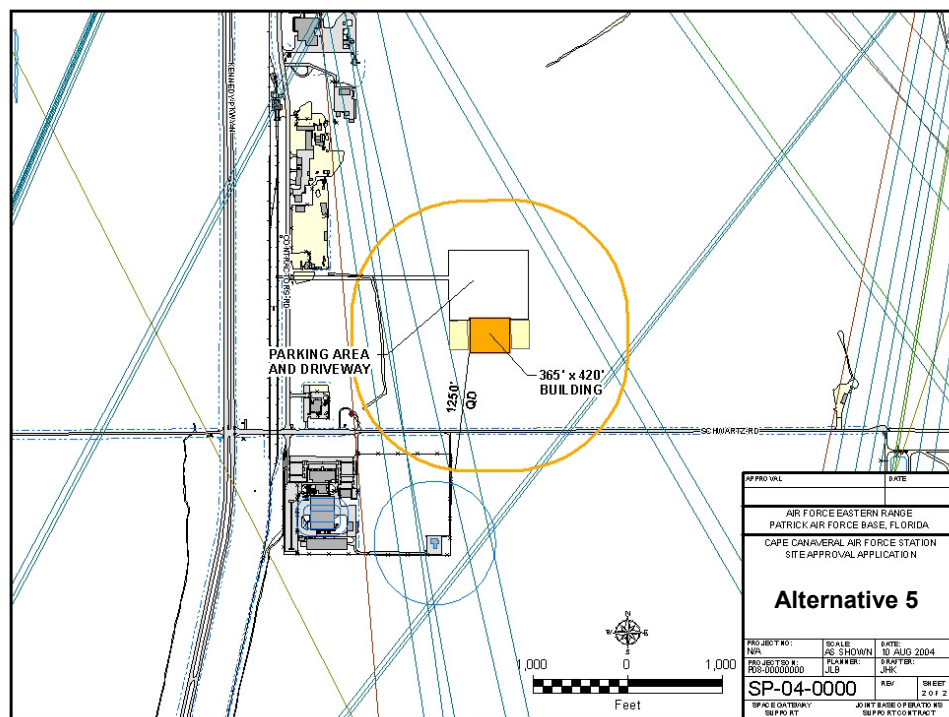


Figure A-5. Location of Alternative 5 and LOS restrictions.

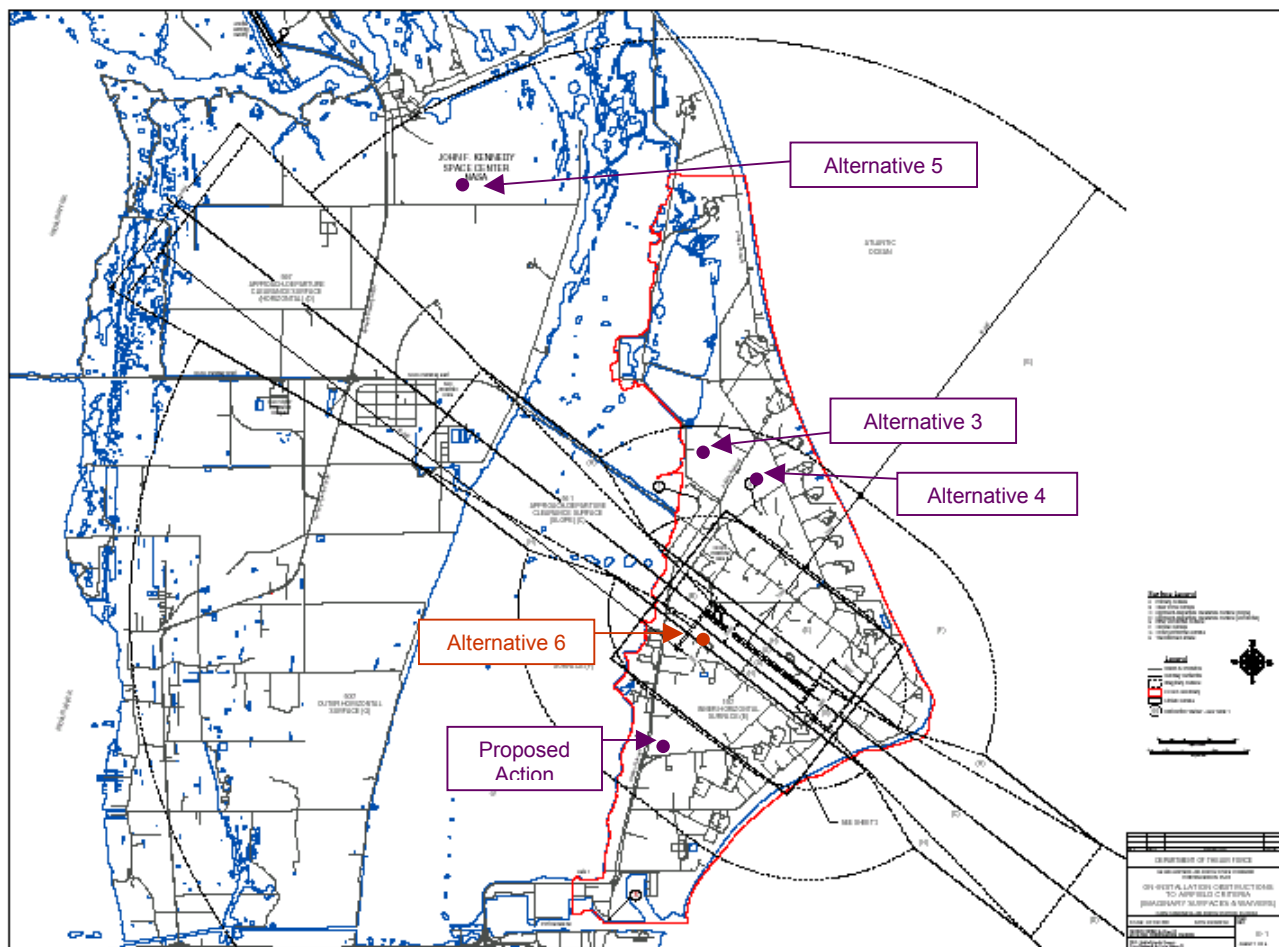


Figure A-6. Skid Strip vertical height restrictions.

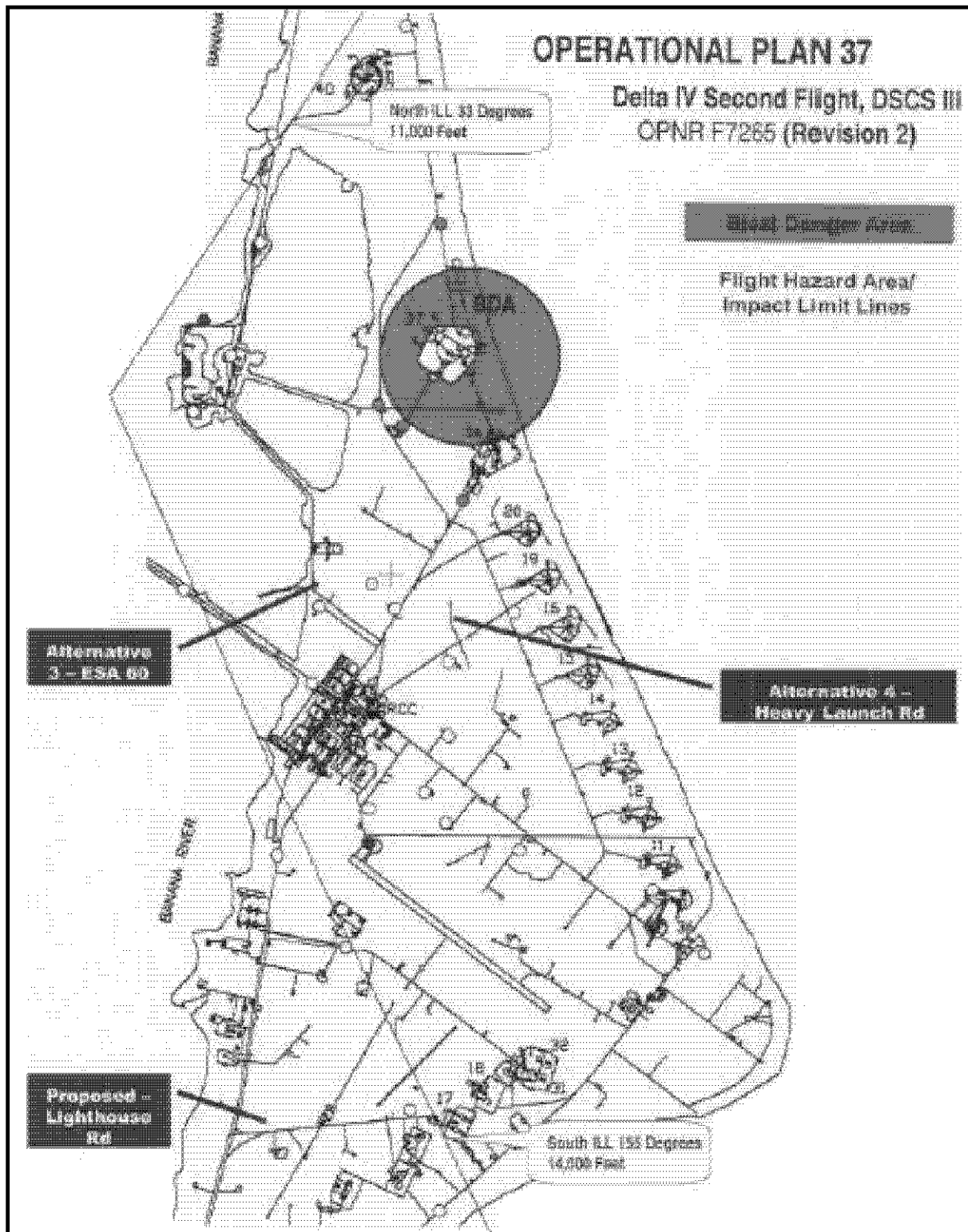


Figure A-7. SLC-37 BDA, FHA and ILL.

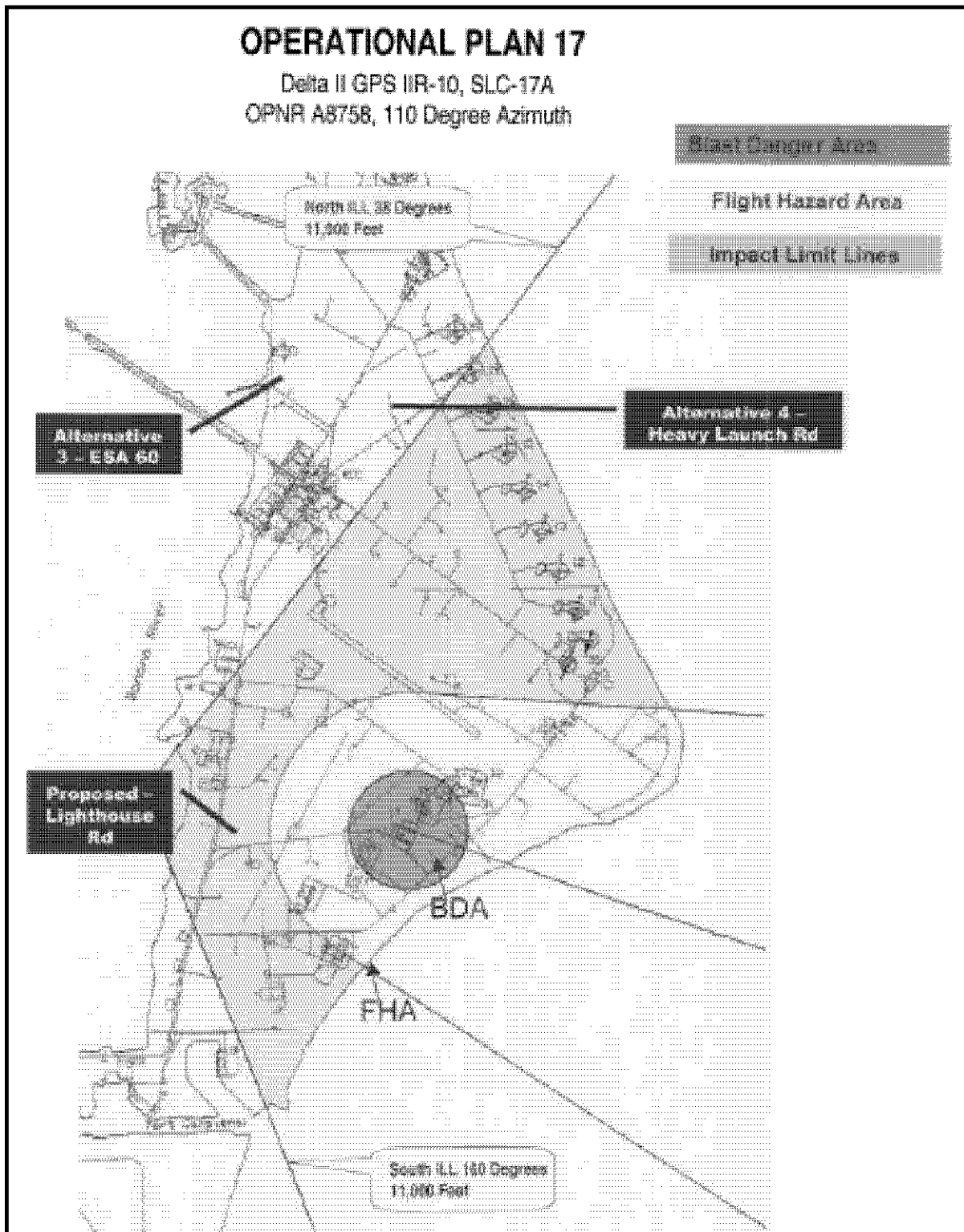


Figure A-8. SLC-17 BDA, FHA and ILL.

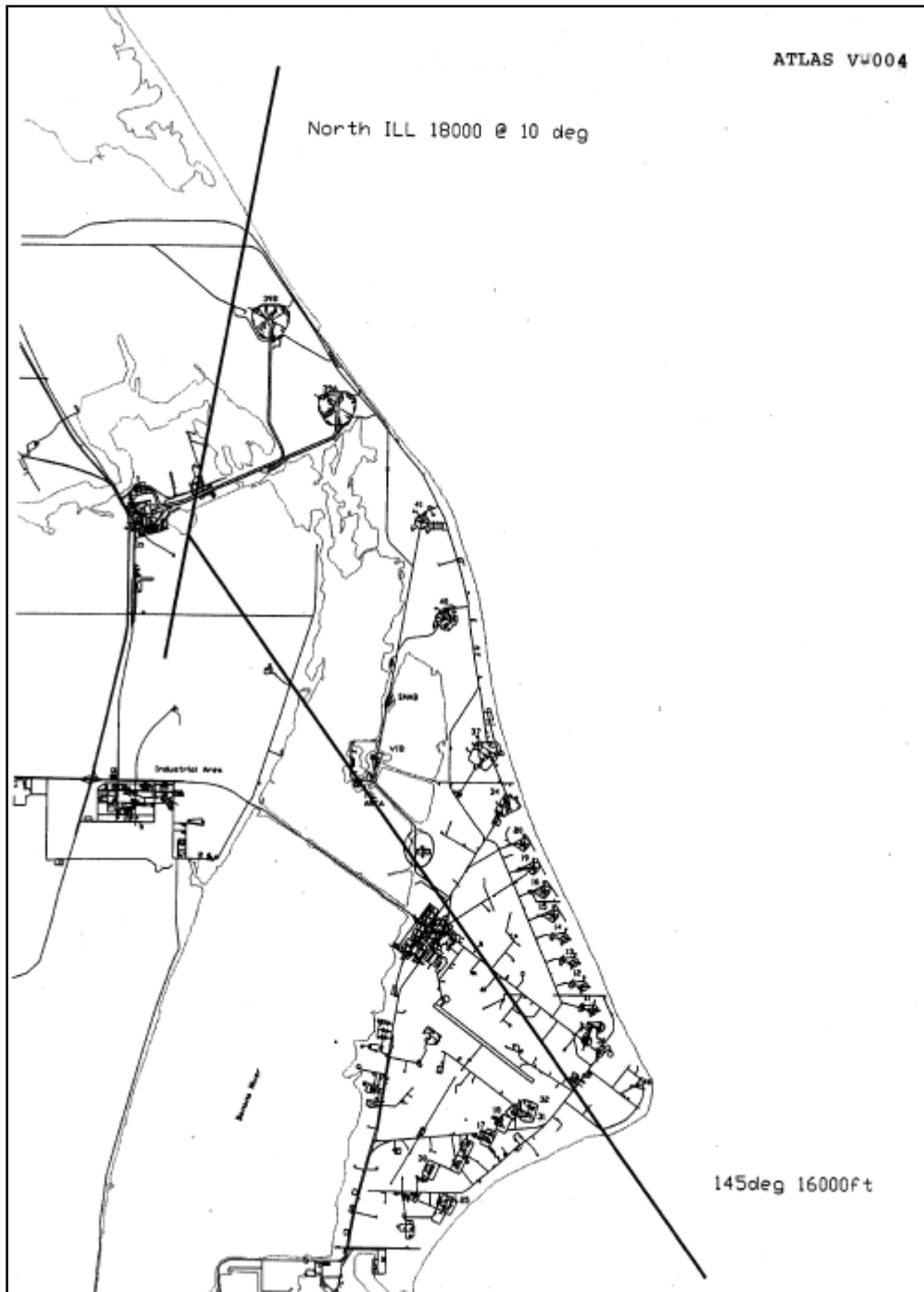


Figure A-9. SLC-41 ILL/FHA.

APPENDIX B

Lighting Design Criteria

Site Lighting Design Criteria
Project 5107.30
November 04, 2004

1. Roadway and Parking Areas lighting design basis:
 - A. Quantity and quality of illumination will conform to the latest issue of the Illumination Engineering Society's (IES) Lighting Handbook except as modified below.
 - B. Vertical light distribution shall be medium distribution 4.5 to 7.5 times the mounting height.
 - C. Lateral (Transverse) light distribution shall be Type II for narrow roads and Type III & IV for progressively wider roads.
 - D. Fixture shall be 180W LPS type fixtures, Semicutoff control which limits the lumen output above nadir to 5% at 90 degrees horizontal and 20% at 80 degrees.
 - E. For Local Residential 30 foot wide roads 4 lux (0.4 footcandles) required average maintained illuminance, with a uniformity ratio meeting IES requirements, fixture mounted 30 foot above roadway on same side of road.
 - F. Normal vehicle parking (including minor repair) will have 5 lux (0.5 footcandles) average measured on 10-foot intervals, except where higher illuminances are approved. Often roadway rather than floodlighting luminaires may be more suitable.
 - G. Luminaries will be located to provide uniformity of illumination with average-to-minimum spacing ratio not to exceed three to one. Actual requirements will be checked against the IES Lighting Handbook guidelines. Luminaires for two and three lane roads will be placed on one side of the streets. Adequate coverage will be provided so that security is not degraded. For four lane roads, poles may have to be placed on both sides of the road for uniformity. The illumination at intersections will be at least twice that required on intersecting roads. To meet these requirements two luminaires are all that are necessary for two and three lane roads; but for intersections of four lanes or those with merging traffic, four luminaires are necessary.
2. Security lighting design basis:
 - A. Quantity and quality of illumination will conform to the latest issue of the Illumination Engineering Society's (IES) Lighting Handbook except as modified below and Air Force security lighting requirements, AFI 31-101, *Air Force Installation Security Program*.
 - B. Lights shall be spaced and located to minimize the impact of a single lamp failure.
 - C. Fixture shall be 180W LPS type fixtures, Semicutoff control which limits the lumen output above nadir to 5% at 90 degrees horizontal and 20% at 80 degrees.
 - D. Illumination of restricted area boundary includes exterior and interior clear zones adjacent to boundary barriers (fences). The design will provide adequate light on the bordering area, glare light in the eyes of the aggressors, and minimum light on guard personnel. Glare which handicaps guards or authorized operations will be avoided. Poles will normally be placed inside the boundary fence and between patrol road and the boundary. The distance of poles from the fence will be + or - 20 feet and will not be less than 5 feet, and this distance will be used only where the patrol road is close to the fence. Controlled lighting will be provided. Mounting height for controlled lighting will be a minimum of 25 feet. Illumination level for controlled lighting will be adequate to detect a moving aggressor, either by visually or by use of CCTV. Shadows, except those cast by aggressors, will be avoided.
 - E. Lighting is installed at entry points through boundaries or into interior sensitive areas to facilitate accurate and rapid identification of personal requiring entry into the area and complete inspection within and under vehicles. Fixtures will be placed so that light sources are above and behind the entry guard and facing persons or vehicles approaching the area. The entry guard house will be inside the area in comparative darkness.
 - F. The boundary for this project will be considered a non-isolated fenced boundary. The width of the lighted area depends on the clear distances available.
 - G. Controlled lighting for non-isolated area will be 20 to 30 feet inside and 30 to 40 feet outside and 4 lux (0.4 footcandles) at outer lighted edge and 5 lux (0.5 footcandles) within.
 - H. Controlled lighting for entry point at structures inside will be 50 feet and 10 lux (1 footcandles) out from structure.

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- I. Controlled lighting for entry point pedestrian inside will be 25 feet and 25 feet outside and 20 lux (2 footcandles) entry pavement and sidewalk.
 - J. Controlled lighting for entry point vehicular inside will be 50 feet and 25 feet outside and 100 lux (1 footcandles) entry pavement and sidewalk.
 - K. The illumination uniformity ratio of the maximum to minimum at any point in the entire clear zone outside the perimeter fence will not exceed 10 to 1 and within a 30-foot inner area will not exceed 6 to 1. Area lighting will not exceed a 6 to 1 ratio.

APPENDIX C

Florida Scrub-Jay Management

Scrub-Jay Management Plan

The Florida Scrub-jay (*Aphelocoma coerulescens*) was Federally listed as a threatened species on June 3, 1987 under the Endangered Species Act (ESA) of 1973. The scrub-jay population on CCAFS is believed to be one of the largest populations currently in existence (Cox 1984, 1987, Stevens and Hardesty 1998). In order to identify species and habitat needs, a number of studies have been conducted to provide information needed to develop a management plan. Management actions for scrub-jays on CCAFS are primarily oriented toward habitat improvement. Since the majority of CCAFS is or could be scrub-jay habitat, many land clearing activities have the potential to adversely impact scrub-jays and their habitat.

Section 7 of the ESA mandates Federal agencies to consult informally with the FWS on any action that is likely to jeopardize the continued existence of species proposed for listing as threatened or endangered; and to consult formally for those species currently listed. Because a large percentage of all scrub-jays occur on Federal lands, the ESA can provide substantial protection to this species. Conducting Section 7 Consultation on projects that may impact scrub-jays is identified as a major protective measure for this species. The Recovery Plan for the Florida scrub-jay (see Appendix 5A for Executive Summary), prepared by the FWS, delineates "reasonable actions believed required to recover and or protect this species" (U. S. Fish and Wildlife Service 1990).

The primary recovery objective and effort for the scrub-jay is to "halt the long term and continuing decline of its numbers and distribution, and to protect and enhance as much of its remaining habitat as possible." A more specific objective is to protect and enhance scrub-jay numbers and habitats at the existing large, viable populations, including CCAFS. The Merritt Island National Wildlife Refuge (MINWR)/Cape Canaveral area contains a very large population of scrub-jays and may be important to smaller scattered populations nearby.

Part II of the Recovery Plan describes recovery objectives and specific management actions required to achieve these objectives. The Recovery Plan provides an implementation schedule of actions to be conducted by various cooperating organizations including the U. S. Air Force. The first objective, and most applicable to the Air Force, is to "protect, manage and enhance Florida scrub-jay habitat on public lands." This objective is of primary importance and must be met to prevent an irreversible decline or extinction of the species. Federally owned lands need to be maintained at a stage suitable for scrub-jays. Therefore, the Air Force must initiate habitat enhancement and protection measures on CCAFS, including, but not necessarily limited to:

1. Maintaining mowed grass areas along roads and facilities.

2. Conducting periodic prescribed burns of oak scrub to prevent possible succession into a xeric hammock or having scrub reach a height unsuitable for scrub-jays.
3. Improving degraded habitat by mechanical clearing methods followed by burning.
4. Monitoring scrub-jay numbers to determine effects of management recovery efforts.
5. Conducting exotic vegetation control in areas that have been improved.

Another objective of the Recovery Plan is to identify research needs of the species. The plan identifies the following research on basic biological requirements of the Florida scrub-jay that should be conducted:

1. Determine minimum size of an area of suitable habitat that can support a viable scrub-jay population.
2. Provide more information on scrub-jay basic biology, particularly for areas where little or no data are currently available. Topics should include reproductive success, nesting, fledgling dispersal, mortality, predation, survival and food habits.
3. In order to objectively assess recovery efforts it will be necessary to continually monitor the stability and health of existing wild populations.

This INRMP component plan describes the biology of scrub-jays and identifies 45SW management goals and objectives for scrub-jays and their habitat on CCAFS. All activities on the station must comply with the ESA throughout Air Force occupation and operation of CCAFS with respect to the threatened Florida scrub-jay. The objectives will be obtained by providing optimal habitat for a population of scrub-jays through a program of prescribed burns and habitat management (see Scrub Habitat Restoration Plan, Appendix 6).

Scrub-jay Background Information

The Florida scrub-jay is endemic to Florida and is a 30-centimeter (12-inch), bluish-colored, crestless jay totally lacking the white-tipped wings and tail feathers of the more common and widespread blue jay (*Cyanocitta cristata*). A necklace of blue feathers separates the white throat from the grayer underparts, and a white line over the eye often blends into a whitish forehead. The tail is long and loose in appearance (Woolfenden 1978). This species is decidedly less vocal than the blue jay. The notes vocalized by scrub-jays are similar to the blue jay but are repeated at greater intervals and are shorter in duration. It is habitat-specific, depending on the availability of Florida scrub for its survival. Because of the loss of scrub habitat due to disruption of natural fire cycles and clearing for homes and agriculture, the populations that remain are small, demographically isolated, and likely to decline. The core populations remaining for Florida scrub-

jays are the Archbold Biological Station (ABS) population located on the Lake Wales Ridge in central Florida, the Ocala National Forest population, the Kennedy Space Center (KSC)/MINWR population, and the CCAFS population. A core population is defined as a contiguous population that exceeds 400 territorial pairs. The CCAFS scrub-jay population is considered part of the larger metapopulation that includes birds on Merritt Island (KSC and the Canaveral National Seashore).

Scrub-jays are non-migratory, extremely sedentary, and have very specific habitat requirements. The jays are permanently monogamous (with the exception of the loss of a mate), long-lived, and exhibit a short, highly synchronized, cooperative breeding and nesting season (Woolfenden 1973). Except where subject to habitat loss and fragmentation, most scrub-jays disperse short distances (one to three territory widths) and occupy a territory for life after becoming breeders (Breininger, et al. 1996).

Observations on CCAFS indicate that nests are frequently constructed in the dense twigs of the tough buckthorn. Nest materials usually consist of oak twigs of various size and shape used to construct the coarse outer structure, and palmetto fibers for the firm woven inner lining.

Scrub-jays are cooperative breeders in that non-breeding adults, referred to as helpers, participate in territory and nest defense, mobbing predators and breeding activities (excluding nest construction, egg-laying and incubation) within their natal territories. Virtually all yearlings and over half of all two-year olds and a percentage of three and four year old Florida scrub-jays remain as helpers (Woolfenden 1973). When the loss of both breeders in a group occurs, helpers will usually join unrelated families. A dominance hierarchy exists for all scrub-jay groups. Males dominate females, breeders dominate helpers and older helpers dominate younger ones. Helpers of like sex and age show lineal dominance - subordination relationships.

Florida scrub-jays rarely breed before two years of age and often do not become reproductively active until three or four years. Clutch size varies from 2-5 eggs with a mean of 3.4. Clutch size generally increases with a female's breeding experience. Incubation of eggs requires approximately 17 days. Predation of nests on CCAFS is extremely heavy (Stevens and Young 2000). Virtually all nest losses at CCAFS are attributed to nest predation. The complete loss of eggs and young from nests that appear undamaged by the removal of their contents implicates snakes as the prime candidates (Stevens and Hardesty 1998). Stevens and Hardesty (1998), found that on CCAFS, nesting activities begin in mid-March and continue through late June. Forty-seven scrub-jay groups attempted 74 nests in 1998. The maximum number of nesting attempts was 3.0 and the minimum was 1.0, with an average of 1.6 attempts per nesting group.

The 16 groups fledging young averaged 3.31 fledglings per group, with number of fledglings ranging from one to four. The presence of helpers increased both the probability that groups would fledge young and the number of young produced by these groups. Groups with helpers averaged 2.0 fledglings, while pairs averaged 0.7 fledglings.

Florida scrub-jays are omnivorous, consuming about 60 percent animal matter. Insects comprise the bulk of the diet for most of the year and are particularly important in the spring, fulfilling the high energetic demands associated with nesting. Various small vertebrates may also be consumed when available: frogs, toads, lizards, small snakes, rodents, bobwhite chicks, and various small bird eggs and fledglings are reported scrub-jay food items at the ABS. Acorns form the primary plant food and are eaten throughout the year. During late summer and fall months, scrub-jays spend a significant portion of the day gathering ripening acorns, the majority of which are buried in the sand to be recovered and eaten later in the year. Acorns are an essential plant component of the scrub-jay's diet, providing a staple food during periods of low insect availability. Other plant items eaten when available include palmetto seeds, tread softly, briars, blueberries, gallberries, rosemary seeds and there is evidence that scrub-jays consume hickory nuts at CCAFS.

The Florida scrub-jay is restricted to a xeric scrub community consisting of low, dense oak thickets including live oak, sand live oak, myrtle, and Chapman oak with numerous interspersed open sandy areas (Woolfenden 1978). Scrub-jays show an obligatory reliance on oaks, especially those growing in low open scrub as previously described. A minimum scrub height of 1m is required for scrub-jay habitation (Westcott 1970), and scrub heights of 1.2-1.7 meters are optimal (Breininger et. al 1995). The preferred scrub-jay habitat includes 10-30% bare sand or sparse herbaceous growth, greater than 50% oaks, less than 15% pine canopy cover, and greater than 100 m of forest (Breininger et al. 1996). Breininger (1981) was unable to locate scrub-jays in habitats averaging greater than five meters in height and Cox (1987) was unable to find jays in areas where large trees resulted in greater than 50 percent canopy closure.

Wildfires are believed to have maintained scrub communities as a low, open habitat suitable for scrub-jays. Exclusion of fire in these communities eliminates open sandy areas and can lead to succession from low scrub to xeric hammock (Veno 1976). The period of time for this succession to occur is not well documented, and probably varies based on site characteristics. Cox (1984) suggested that fires need to occur at least every 20-30 years if scrub is to remain suitable for scrub-jays. Data from the ABS indicated that scrub-jays abandoned an area of scrubby flatwoods in a period of 50 years when fire was excluded from the site (Cox 1984).

Florida Scrub-jay Population Estimates for CCAFS

The Nature Conservancy (TNC) is contracted by the Air Force to study the demography of Florida scrub-jays on CCAFS. A census of all suitable, accessible jay habitat is completed between January and March each year. Censuses are performed on virtually all roadways, lines-of-sight, fire breaks, canal banks, and any other edge areas. Census protocols were adapted from Woolfenden and Fitzpatrick (1991). Where possible, census points are spaced at 100-yard intervals to minimize the potential for over- or under-counting groups and individual birds. Areas with high scrub-jay densities are surveyed repeatedly to improve the accuracy of the census (Stevens and Hardesty 1998).

Nesting activity is monitored from February to July. Observers attempt to find every nesting attempt in the study areas and to follow their progress. Nestlings are banded on or about 11 days after hatching using procedures discussed in Woolfenden and Fitzpatrick (1991). Banding is conducted by placing a uniquely identifying open ended metal ring around the leg of the bird. The bands are very light-weight and do not appear to impede the birds in any way. All steps are taken to minimize disturbance to the animals.

Color banding is the best method for gathering information on the Florida scrub-jay in a defined area (generally including five or more territories). The extreme docility of this species, when not harassed, makes it an ideal subject for banding and observation. Since the birds do not migrate, they can be studied in their habitat year-round with little inconvenience to the observer or bird. In addition, banding nestlings and juveniles during the nesting season can follow several generations of cohorts.

Approximately half of the estimated 7,000 - 11,000 scrub-jays statewide exist on the Merritt Island National Wildlife Refuge/CCAFS complex. Considering the importance of the CCAFS scrub-jay population for maintaining stable statewide population, special consideration and management of this species and its habitat is required.

Stevens and Young (2000) found that numbers of groups dropped from 123 in 1999 to 104 in 2000. Loss of optimal habitat is believed to be the main agent responsible for this decline. Figure 1 illustrates the results of the 2000 census. The number of birds decreased 7% to 293 birds. Reproductive success in 2000 was above the average for the CCAFS population. Fifty-six percent of nesting groups produced fledglings. Nest predation still appears to be the major determinant to reproductive success and almost always resulted in the complete loss of eggs or young. Long-term prospects for Florida scrub-jay populations

surviving and reproducing in degraded scrub are not encouraging. Modeled population trajectories based on observed demographic parameters for five sites on nearby KSC/MINWR showed populations declining by 25-50% over 10 years (Breininger et al. 1996).

Scrub-jay Habitat on CCAFS

Previous reports noted that Cox (1987) estimated approximately 11,000 acres of coastal scrub and coastal strand habitats remained on the station in 1979. This number is believed to be excessively high and may be related to some inaccuracies in methodologies used. More recently, low altitude aerial infrared imagery was analyzed and it was estimated that approximately 7,700 acres of scrub potentially suitable for jays exist on the station (INRMP 1997). Mercadante (1990) estimated acreages for oak scrub (includes all inland scrub and oak woodlands), disturbed oak scrub, coastal strand, and disturbed coastal strand habitats. Analysis further refined estimate acreages for two vegetation height classes; less than or equal to three meters and greater than three meters (Table 1, Analysis of Scrub-jay Habitat on CCAFS). Note that these data were developed over a decade ago using the 3 meter criteria instead of 2 meter and acreage numbers have changed with time and management activities.

**Table 1. Analysis of Scrub-jay Habitat on CCAFS
(Derived From 1989 Low Altitude Aerial Infrared Imagery)**

Cover Type	Height(m)	Area(ac)	%Cover
Oak Scrub	<3	964	12.4
Oak Scrub	>3	5,359	69.3
Oak Scrub (Disturbed)	Various	1,027	13.3
Coastal Strand	<3	321	4.1
Coastal Strand (Disturbed)			
Total Potential Scrub-jay Habitat		7,737	

This estimate of potential habitat does not include ruderal areas (e.g., road shoulders and facility grounds) adjacent to scrubs, which are periodically used by, and provide habitat (primarily the open space components) for jays. Extensively disturbed scrub sites completely lacking shrubs or dominated by undesirable species (e.g., Brazilian pepper, wax myrtle and *Baccharis*) were also omitted from the estimate. Large, contiguous open sites that lack oak shrubs or trees are probably not utilized by scrub-jays.

Remarkably, in 1990, nearly 70 percent of all potential jay habitat on the station exceeded optimal scrub height (1-2m) for jay use, and only 18 percent of undisturbed oak scrub was considered optimal for scrub-jays. This does not mean that 70 percent of the scrub on CCAFS is not inhabited by jays, but may

indicate populations are pressured by marginal habitat conditions. Scrub-jay territories located in marginal habitat on the station could be population sinks, where mortality exceeds natality (birth rate) (Breininger et al. 1998).

Florida scrub-jays defend relatively large territories (5-15 ha) that often include habitat patches with different fire histories (Woolfenden and Fitzpatrick 1984, Breininger et al 1995). Breininger et al (1995) concluded that reproductive success for Florida scrub-jays exceeded mortality only in areas where scrub was a mixture of short (< 1.2 m tall) and optimal height scrub (1.2 – 1.7 m tall). It was hypothesized that the absence of scrub > 1.2 m tall would have negative impacts on scrub-jay populations because they need scrub taller than 1.2 m to provide cover for nest sites and to escape predators.

Breininger et al (1995) study is the only published account to have concluded that scrub-jays cannot survive in habitats that differ from these parameters. It was concluded that long-term survival of Florida scrub-jays would require a habitat where virtually all the scrub is burned within the last 20 years and includes a mosaic of different age classes and sizes.

Management Implications

It is generally accepted that scrub-jay numbers could be declining on the station due to several factors, including habitat destruction and lack of suitable habitat. One immediate impact is destruction of habitat due to new construction. Although most new construction on CCAFS typically requires less than five acres, several "small" jobs can cumulatively have a significant impact on scrub-jay habitat at the station. A more significant threat to scrub-jays on CCAFS is the disruption of the ecosystem's fire ecology. Historically, fires started by lightning were an important factor in maintaining the sparse, low scrub vegetation required by the scrub-jay. The 40-year history of fire suppression on CCAFS has influenced the vegetative structure. In addition, an unknown number of human induced scrub-jay mortalities result from the operation of motorized vehicles.

Studies of several banded populations of FSJs in different scrub habitats provide a wealth of information that can be used to document the status of populations and project their future status. Several lines of evidence suggest that the future status of the FSJ population on CCAFS depends on the size of the population and the amount of optimal scrub habitat available to them. Major points include:

1. Population size is well below what is needed for long-term population persistence.
2. Population size is declining.
3. Adult mortality usually exceeds recruitment (juveniles surviving to adulthood) in sub-optimal habitat.
4. Most scrub habitat on CCAFS is sub-optimal in quality.

5. Nominal scrub restoration rate (recently at 150 ac/year) will not provide sufficient optimal habitat for more than 100 groups.

An analysis of risks and the development of targets or goals for Florida scrub-jay population management on CCAFS was conducted in May of 2001 (Schmalzer and Stevens, in Appendix 6). It was determined that the future status of this population remains questionable, however, CCAFS contains sufficient scrub habitat to support a population large enough to weather most anticipated challenges to its long-term persistence. The immediate need is to improve the quality of the remaining scrub at a pace that will minimize short-term losses to the existing FSJ population and provide sufficient optimal habitat to sustain long-term persistence.

The goal should be to establish a viable population of Florida scrub-jays on CCAFS. The characteristics of a viable population are:

- A healthy population in which recruitment is greater than or equal to mortality.
- A population size sufficient to weather catastrophic events, (e.g. epidemics, hurricanes).
- Long-term population persistence.
 - Time frame of 100 years is a common metric.
 - An acceptable risk of extinction, usually less than or equal to 10%.

After analyses were run on three population sizes – 100 groups of birds, 200 groups, and 300 groups, the determination was that approximately 300 groups would be necessary for long term survival and 300 groups could be supported on the CCAFS. This was followed by analyses of the number of acres of suitable habitat required to be restored in a timeframe that would reduce the risk of quasi-extinction (extinction in a localized area) of jays on CCAFS.

The recent nominal rate of scrub restoration of 150 ac/year is an improvement over the past when little or no restoration occurred, but is inadequate. At that rate, the initial restoration treatment of even the lowest goal of 2500 ac (100 groups of jays) would require 10 years, and the maintenance phase for this area of restored scrub would not be reached for 20 years (See Appendix 6). This rate of restoration would require 43 years to complete the initial restoration of 7500 ac of scrub.

In the chosen restoration scenario (Scenario 3, Figure 2), the initial restoration treatment is completed in 11 years (2012). Second burns are completed in 2017 and third burns in 2022. During the restoration period, a maximum of 1500 ac/yr of prescribed burning is required. Maintenance burning begins in 2014, and it continues at a rate of about 1000 ac/yr after 2022.

This scenario requires restoration and management of nearly the entire scrub habitat on CCAFS. It provides the lowest risk of quasi-extinction. Given adequate funding and limited conflicts with the Air Force mission, this goal will be implemented as our conservation target.

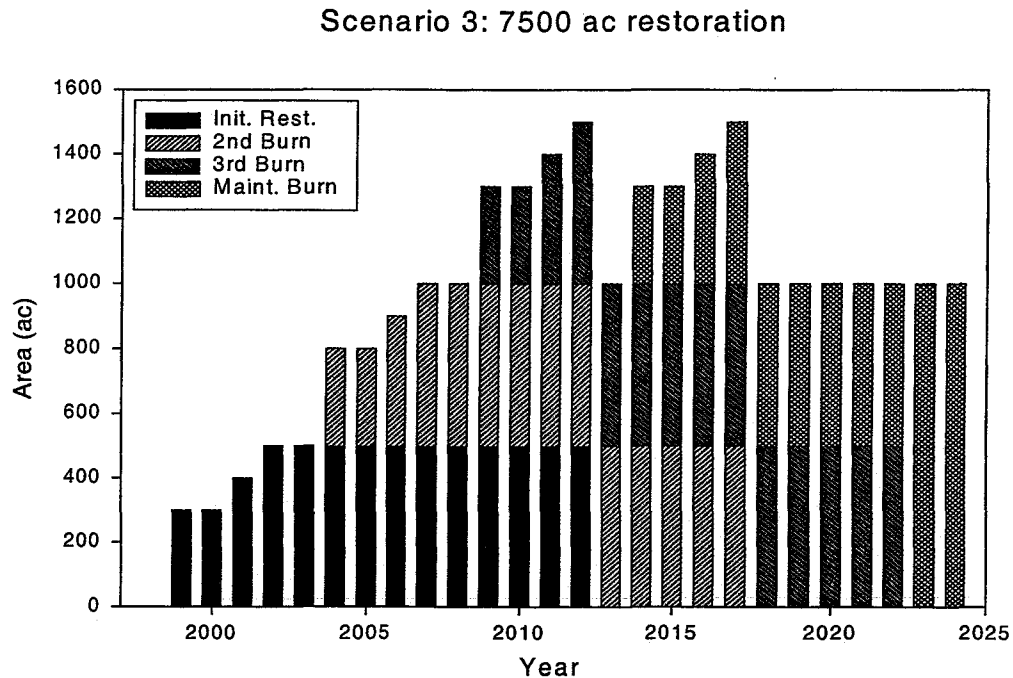


Figure 2

Activities That May Impact Scrub-jays

In accordance with AFI 32-7061, Environmental Impact Analysis Process, all CCAFS projects are reviewed for environmental compliance with state and Federal regulations. Any impacts to scrub-jays will be reviewed during this process. Identification and implementation of the proposed construction and mitigation guidelines will be accomplished through the EIAP.

Lack of habitat management and the removal of scrub associated with construction activities are the primary threats to the scrub-jay population on CCAFS. However, incidental impacts result from operation of motorized vehicles and potentially result from the application of pesticides. On CCAFS, Section 7 Consultation is accomplished by the U. S. Air Force (action proponent) with the FWS, Region 4, Endangered Species Field Station, Jacksonville, Florida

(representing the Secretary of Interior). Since the majority of Florida scrub-jays are located on Federal lands, Section 7 is considered one of the most powerful tools to protect this species and its habitat.

After an informal review held in 1999 between the Air Force and FWS, a document was developed entitled Scrub Habitat Compensation on CCAFS. This document is included in the INRMP as a separate component plan. In the meeting, the FWS stated that all habitat on CCAFS is potential "scrub" and is considered scrub habitat that must be compensated for if lost/developed. Because of this, the Air Force has adopted a policy that was agreed upon by FWS for a 4 to 1 compensation rate for scrub lost to development. Funds will be given to the on going CCAFS scrub restoration program coordinated by the Environmental Planning Function.

Although construction activities are not the only actions that have the potential to adversely impact threatened and endangered species, it is one of the significant impacts on scrub-jays at CCAFS. In compliance with the Endangered Species Act, the Air Force will informally consult with the FWS for all projects located in scrub; or other actions that have the potential to impact the scrub-jay. If through the Informal Consultation process it is determined that an action is likely to adversely impact scrub-jays, the Air Force (or project proponent) will prepare a Biological Assessment addressing potential impacts, and enter into Formal Consultation with the FWS.

Construction of new facilities and expansion of existing facilities on CCAFS are periodically needed to meet mission requirements. A significant portion of this development will undoubtedly impact existing scrub habitat on CCAFS. During the past 8-10 years, construction projects have resulted in the destruction of approximately 15-20 acres of scrub per year. However, destruction or disturbance of scrub can be minimized through proper site planning and thoughtful construction practices. Unavoidable scrub loss will be offset (mitigated) through scrub compensation measures currently in place on CCAFS.

The operation of motorized vehicles on CCAFS is potentially a significant source of mortality for scrub-jays on the station. Much of the suitable habitat on CCAFS is adjacent to major roads that are heavily utilized during early morning and late afternoon hours. Those peak traffic hours correspond to the scrub-jay's most active periods. Scrub-jays are often observed foraging along mowed road shoulders. Vehicles traveling at speeds in excess of 50 miles an hour have little opportunity to avoid hitting a startled scrub-jay or an individual that has darted into the roadway in pursuit of food. Both of these behaviors are frequently observed along CCAFS roadways. It has been observed that young fledgling birds are more likely than older birds to succumb to vehicular strikes. Determining a reasonable estimate of scrub-jay mortality from vehicular strikes is extremely difficult due to the rapid removal of carcasses by scavengers (e.g.,

vultures and raccoons). However, there have been several documented vehicle strikes, resulting in scrub-jay mortalities on both CCAFS and KSC. At least 16 mortalities are known to have occurred from 1989-1998 (Oddy 1998, pers. comm.). Although some amount of vehicular related jay mortality on CCAFS is unavoidable, a better understanding of the problem and potential solutions are required.

A long-term investigation to monitor mortality of scrub-jay groups with territories abutting major roads and groups in similar habitat that are not adjacent to major roads could provide some insight into road related mortality. Putting aside the unknowns of where and how many vehicular related scrub-jay mortalities occur, there are actions that can be implemented immediately that would reduce this mortality on the station. Efforts will be made to:

- 1) Encourage law enforcement to lower and enforce speed limits during the months when fledglings are moving across particular roads with known high nest densities and high speed limits (i.e. Pier Road).
- 2) Institute a program to increase public awareness of scrub-jays and other wildlife through Cape Bulletins and possibly road signs.

Research and Monitoring

Monitoring of the population is necessary to assess the success of scrub habitat restoration activities on CCAFS. Activities involved in scrub-jay censuses and monitoring, described earlier, are carried out by a strict protocol adopted from Woolfenden et al (1991). Impacts to the animals are considered minimal but necessary.

The FWS Recovery Plan for the Florida scrub-jay indicates that little information on scrub-jay basic biology is available outside of data collected from the ABS and MINWR. Suggested research topics for other locations include: defining optimal habitat, reproductive success, nesting, dispersal of fledglings, mortality predation, survival, and food habits. The Recovery Plan further states that it will be necessary to continually monitor the stability and health of existing wild populations. The Air Force is included in the following research tasks: determine minimum habitat size, obtain information on basic biology, determine introduction capabilities of scrub-jays, determine current distribution of small populations, and conduct periodic censuses. However, not all of these activities, such as determining introduction capabilities and distribution of small populations, are applicable to CCAFS.

The research objectives of TNC in studying the demography of Florida scrub-jays on CCAFS are to document the size of the population, monitor reproduction and survival of color-banded individuals, monitor the bird's response to habitat

modifications, and to suggest management recommendations. Prior to 1989, no formal studies on Florida scrub-jays were conducted on CCAFS.

TNC utilizes five primary study sites for their scrub-jay research on Cape Canaveral (Figure 3, Study Sites). Three of these sites, the Beach (BCH), Enhancement (ENH) and Rosemary (ROS), were established in 1994. The North Rosemary (NRO) site was added in 1995. The fifth site, Parkway (PKWY), was added late in the summer of 1998. This site, along with the BCH and combined NRO and ROS sites support the largest clusters of Florida scrub-jay groups on CCAFS (Stevens and Hardesty 1998). TNC is augmenting the scrub restoration program by additionally making observations of birds in some of the newer restoration sites.

The Air Force will conduct research on the Florida scrub-jay at CCAFS for the purpose of obtaining information needed to properly manage the species and its habitat. When a sufficient amount of data has been compiled to make these determinations, the research effort will be reduced proportionately. Periodic monitoring of the population must be continued until the species has fully recovered.

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Scrub Habitat Restoration Plan

Introduction

In the 1950s, after the Air Force acquisition of CCAFS, a fire suppression policy became effective. Total wildfire suppression was conducted at CCAFS to protect resources vital to the United States. Consequently, the natural cycle of the coastal scrub community was adversely interrupted, and the typical sparse, reduced height scrub became overgrown.

In the late 1980s, the lack of wildfires or the implementation of a prescribed burning program on CCAFS was deemed to be a threat to the continued survival of the Florida scrub-jay, (*Aphelocoma coerulescens*). Under the ESA, all Federal lands, where scrub-jays exist, must be managed so that the survivability of the species is improved. Recovery efforts throughout the state and consultations between the FWS and the Air Force led to the FWS Biological Opinion (January of 1991) regarding the first scrub-jay management plan for CCAFS. The scrub-jay management plan (current version found in Appendix 5, INRMP) led to the development of a strategy for restoring the scrub habitat required by this Federally threatened species.

The CCAFS scrub habitat restoration program was initiated in 1991 for the purpose of restoring over-mature scrub to a condition suitable to support the Florida scrub-jay. Initially, this program was accomplished solely through the application of prescribed fire. The purpose of the original burn program was to introduce a controlled fire in place of naturally occurring wildfires initiated by lightning strikes in the oak scrub. These burns maintain the oak scrub as a low, open habitat that many floral and faunal species have evolved to utilize. In addition, a fire regime reduces vegetative biomass to needed nutrients used to promote future plant growth. Additionally, the newly sprouting vegetation supports numerous wildlife species by providing a preferred food source.

After the initial program began, it was realized that over-mature oak scrub could not be managed through controlled burning alone. Mechanical treatment prior to burning was deemed necessary in some areas and therefore, in 1994, the Air Force purchased a Hydro-ax™ tree cutter to support the scrub restoration program. The Hydro-ax™ is a large rubber-tired tractor with an articulated mower deck capable of chopping down shrubs and trees up to 10 inches in diameter. After treatment, vegetation height is reduced with minimal disturbance to the soils and plant root systems. Once slash has dried sufficiently, sites are then burned. Burning of mechanically treated sites is required to prevent an accumulation of debris/litter (fuel) as well as maintain open patches of sand, which has been shown to be essential to scrub-jays. In addition to improving the habitat, controlled burns reduce the amount of fuel that has accumulated during 40 years of fire suppression of CCAFS, thus reducing the possibility of catastrophic wildfires.

The directives of the scrub restoration program reflect modern conservation practices aimed at promoting operational safety, efficiency and enhancing the habitat usability by various wildlife species. These actions are compatible with the CCAFS mission, but methods will be modified, as required, to ensure that there is no conflict with the mission. This plan will be revised, as needed, to incorporate operational changes in procedures and land use, and to incorporate information from monitoring of the scrub restoration program.

Prescribed burning will reduce accumulated fuel in a controlled situation, thereby reducing the hazard of naturally occurring wildfires. Professional foresters, having visited CCAFS, have agreed that a dangerous accumulation of combustible fuels does exist on the station (Figure 1, Fuel Loads). This situation increases the dangers related to wildfires as the intense heat, produced by excessive amounts of fuel, inhibits efforts to control or suppress the blaze. An intense and uncontrolled wildfire would be counterproductive to the goals of this plan and the overall mission on CCAFS.

Controlled burning is highly recommended for wildlife habitat management in southern forests, especially those considered fire sub-climax communities. If vegetation in these types of communities is not burned periodically, the land will evolve past its current composition, thereby rendering the habitat unsuitable for certain wildlife species indigenous to CCAFS. The major wildlife species on CCAFS which would benefit from the use of controlled burning include Florida white-tailed deer, squirrels, rabbits, gopher tortoise, Eastern indigo snake, quail, doves, and the Florida scrub-jay. Beneficial results from burning include an increase in yield and quality of herbage, legumes, browse from hardwood sprouts, and the creation of openings for feeding, caching and travel.

The proper size, frequency and time of burn are critical to the successful use of fire in managing wildlife habitat and maintaining biodiversity. Prescriptions will recognize the biological requirements of the wildlife species and current condition of the available food sources within a proposed burn site. Since it is not feasible to burn all forested land on CCAFS, it is imperative that the Air Force attain this controlled burn goal to ensure the continued existence of the Federally threatened Florida scrub-jay on the station.

Currently, the Air Force uses prescribed fires in selected portions of the CCAFS coastal scrub to reach the goals and objectives described above. A total of 8,030 acres of unimproved lands were compartmentalized to facilitate a scrub management program on CCAFS in 1991. One hundred thirty-four management compartments delineated by existing roads, firebreaks, lines-of-sight, canals and natural interdunal swales were identified to receive various scrub habitat manipulations (Figure 2, Burn Compartments).

Several lines of evidence suggest that the future status of the FSJ population on CCAFS depends on the size of the population and the amount of optimal scrub habitat available to them. Major points include:

1. Population size is well below what is needed for long-term population persistence.
2. Population size is declining.
3. Adult mortality usually exceeds recruitment (juveniles surviving to adulthood) in sub-optimal habitat,
4. Most scrub habitat on CCAFS is sub-optimal in quality.
5. Nominal scrub restoration rate (recently at 150 ac/year) will not provide sufficient optimal habitat for more than 100 groups.

In May 2001, Schmalzer and Stevens (Appendix 6A) analyzed risks to the Florida scrub-jay and potential goals for scrub restoration on CCAFS. It was determined that the future status of this population remains questionable, however, CCAFS contains sufficient scrub habitat to support a population large enough to weather most anticipated challenges to its long-term persistence. The immediate need is to improve the quality of the remaining scrub at a pace that will minimize short-term losses to the existing scrub-jay population and provide sufficient optimal habitat to sustain long-term persistence.

The goal should be to establish a viable population of scrub-jays on CCAFS. The characteristics of a viable population are:

- a healthy population in which recruitment is greater than or equal to mortality,
- a population size sufficient to weather catastrophic events, (e.g. epidemics, hurricanes),
- long-term population persistence (time frame of 100 years is a common metric, and
- an acceptable risk of extinction, usually less than or equal to 10%).

After analyses were run on three population sizes – 100 groups of birds, 200 groups and 300 groups, the determination was that approximately 300 groups would be necessary for long term survival and 300 groups could be supported on the CCAFS. This was followed by analyses of the number of acres of suitable habitat required to be restored in a timeframe that would reduce the risk of quasi-extinction of jays on CCAFS.

To develop potential goals for scrub habitat restoration for CCAFS, they considered the following information:

- Scrub-Jay populations have been shown to be demographically stable (reproduction > mortality) only where habitat conditions are optimal.
- Scrub on CCAFS is highly degraded due to > 40 years of fire suppression. In some areas, exotic plants, particularly Brazilian pepper, further degrade scrub habitat.
- Scrub restoration sites treated since 1998 show generally good recovery and improving habitat conditions; however, optimal conditions will not be produced

by a single management action. By the end of FY 2001, it is expected that about 1000 ac will have been treated initially.

- Growth rates of long-unburned scrub often exceed that of scrub that has burned periodically. The coastal scrub, dominated by *Quercus virginiana*, that occupies much of CCAFS exhibits rapid height growth.
- Scrub restoration needs to be considered a process leading to a maintenance phase of management by prescribed burning rather than a single management action. Based on current knowledge, the following protocol seems most appropriate.

1. Initial Restoration – mechanically cut to the extent required and prescribe burn scrub.
2. Conduct exotic plant treatment to the extent required 1 year following fire.
3. Conduct second burn five years following initial burn.
4. Conduct third burn five years after second burn.
5. Transition to long-term management through prescribed burning at 5-10 year (mean = 7.5 year) intervals. The second and third restoration burns and the long-term management burns are intended to be mosaic burns that produce and maintain a mix of optimal height and short scrub.

The recent nominal rate of scrub restoration of 150 ac/year is an improvement over the past when little or no restoration occurred but is inadequate. At that rate, the initial restoration treatment of even the lowest goal of 2500 ac (100 groups of Jays) would require 10 years, and the maintenance phase for this area of restored scrub would not be reached for 20 years. This rate of restoration would require 43 years to complete the initial restoration of 7500 ac of scrub.

In the restoration scenario chosen, Figure 3, the initial restoration treatment (applied to 500 ac/yr) will be completed in 11 years (2012). Second burns will be completed in 2017 and third burns in 2022. During the restoration period, a maximum of 1500 ac/yr of prescribed burning will be required. Maintenance burning will begin in 2014, and continues at a rate of about 1000 ac/yr after 2022.

This scenario requires restoration and management of nearly the entire scrub habitat on CCAFS. It provides the lowest risk of quasi-extinction. Given adequate funding and limited conflicts with the Air Force mission, this goal will be implemented as our conservation target.

Methods

Mechanical treatment, followed by controlled burning will be the primary management tool for scrub enhancement on CCAFS. Mechanical treatment, as well as installation of firebreaks, of the units will be performed by the Air Force's environmental contractor. Controlled burning of the units will be performed by FWS personnel from the Merritt Island National Wildlife Refuge, under a Cooperative Agreement signed in 1984. The Air Force environmental contractor

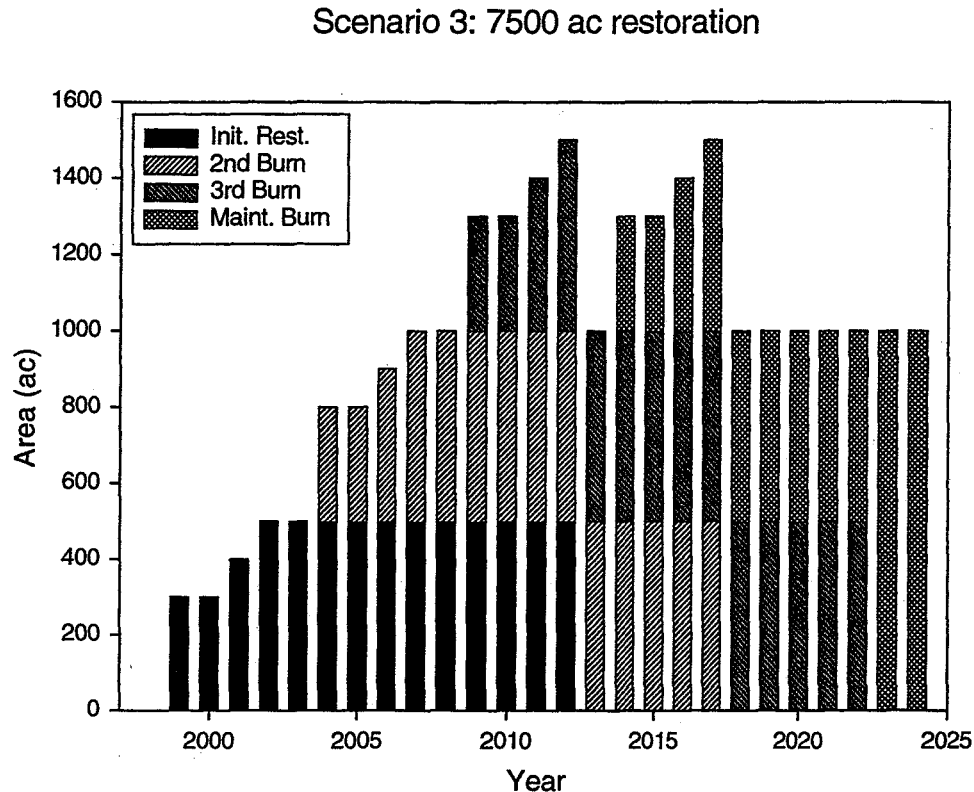


Figure 3. Scenario 3 in Risk Analysis with 7500 acres restored on CCAFS.

will identify sites to be burned, safety and security considerations, and dates when burns can be conducted without impacting the mission.

Sites will be prioritized based on their potential for improvement as habitat for scrub-jays. Once determined, sites will be mechanically cut at a height not less than 18 inches to lessen soil disturbance, and reduce the probability of creating areas for exotic species growth.

Due to the presence of the scrub-jay on CCAFS, special consideration will be given to populated sites prior to cutting and burning. The Nature Conservancy (TNC) is the contractor responsible for conducting jay population censuses on CCAFS. Based on their findings and recommendations, compartments will be treated and burned so as to reduce impact on this and other species.

The FWS and the Air Force environmental contractor determine primary and alternate dates for the prescribed burning of selected compartments once the sites are prepared. The current notification procedure involves an electronic (e-

mail) notification process in which Cape Support is the focal point. The Air Force environmental contractor, in conjunction with Cape Support, has developed an electronic mailing list that includes facility managers, launch squadron commanders, spacecraft managers, civilians and contractors who provide spacecraft support and/or maintenance.

Burn schedules with appropriate burn unit locations, and a brief description of the weather requirements and restrictions, are sent to Cape Support. In most cases, notifications are sent 30 days, 15 days, seven days, and the week of the burn. Cape Support then proceeds to generate a bulletin-type announcement that is sent via e-mail to the distribution list. Cape Support serves as a filtering and question/concern gatherer. Questions/concerns generated by those on the distribution list are passed to the Air Force environmental contractor for follow up and resolution. They are also responsible for obtaining verbal confirmations (go/no go) from those institutions determined to have final veto on the burn.

Due to CCAFS mission-related operational constraints and weather restrictions, satisfactory burn days are limited. Therefore, when suitable days occur, top priority should be given to accomplish the burn. Firebreak construction and maintenance must be completed prior to initiation of a burn. The burn should be initiated as soon as possible after the approved 9:00 A.M. start time. On the day of the burn, prior to setting the fire, coordinating agencies (Fire, Security and Safety Departments) and adjacent property owners will be notified. The Burn Manager will make a final check with the U.S. Weather Service and defer burning if predictions are unfavorable for the next 12 hours. All fires will be extinguished one hour prior to sunset on the same day as ignited.

A number of firebreaks have been constructed on CCAFS to protect hazardous operation areas from the threat of forest fires. In addition, five vegetative firebreaks were constructed in 1988 as part of a multiple use project designed to reduce sightline and canal bank maintenance, improve wildlife habitat, provide additional security access and initiate a Cape-wide firebreak system. Routine maintenance has not been established for these firebreaks. Further, the road and drainage canal system on CCAFS provides an extensive network of disturbed land that facilitates bare ground firebreak construction. Therefore, firebreak construction has been identified and planned in accordance with the priorities established for the compartments' burning schedule.

Florida law requires a permit to conduct open burning in the state. This authorization must be obtained from the Division of Forestry. The person responsible for conducting the burn must be in attendance at a location upwind from the fire for the entire period of the burn. The burn cannot be allowed to produce smoke, soot, odors, visible emissions, heat, flame, radiation or other conditions to such a degree as to create a nuisance. The Division of Forestry can revoke burn permits for improper management techniques.

Appendix 6

When planning and conducting prescribed fires, the Prescribed Fire Manager and Prescribed Burn Boss must exercise their responsibilities in a way that meets Clean Air Act standards (Public Law 95-95) and best serves the public interest. Prescribed fire stewardship emphasizes the immediate safety aspects of personnel conducting the burn; the health, safety, and property of others that may be directly affected by the fire; and the potential for off-site effects of smoke on public health and visibility. Prescribed fires produce varying quantities of smoke, an elusive by-product that can be a major concern; therefore, smoke management must be considered in every prescribed fire plan.

Prior to mechanical treatment and burning, sites are visited to determine general presence of fauna and any related constraints. Heavy equipment operators conducting mechanical treatment activities will be observant to the presence of both gopher tortoises and nesting birds.

To date, 37 compartments totaling approximately 1100 acres have been treated (Figure 4, Treated Units). Some of these units were treated in the early 1990's, and did not respond well, requiring additional treatment in the future.

Each year the plan is reassessed and targeted compartments are evaluated based on the latest scrub-jay information (through site visits and meetings with the scrub-jay monitoring team), restoration techniques and resources. Appendix 6A. provides an example of the monitoring report generated each year related to restoration activities. Work plans are developed for the annual targeted areas with a general prescription for each. The following are the general areas targeted for scrub restoration work.

Current Work Plan – Phillips Parkway

Scrub restoration along the Phillips Parkway corridor proceeded more rapidly than expected with compartments 37, 38, 39, 49, 68, 69 and 81 cut and burned in 1999. Between January and November 2000, compartments 99, 100, 101, 115 and 118 were cut and burned. Preliminary data indicate that scrub-jays have continued to use treated units, and some jay groups have produced fledglings in these areas (Stevens and Young 1999).

Scrub restoration in FY 2001 is planned for compartments along Phillips Parkway not completed in FY 2000. These will complete the first phase of scrub restoration along Phillips Parkway.

The FY 2001 compartments include compartment 82, which surrounds Fuel Storage Area 5. This compartment is heavily used by scrub-jays; seven jay groups nested in it during the 2000 season. Therefore, only the eastern portion, which is higher and much less suitable, will be treated at this time. Compartment 80 is adjacent to C-82 and enclosed by the same fence. It consists of tall, dense scrub with little scrub-jay use. It will be treated in conjunction with C-82. The heavy utilization of C-82 by jays makes it important to improve poor quality scrub

adjoining this unit. Compartment 81 to the north and C-99 and C-100 to the south have already been cut and burned.

Compartment 116 was burned in 1991, but has grown rapidly. About 30 acres that didn't burn in 1991 require cutting. The eastern portion of the unit contains larger dimension trees than can be handled with present equipment and will be left untreated. The cut scrub and 50-70% of the uncut will then be burned, but some will be left unburned for jays resident there. Three jay groups nested in the unit during the 2000 season

Compartment 117 will require cutting, prescribed burning, and treatment of the exotic Australian pine (*Casuarina* spp.) for its restoration. One scrub-jay group nested in the unit during the 2000 season. The eastern portion of the unit contains larger dimension trees, and some may be left untreated.

Compartment 126 is on the south corner of Pier Road and Phillips Parkway. It is a unit of 44 acres where most of the scrub is tall and dense. One scrub-jay group nested in it during the 2000 season, primarily utilizing edges. Most of the unit will be cut and burned, leaving some shorter scrub for the resident jays.

Work Plan – Pier Road

After completion of the Phillips Parkway treatment, work can begin along the Pier Road corridor. Pier Road, particularly in proximity to the coast, is important scrub-jay habitat, but habitat quality has declined. Work along Pier Road will proceed in two phases. Five compartments totaling 187 acres occur along the east-west section of the road. Restoration via cutting and burning of some or all of these units will establish a corridor of more suitable habitat between Phillips Parkway and the north-south section of Pier Road. Ten compartments totaling 387 acres that would benefit from restoration have been identified along the north-south section of Pier Road. More detailed plans for work in these compartments will be developed in the future. Figure 5 illustrates the units planned for treatment in the near future.

Work Plan – Other Areas

Several additional compartments are planned for treatment through specific project funding sources, currently being worked in two phases. They include an effort to restore compartments 48, 66, 7 and 4, and a second phase to restore 67, 79, 98, 86, 87, and 88. The details of each compartment, including condition, jay use and prescription are described in the work plans for these projects. Several of the compartments in the first phase include a large percentage of oaks too large to be cut readily by Hydro-ax™, and so a V- Saw™ will be used.

One scrub-jay group occurred in compartment 48 during the Cape-wide census (Stevens and Young 2000). Compartment 66 had two scrub-jay groups

observed during the Cape-wide census. There is some scattered Brazilian pepper along the edges of the unit, particularly along the ditches on the east and southeast sides.

Compartment 7 is the major component of the Rosemary Scrub scrub-jay study site (Stevens and Young 2000). It consists of approximately 38 acres and is located on the west side of Phillips Parkway north of LC-37. Vegetation in the unit is oak-saw palmetto scrub with sand live, myrtle and Chapman oaks as the dominant species. An old clearing through this unit supports the largest stand of Florida rosemary present on Cape Canaveral.

Six scrub-jay groups occurred in Compartment 7 during the Cape-wide census and during breeding season (Stevens and Young 2000). This unit has been unburned for a long time. Growth rates on these older, acid soils appear to be slower than elsewhere on Cape Canaveral. However, there are patches of large oaks particularly along the northern edge and along the northeastern edge where large oaks require mechanical treatment. Brazilian pepper is also present particularly along the northeast edge.

Stevens and Young (2000) recorded 10 scrub-jay groups in Compartment 4 during the Cape-wide census, but only four in the breeding season and one nesting. Brazilian pepper is abundant in parts of the unit.

No scrub-jays currently use Compartment 67, but jays occur in adjacent compartments to the east (C-68) and north (C-48, C-66) (Stevens and Young 2000). Vines, primarily *Vitis* spp. (grape), are abundant around some edges. There is some scattered Brazilian pepper along edges also.

Compartment 79 consists of approximately 120 acres and is located directly east of C-81 that was burned in July 1999 after being cut. No scrub-jays currently use this compartment, but jays occur in adjacent compartments to the east (C-82, C-80). Grape vines occur along some edges, as does Brazilian pepper.

Compartment 98 has abundant Brazilian pepper along the canal on the south side. No scrub-jays currently use this compartment, but jays occur in adjacent compartments to the east (C-82) and south (C-99, C-100).

Compartment 86 has some Brazilian pepper, which will require herbicide treatment. There is some use of this compartment by scrub-jays; one jay group was recorded in the compartment in the 2000 census. Mechanical treatment will be required for some scrub on the western and northern edges.

Compartment 87 is used to some extent by jays (one group in 1999) but no jay groups were recorded in the compartment in the 2000 census. Compartment 88 also has some Brazilian pepper present, requiring herbicide treatment. There is scrub-jay use of this unit; six groups were recorded in the 2000 census.

Exotic Vegetation Control

A project to treat Brazilian pepper in Compartments 1, 2, 3, 4 and 14 began in July 2000. Compartments 1, 3, 4 and 14 had been cut and burned previously for scrub habitat restoration. Compartment 1 was treated first, followed by compartments 2, 3, and 14. The need for more financial resources as well as the large amount of Brazilian pepper in these units did not allow for treatment of Compartment 4.

Basal bark application of Garlon 4™ herbicide was applied to the Brazilian pepper. In order to evaluate the effectiveness of the treatment, a sample (n=55) of treated shrubs were marked and tagged, their heights and canopy diameters recorded and their status recorded. The sample included 35 in Compartment 1, 10 in Compartment 3 and 10 in Compartment 14.

At the time of the initial sampling, 80% of the pepper showed substantial wilting of leaves; 18.2% had a mix of green and wilting leaves. Only one individual was not wilting when sampled. Subsequent observations indicate complete or nearly complete defoliation of treated Brazilian pepper. Basal bark application was quite accurate with little impact to surrounding, non-target vegetation. Tagged shrubs were examined approximately six months after original treatment; none showed any signs of recovery with mortality being 100%.

Post Burn Observations

Rehabilitation of any area on CCAFS following a controlled burn will be by natural ecological recovery. Seldom will a fire destroy the root system of plants, therefore water and wind erosion potential is minimal. Observations of scrub areas burned on CCAFS indicate that most plant species re-sprout within six months after fire and demonstrate significant re-growth within a year. The natural recovery mechanism built into the fire-dependent ecosystems of the area will be sufficient to rehabilitate the area following normal fire conditions.

When wild land resource loss due to fires does occur, rehabilitation will be to re-establish the pre-existing natural community type, thus achieving the natural systems management encouraged by the Air Force. The method used will depend on the type and extent of resource loss incurred. Artificial site conversion from the pre-existing natural community type will not be undertaken.

Selected compartments are being monitored before treatment and periodically after burning. Monitoring is typically conducted at 6-month intervals for the first three years and then only annually beginning at year four. Annual monitoring reports provide information regarding the rehabilitation of the compartment, as well as its success in being restored to suitable scrub habitat (Appendix 6B).

Multiple-Use Coordination

The Air Force, as a Federal landowner, is obligated to act responsibly and effectively in the use of natural resources under their control. Multiple land use will be in effect to the maximum extent possible while remaining compatible with the mission of CCAFS. Therefore, implementation of a natural resources program and the military mission need not, and shall not, be mutually exclusive. Use requirements for CCAFS land will be established in coordination with the installation master plan and as supported by the approved natural resource management plans. The military mission will determine primary land use at CCAFS.

Coastal Zone Management Act Consistency

The Federal Coastal Zone Management Act of 1972 (CZMA) and the Florida Coastal Management Program (FCMP) stipulate that Federal agency activities, though exempt as stated in Sections 305(b)(1) and 304 of the CZMA, shall be consistent, to the maximum extent practicable, with approved state management programs. The Scrub Habitat Restoration Program at CCAFS is consistent with all programs regulating coastal development and, therefore, does not require further coordination or review with regards to environmental affects.

Interagency Cooperation

A Cooperative Agreement for the Protection, Development and Management of Fish and Wildlife Resources at CCAFS was signed by the Installation Commander, FWS and the Florida Game and Freshwater Fish Commission (now Fish and Wildlife Conservation Commission-FWCC) in 1984 (Appendix 6C). The purpose of this agreement is to protect, develop and manage fish and wildlife resources at CCAFS. The agreement remains in effect until revised or terminated by any of the parties to the agreement.

Funds will be transferred from the Air Force to FWS through a Military Interagency Purchase Request (MIPR) to conduct controlled burning activities on CCAFS. These funds have been programmed into ACES out until FY07. The Air Force's environmental support contractor is contractually obligated to restore 150 acres per year. This amount has been exceeded during the past few years. Additional funds for restoration activities may be provided by the Air Force to supplement the current program.

Recommendations

The lack of openings (bare spots) may be a problem for scrub-jays in some compartments previously burned. Natural resource managers have recommended testing the effectiveness of Semizene TM or other herbicides in creating openings. This would include treating 5-10 spots, each about 50 square

meters in three compartments (37, 101 and 118), and monitoring these spots to determine if they remain open.

There are serious negative effects to excessive mechanical disturbance to scrub, including loss of fuel continuity and increased likelihood for exotic invasion. Natural resource managers recommend that no additional mechanical treatment to any of the Phillips Parkway compartments occur at this time.

The following actions are recommended for exotic vegetation control:

1. Complete treatment of C-14 that began in FY2000. Treat scattered pepper in the southern part of the unit. Treat pepper along the ditch on the north and east edge of the restored scrub. Treat the degraded northeastern section. This site can be used to test whether a severely degraded site will respond favorably to exotic removal or whether additional actions are needed.
2. The South Phillips Parkway corridor is key to maintaining the scrub-jay population on CCAFS. Pepper is currently restricted to edges, disturbed sites, and canals in this area. These sites have burned within the last two years, so access is good. Therefore, we recommend prioritizing the treatment of these compartments (C-37, C-38, C-39, C-49, C-68, C-69, - C-81, C-99, C-100, C-101) to prevent degradation and maximize what can be achieved with limited resources.
3. Patches of grape vines along the edge of C-101 should be treated based on our experience with the Heavy Launch Road site. Effective means of reducing grape vine should be determined.
4. The Australian pine stands in C-117 should be removed. Australian pine is capable of very rapid height growth, and the cutting and burning planned for restoration of this compartment will not eliminate it.
5. Remaining resources should be used for the Complex 19 sites, starting with the less degraded ones (C-27, C-28) and proceeding to the more degraded ones (C-18, C-22).
6. Compartment 4 could be treated at this point, but it would be difficult due to dense vegetation. We recommend a prescribed burn of this unit within the next 1-2 years and exotic treatment after that.

Final Remarks related to NEPA

An Air Force Form 813 was completed in January 2000 that addressed the impacts of scrub restoration activities on CCAFS (Appendix 6D). Based upon the findings of this analysis, it was shown that the scrub restoration program would

not adversely impact CCAFS environmental attributes and qualified for a Categorical Exclusion.

Scrub restoration is highly recommended for wildlife habitat improvement and many wildlife species benefit, however, negative short-term impacts to nestling birds may exist during a fire. The Migratory Bird Treaty Act makes it illegal to kill or destroy the eggs or nest of any migratory bird. Nestling birds could be impacted through direct destruction of nests located in trees targeted for cutting or by fire. A migrant and resident bird population study completed in 1998 (Schultz 1998) showed that CCAFS serves a rather extensive migratory bird community. Despite the potential loss of an occasional nest, the study concluded that over-grown, fire-suppressed xeric hammock should be restored to its original oak scrub condition in order to benefit both migrant and resident bird species.

Scrub restoration activities have the potential to directly impact other species such as gopher tortoises. Although never observed on CCAFS, slow moving gopher tortoises could be run over by heavy equipment performing cutting activities. Concerns regarding heavy equipment collapsing and entombing them inside of their burrows have been dismissed based on studies by the FWCC (Joan Berish, pers. comm.). More beneficial than deleterious, scrub restoration does provide herbaceous growth for tortoise food.

The scrub restoration plan is reviewed by both the FWS and the FWCC. To date, these agencies concur with the continued implementation of the scrub restoration program on CCAFS. Those parties are responsible for decisions regarding the need for any take permits or other mitigative actions.

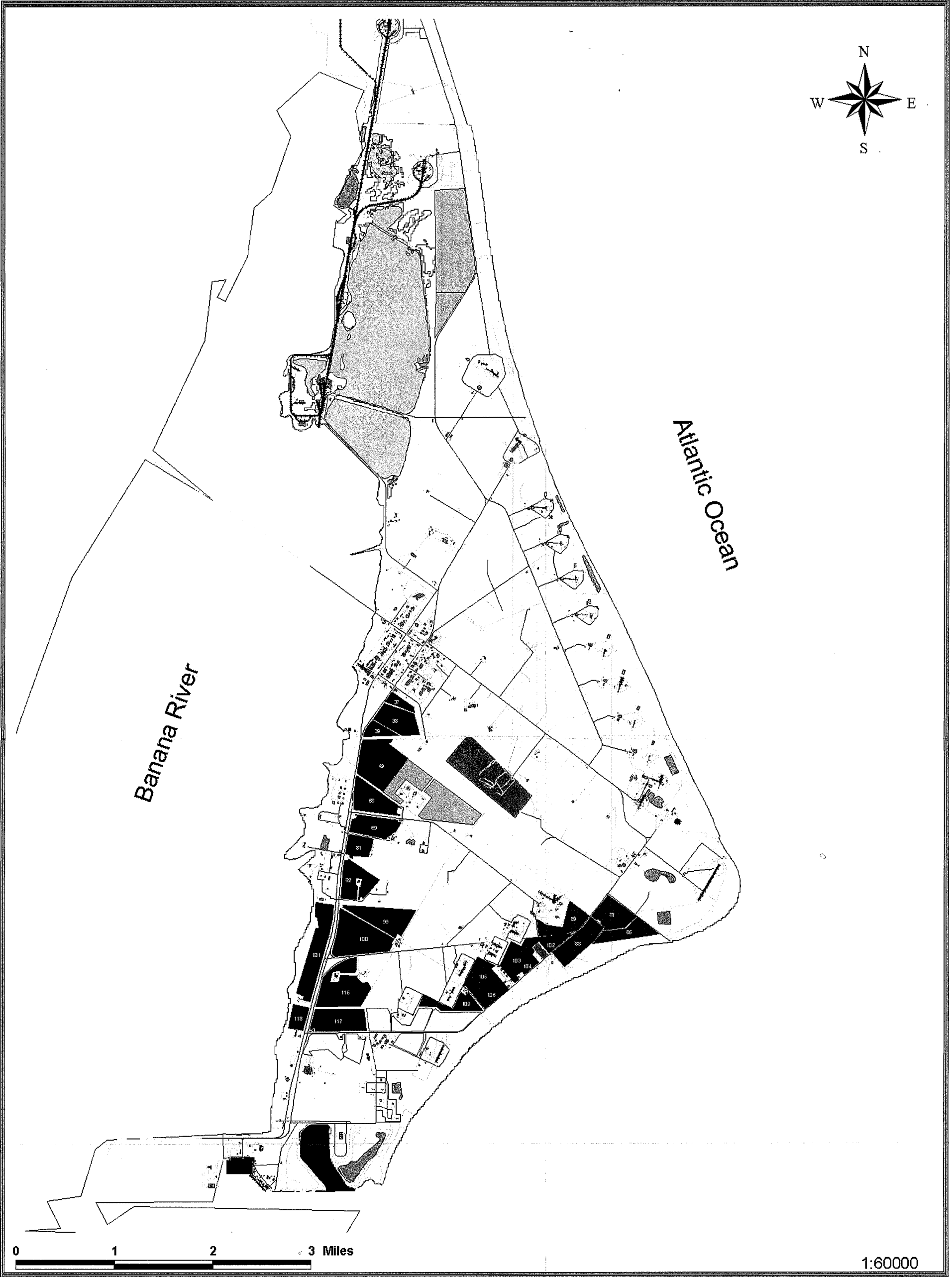
REFERENCES

Personal communication with Joan Berish, Fish and Wildlife Conservation Commission, dated May 1999.

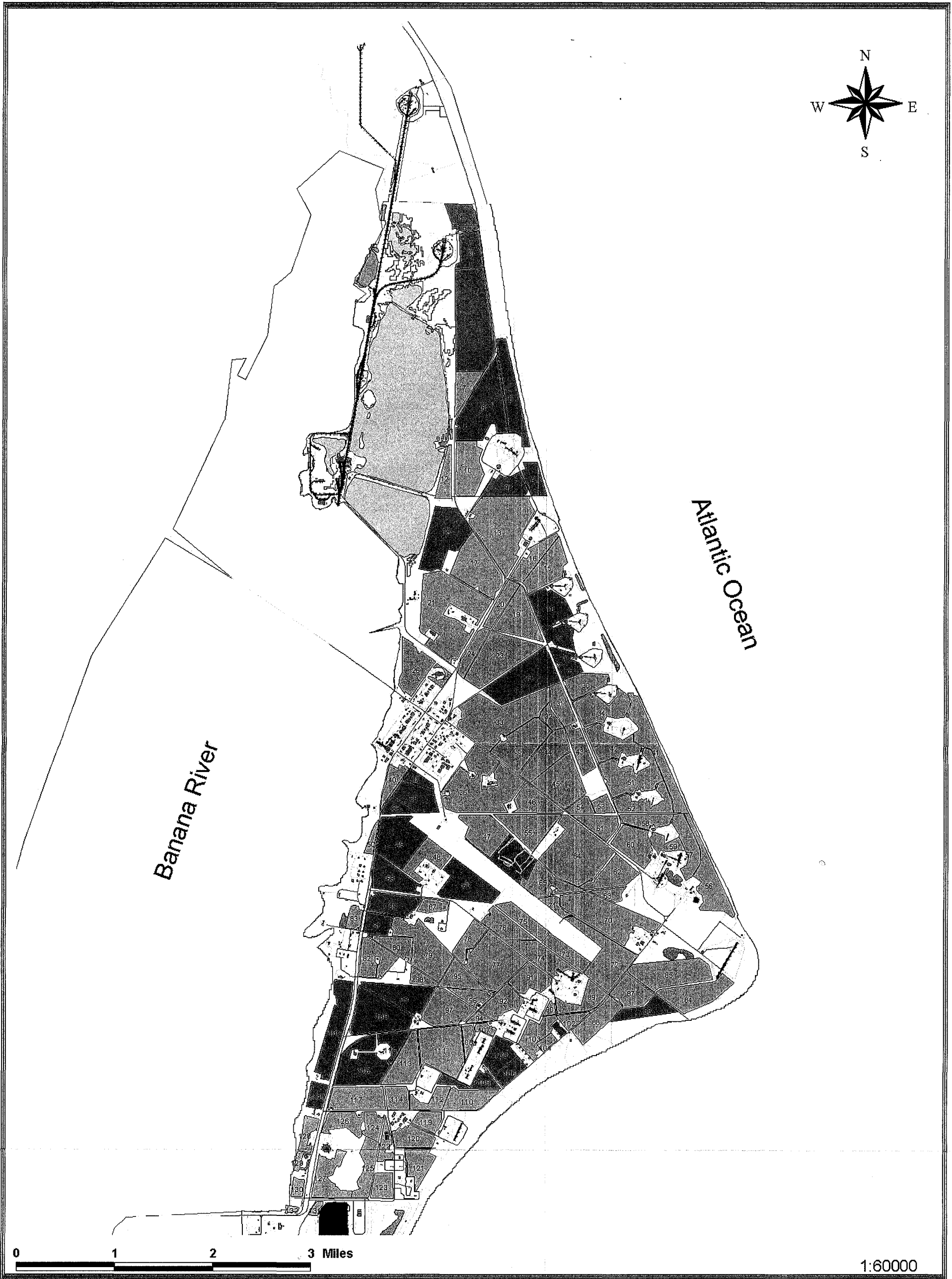
Personal communication between Dr. Paul Schmalzer, Dynamac and Ted Stevens, The Nature Conservancy, dated November 2000.

Stevens, T. and J. Young. 2000. Status and Distribution of the Florida Scrub-Jay (*Aphelocoma coerulescens*) at Cape Canaveral Air Force Station, Florida. Annual Report: 1999-2000. The Nature Conservancy. 61 pp.

Schultz, Gary. 1998. Biological Survey of Cape Canaveral Air Station, Year Two: Final Report. Florida Natural Areas Inventory, Tallahassee, Florida. 29pp.



Integrated Natural Resources Management Plan		Cape Canaveral Air Force Station Burn Plan		Figure 5			
Legend							
Burn Plan - Future-PP - Future-PRC/EW - Future-PRC/NS - Future		Roads - Primary road with limited access - Primary road - Secondary and connecting road - Access ramp		Other Features - Ferry crossing - Railroad - Unnamed Roads and Trails - Buildings		Lakes and Ponds - Lake - Navigable Waters - Ponds	



Integrated Natural Resources Management Plan		Cape Canaveral Air Force Station Treated Burn Units		Figure 4	
Legend					
Burn Units Treated Not Treated	Roads Primary road with limited access Primary road Secondary and connecting road	Access ramp Ferry crossing Railroad Unnamed Roads and Trails Buildings	Lakes and Ponds Lake Navigable Waters Ponds		
April 2001		VPG			

CCAFS Scrub Habitat Compensation Plan

Purpose

In order to improve the Environmental Impact Analysis Process (EIAP) regarding scrub habitat conservation at CCAFS, a meeting was held on 13 January 2000 to clarify the expectations of the U. S. Fish and Wildlife Service (FWS) and the 45th Space Wing (45SW). Historically, compensation was completed by two methods: 1) enhancement of existing over-mature oak scrub/woodlands, and 2) restoration of previously disturbed scrub habitats. Certain compartments on CCAFS were chosen as scrub enhancement/mitigation sites and this acreage was used as compensation for activities that required scrub removal. Any enhancement acreage completed in excess of the 45SW's obligation to compensate for scrub removal (at a 3:1 ratio) was identified to FWS, documented and "banked" for future compensation requirements. During the past few years, new information has become available from compensation projects and lessons learned at KSC and CCAFS. Furthermore, in the course of discussions in 1999, FWS indicated that there was no true "mitigation" or compensation on CCAFS and local Federal lands in the terms and conditions sections found in earlier compensation plans drafted in the 1990's. FWS also stated that the ongoing CCAFS scrub restoration program was considered a 45SW requirement that does not 'remediate' future development at CCAFS. New construction in scrub habitat will be handled on a case by case basis and consistent with the compensation plan. It was evident that the creation of an updated scrub habitat compensation plan for CCAFS was critical to clarifying how the CCAFS Environmental Flight (CEV) should proceed in guiding future development actions that affect scrub. The following plan was developed as a result of the January 2000 meeting.

Implementation

The 45SW and FWS stewardship role is to develop CCAFS with the intent to follow a stepwise approach of avoidance, minimization, and mitigation/compensation. CEV will notify all proponents, requesting land clearing, of the need for compensation through the 332/813 or other EIAP process. When a project involving land clearing must happen, the following will be considered.

All scrub lost, regardless of unit size will be considered for compensation. All habitat on CCAFS that is "potential scrub", in terms of current vegetation and soil type, will be considered scrub habitat and therefore potential scrub jay habitat. This classification will hold whether or not it is occupied by scrub jays. This is due to the fact that despite the condition of this scrub, it is part of a Core Scrub jay area and therefore is considered by FWS to be highly valuable to the recovery of the species.

In lieu of typical mitigation on a site by site basis, all scrub on CCAFS that is lost to development, will be compensated at a rate of 4 to 1 by putting funds toward the ongoing 45SW scrub restoration program coordinated by CEV. The 4 to 1 rate has been set by the FWS. The details of the current program are found as Appendix 1, at the end of this plan. As sites are earmarked for development, the proponent will be required to compensate for acreage's lost to development.

Payment Process

The payment will be calculated based on the cost of restoring one acre. This includes preparing the land (i.e., hydroax, bulldozing fire lines, etc.) burning the land, monitoring both the jay populations and the vegetation, and finally, maintenance of the habitat via best land management practices. Calculations performed in January 2000 resulted in the costs found in the following table.

Habitat Management Component	Cost /Acre	Costing Source
Burning	40.00	FWS
Land Preparation	964.00	ESC
Monitoring Jays	33.75	TNC
Monitoring Vegetation (Veg)	236.00	ESC
Maintenance: basic burn	40.00	FWS
Maintenance: line preps	482.00	ESC
Maintenance: exotic veg control	462.00	ESC
5% administration fee for use of NFWF fund	113.00	NFWF
Total Cost per Acre	2370.75	

The current base cost (FY 2000) is calculated to be \$2370.75 per acre and therefore every acre or part of an acre compensated for will be this base rate times 4, or \$9,483.00 per acre.

In the case of 45SW projects, the work that is currently being funded by CEV for scrub habitat restoration will be used to help "mitigate" a project. If the mitigation requirements exceed the baseline set-aside in the Environmental Support Contract (ESC), other arrangements will need to be made. This can only be done within the fiscal year of the project's plan and using acreage available from the scrub restoration program that same year. The ESC office will keep a record of scrub restored within each fiscal year (Appendix 7B).

45SW INRMP, 2001
Appendix 7

Payments made in lieu of actual habitat restoration will be made by the proponent to a fund with the sole intent of use in the 45SW scrub restoration program. The monies will be sent to the 45SW, with appropriate cost accounting, and then sent to the 3rd party trust National Fish and Wildlife Foundation (NFWF). The foundation is administered by FWS, Jacksonville Office. NFWF will hold the monies for 45SW with a 5% administration fee. Monies from the account will be withdrawn to pay for future habitat restoration activities on CCAFS.

APPENDIX D

MEMORANDUM FOR THE RECORD CULTURAL RESOURCES

MEMORANDUM FOR THE RECORD

The National Reconnaissance Office (NRO) proposes to construct their Eastern Processing Facility (EPF) at the intersection of Phillips Parkway and Lighthouse Road on Cape Canaveral Air Force Station (CCAFS), Florida. The site selected for construction of the EPF is known to contain all or part of two previously identified archaeological sites, 8BR557 and 9BR558. Consequently, the NRO funded a Phase 1 archaeological survey of the EPF area of potential effect (APE). New South Associates, Stone Mountain, Georgia, conducted the Phase 1 survey.

The survey showed that 8BR557 was not in the project area, and shovel tests revealed "scant evidence" of site 8BR558, located in the southeast corner of the APE. In addition, further shovel testing identified four small shell and artifact scatter sites that had not been previously discovered. New South Associates recorded these four sites in the Florida Master Site File as 8BR1894, 1895, 1896, and 1897.

Based upon the findings of their records search and field survey, New South Associates has concluded that none of the sites within the EPF APE are eligible for listing in the National Register of Historic Places (NRHP). Further, due to the sparse amount of artifacts and evidence that indicated minimal use of these sites, it is believed that little significant information could be recovered from any additional archaeological investigations.

Therefore, based on the findings of the Phase 1 survey, the 45th Space Wing (45SW) of the USAF has determined that construction of the NRO Eastern Processing Facility will not have an adverse effect on cultural resources that are eligible, or potentially eligible, for listing in the NRHP. It is the decision of the 45SW Cultural Resource Manager that no further site testing is needed and that formal consultation with the Florida State historic Preservation Office in accordance with Section 106 of the National Historic Preservation Act is not required.

Questions or requests for additional information regarding cultural resources at the NRO Eastern Processing Facility should be directed to Mr. Don George, 45CES/CEVP, 853-6823.

Robin L Sutherland
Ms. Robin Sutherland
45SW Cultural Resource Manager

3 Aug 65
Date

APPENDIX E

U.S. Fish and Wildlife Service Biological Opinion for the Proposed NRO Eastern Processing Facility at Cape Canaveral Air Force Station



United States Department of the Interior

FISH AND WILDLIFE SERVICE

6620 Southpoint Drive, South
Suite 310
Jacksonville, Florida 32216-0912

IN REPLY REFER TO:

FWS/R4/ES-JAFL/05-1077

August 1, 2005

45 SW/CC

Attn: Colonel Mark H. Owen
1201 Edward H. White II Street, MS-7100
Patrick AFB, Florida 32925-3299

Re: FWS Log No: 05-1077

Dear Colonel Owen:

This document is the Fish and Wildlife Service's (Service) biological opinion based on our review of the proposed National Reconnaissance Office (NRO) Eastern Processing Facility (EPF) on Cape Canaveral Air Force Station (CCAFS) in Brevard County, Florida, and its effects on the Florida scrub-jay (*Aphelocoma coerulescens*), southeastern beach mouse (*Peromyscus polionotus niveiventris*), and the eastern indigo snake (*Drymarchon corais couperi*) pursuant to section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). Your request for formal consultation for these species was received on March 7, 2005.

This biological opinion is based on information provided in the draft Environmental Assessment (EA) of the new EPF, a meeting conducted on February 1, 2005, with representatives from the NRO, CCAFS, and the Service, the final draft EA of the EPF received on March 7, 2005, telephone conversations on April 4, 2005, with Angy Chambers and Randall Rowland, a site visit conducted at CCAFS with the Service and representatives of the 45th Space Wing on April 14, 2005, followed by a meeting with the Wing Commander of the 45th Space Wing, Colonel Mark H. Owen, and other sources of information. A complete administrative record is on file at the Ecological Services Office in Jacksonville, Florida.

CONSULTATION HISTORY

On August 17, 2004, the Service met with representatives of the 45th Space Wing to discuss another project. At that meeting, the EPF was briefly discussed, and the August 2004 draft Environmental Assessment (EA) for the new EPF at CCAFS was given to the Service. On September 15, 2004, the Service met with representatives from the NRO and CCAFS to discuss the EPF. The Service expressed concern for the preferred location of the site and recommended investigating other alternatives listed in the draft environmental assessment that would minimize impacts to the Florida scrub-jay population. A copy of the report containing the results of a two-year analysis for determining the preferred project site was requested by the Service. In addition,

the Service also said that the draft EA was deficient in covering direct and indirect effects of the project on scrub-jays, and offered assistance in reviewing these impacts. The impacts to listed species which may result from lack of prescribed burns for scrub-jay habitat due to the sensitivity of the equipment in this facility were discussed.

On March 7, 2005, the Service received the final draft EA for the EPF and requested formal consultation with the Service. The draft EA stated with respect to the Florida scrub-jay, "the project would result in a loss of habitat which would be considered a significant adverse effect" (page 28 of the draft final Environmental Assessment).

On March 31, 2005, two weeks into the Service's review period of the EA, the Service received a phone message from representatives of the 45th Space Wing, Angy Chambers and Randall Rowland, stating that the majority of the area in the location of the proposed EPF was mistakenly cleared. On April 4, 2005, it was communicated to the Service that approximately 38 acres of scrub-jay habitat were cleared, which provided habitat for approximately 6 groups of scrub-jays. By follow-up letter dated April 13, 2005, Colonel Mark H. Owen, Commander of the 45th Space Wing, notified the Service of the clearing activity.

On April 14, 2005, the Service met with the representatives of the 45th Space Wing to discuss the effects of the clearing and performed a site visit. CCAFS staff relayed at that meeting that the draft EA was incorrect and that prescribed burning would be allowed up to the limits of the area being proposed for the EELV facility. The Service stressed the importance of the CCAFS population of scrub-jays for recovery of the species and expressed concern for the piecemeal approach being taken by CCAFS in the submittal of proposals. The Service requested that CCAFS staff take the time to generate a master plan so we will know what may be coming in the future. CCAFS relayed that they were working on a 10-year plan and are planning to initiate consultation with the Service on that planning process once it is completed. The Service reminded CCAFS staff that the Integrated Natural Resources Management Plan (INRMP) was taken seriously, and that we are willing to help CCAFS achieve 300 breeding pairs of scrub-jays, as set in the INRMP. Existing facilities are already impacting CCAFS's ability to conduct prescribed burns, and we're reluctant to add to the problem for fear that it will keep them from achieving the INRMP goal. Later that day, the Service met with Colonel Mark Owen, to discuss the impacts related to the unauthorized clearing activity. The Service reiterated the importance of CCAFS's scrub-jays toward overall recovery of the species and stressed the importance of continued management for reaching the INRMP goal of 300 breeding pairs.

On April 25, 2005, a conference call was held with the Service, representatives from the NRO, and the 45th Space Wing to discuss the Service's preference for Alternative 3 identified in the Final Draft EA, which minimized the effects of the impacts on the Florida scrub-jay as compared to the NRO's preferred alternative. Alternative 3 proved to be within a flight hazard area and would result in multiple evacuations of people within the vicinity of Launch Complex 37 during all launch events and attempts. The NRO confirmed that they will modify the proposed project to fit the building with equipment to allow for prescribed burns within the vicinity of the building. These fittings would reduce direct and indirect effects of the preferred alternative on the Florida scrub-jay population by lessening limitations on scrub habitat management with prescribed burning in the areas around this facility.

On April 26, 2005, during a conference call with representatives of the 45th Space Wing, the Service discussed the possibility of permanently setting aside areas of core scrub-jay habitat to help achieve a sustainable Florida scrub-jay population. On May 5, 2005, the 45th Space Wing conveyed that setting scrub-jay areas aside would "encroach" on the mission of CCAFS and is not allowed by the Department of Defense. As an alternative to minimize the impacts of the EELV Payload Processing Facility, CCAFS staff discussed the possibility of restoring all of the existing Quantity Distance (QD) arc areas, since they cannot be developed for safety reasons. These QD arcs are located in areas where scrub-jays are currently present or have the potential to be present following restoration of habitat.

On May 25, 2005, representatives of the 45th Space Wing and the Service met to discuss the impacts of the proposed project. The first issue dealt with the number of scrub-jay pairs required on CCAFS to promote recovery of the Merritt Island/Cape Canaveral core metapopulation. CCAFS staff is currently having problems meeting management goals as set in the INRMP, and thinks that 300 breeding pairs of scrub-jays is an unreasonable goal. They are looking to establish a more realistic number of scrub-jay breeding pairs.

The second issue discussed pertained to a proposal that the NRO fund a 5-year, peer-reviewed mechanical clearing study. It was emphasized that mechanical clearing should not take the place of prescribed burning on the CCAFS but should only be used in areas where prescribed burning would be delayed and only as a temporary solution to land management conflicts.

Scrub management at CCAFS through prescribed burning has its limitations due to the sensitivity of equipment to smoke in the various facilities. A prescribed burn working group has been established at CCAFS to help resolve some of these issues. The Service recommended a goal of fitting buildings in the major scrub-jay areas with the latest technology to allow for burning the areas around them.

Both the Service and representatives from CCAFS agreed that there is not sufficient scrub habitat located in the QD arcs to support the number of groups of scrub-jays that CCAFS needs for recovery, but the QD arcs would be a good base for concentrating management in areas that would not be developed. Restoration and/or management of the scrub-jay habitat located within the QD arcs would be a good way to stabilize the existing population of scrub-jays. CCAFS should then expand the areas of scrub-jay habitat by restoring scrub areas outside of the QD arcs. CCAFS proposes to place emphasis on the management of scrub-jays in their INRMP, currently under revision.

Finally, the restoration of compartment 6, located on the northern end of CCAFS, was discussed as a means of minimizing impacts of the proposed facility on scrub-jays, by helping to maintain a dispersal corridor with MINWR and to stabilize the population of scrub-jays located there.

On June 6, 2005, the Service sent a letter to representatives of the 45th Space Wing requesting the following information for the analysis of impacts with respect to the proposed project: (1) copy of two-year study conducted on alternative sites by the NRO; (2) budget for restoration of

Compartment 6; and (3) number of scrub-jays that will be CCAFS's contribution to the recovery of the metapopulation.

On June 14, 2005, the Service received an email from representatives of the 45th Space Wing with information about the funding for restoration of Compartment 6.

On June 15, 2005, the Service received an email containing the two-year site selection study. Because the MINWR Comprehensive Conservation Planning document is still in draft, for the purposes of this biological opinion, we will use 300 breeding pairs of scrub-jays as a goal for CCAFS to achieve, as outlined in their current INRMP.

On June 23, 2005, the Service received an email from representatives of the 45th Space Wing with a response to our June 6, 2005, letter, the mechanical treatment study proposal, and an analysis of cumulative effects. Representatives of the 45th Space Wing, called the Service to verify receipt of the email. The Service notified the representatives of the 45th Space Wing that all the necessary information from the Air Force was received to complete the biological opinion.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The NRO proposes to construct a new EPF on CCAFS that can support processing of satellites that use multiple launch vehicles, and that provide operational flexibility by allowing the various programs to support their launch complex activities simultaneously. A building 425 feet long by 365 feet wide will be constructed, and an additional 130 feet will be cleared from the building to a proposed fence. The amount of scrub habitat to be removed for the building, fence, and grounds is 45 acres. All of this habitat was or is restored oak scrub; however, 38 acres were previously cleared during consultation. This biological opinion will address the impacts of clearing the remaining seven (7) acres of scrub habitat that was not cleared and is required for project completion.

The action area (area including all direct and indirect effects), for the purpose of this consultation, will include all of CCAFS. If acceptable mechanical clearing methods are discovered during the 5-year study, and are agreed upon by the 45th Space Wing and the Service, they will be used in the immediate vicinity of the EPF only as a means to temporarily delay prescribed burn treatments. The scrub habitat surrounding the 45 acres impacted by this project will continue to be managed by prescribed burns to maintain the habitat so it will be suitable for occupation by scrub-jays, and as described in the current INRMP for CCAFS.

Conservation measures agreed to by CCAFS include funding a five-year scrub management technique study in Compartments 97 and 101, and restoration of Compartment 6 to allow for occupancy by the Florida scrub-jay.

STATUS OF THE SPECIES/CRITICAL HABITAT

This section provides pertinent biological and ecological information for the Florida scrub-jay, southeastern beach mouse, and eastern indigo snake, as well as information about their status and trends of throughout their entire range. We use this information to assess whether a federal action is likely to jeopardize the continued existence of the above-mentioned species. The "Environmental Baseline" section summarizes information on status and trends of the Florida scrub-jay, southeastern beach mouse, and eastern indigo snake specifically within the action area. These summaries provide the foundation for our assessment of the effects of the proposed action, as presented in the "Effects of the Action" section.

FLORIDA SCRUB-JAY (*APHELOCOMA COERULESCENS*)

Species/Critical Habitat Description

Florida scrub-jays are about 10 to 12 inches long and weigh about 3 ounces. They are similar in size and shape to the blue jay (*Cyanocitta cristata*), but differ significantly in coloration (Woolfenden and Fitzpatrick 1996a). Unlike the blue jay, the scrub-jay lacks a crest. It also lacks the conspicuous white-tipped wing and tail feathers, black barring, and bridle of the blue jay. The Florida scrub-jay's head, nape, wings, and tail are pale blue, and its body is pale grey on its back and belly. Its throat and upper breast are lightly striped and bordered by a pale blue-grey "bib." Scrub-jay sexes are not distinguishable by plumage, and males, on the average, are only slightly larger than females (Woolfenden 1978). The sexes may be differentiated by a distinct "hiccup" call vocalized only by females (Woolfenden and Fitzpatrick 1986). Scrub-jays that are less than about five months of age are easily distinguishable from adults; their plumage is smokey grey on the head and back, and they lack the blue crown and nape of adults. Molting occurs between early June and late November and peaks between mid-July and late September (Bancroft and Woolfenden 1982). During late summer and early fall, when the first basic molt is nearly done, fledgling scrub-jays may be indistinguishable from adults in the field (Woolfenden and Fitzpatrick 1984). The wide variety of vocalizations of the scrub-jay is described in detail in Woolfenden and Fitzpatrick (1996b).

No critical habitat has been designated for this species; therefore none will be affected by the proposed project.

Life History/Population Dynamics

Scrub-jays are non-migratory, extremely sedentary, and have very specific habitat requirements (Woolfenden 1978). They usually reside in oak scrub vegetated with sand live oak, myrtle oak, inopine oak, and Chapman oak, along with saw palmetto, scrub palmetto, scattered sand pine, and rosemary. Such habitat occurs only on fine, white, drained sand, along the coastlines in Florida, and in dunes deposited during the Pleistocene, when sea levels were much higher than at present (Laessle 1958, 1968). Scrub-jays are rarely found in habitats with more than 50 percent canopy cover over three meters in height (U.S. Fish and Wildlife Service 1990). The habitat required for the scrub-jay greatly restricts the bird's distribution. Active management either through burning or mechanical clearing is necessary to maintain optimum conditions. In general,

scrub-jay habitat consists of dense thickets of scrub oaks less than nine feet tall, interspersed with bare sand used for foraging and storing of acorns (U.S. Fish and Wildlife Service 1990).

Florida scrub-jays are monogamous and remain mated throughout the year (Sprunt 1946; Woolfenden 1978). Scrub-jays have a social structure that involves cooperative breeding, a trait that the other North American species of scrub-jays do not show (Woolfenden and Fitzpatrick 1984). Scrub-jays live in families ranging from two birds (a single mated pair) to extended families of eight adults and one to four juveniles. Fledgling scrub-jays stay with the breeding pair in their natal territory as "helpers, forming a closely-knit cooperative family group. Pre-breeding numbers are generally reduced to either a pair with no helpers or families of three to four individuals (a pair plus one or two helpers. The presence of helpers generally increases reproductive success and survival within the group, which naturally causes family size to increase (Woolfenden and Fitzpatrick 1978).

Scrub-jays have a well-developed intrafamilial dominance hierarchy with breeder males most dominant, followed by helper males, breeder females, and finally, female helpers (Woolfenden and Fitzpatrick 1977). Helpers take part in sentinel duties (McGowan and Woolfenden 1989), territorial defense, predator-mobbing, and the feeding of both nestlings (Stallcup and Woolfenden 1978) and fledglings (McGowan and Woolfenden 1990). The well-developed sentinel system involves having one individual occupying an exposed perch watching for predators or territory intruders. When a predator is seen, the sentinel scrub-jay gives a distinctive warning call, and all family members seek cover in dense shrub vegetation (Fitzpatrick *et al.* 1991).

Florida scrub-jay pairs occupy year-round, multi-purpose territories (Woolfenden and Fitzpatrick 1984; Fitzpatrick *et al.* 1991). Territory size averages 22 to 25 acres, with a minimum size of about 12 acres. The availability of territories is a limiting factor for scrub-jay populations. Because of this limitation, non-breeding adult males may stay at the natal territory as helpers for up to five years, waiting for either a mate or territory to become available (Fitzpatrick *et al.* 1991). Birds may become breeders in several ways: (1) by replacing a lost breeder on a non-natal territory (Woolfenden and Fitzpatrick 1984); (2) through "territorial budding," where a helper male becomes a breeder in a segment of its natal territory (Woolfenden and Fitzpatrick 1978); (3) by inheriting a natal territory following the death of a breeder; (4) by establishing a new territory between existing territories (Woolfenden and Fitzpatrick 1984); or (5) through "adoption" of an unrelated helper by a neighboring family followed by resident mate replacement (B. Toland, USFWS, pers. comm. 1996). Territories can also be created by restoring habitat through effective habitat management efforts in areas that are overgrown (Thaxton and Hingtgen 1994).

To become a breeder, a scrub-jay must find a territory and a mate. Evidence presented by Woolfenden and Fitzpatrick (1984) suggests that scrub-jays are monogamous. The pair retains ownership and sole breeding privileges in its particular territory year after year. Courtship to form the pair is lengthy and ritualized, and involves posturing and vocalizations made by the male to the female (Woolfenden and Fitzpatrick 1996b). Copulation between the pair is generally out of sight of other scrub-jays (Woolfenden and Fitzpatrick 1984). These authors also reported never observing copulation between unpaired scrub-jays or courtship behavior between

a female and a scrub-jay other than her mate. Age at first breeding in the scrub-jay varies from one to seven years, although most individuals become breeders between two and four years of age (Fitzpatrick and Woolfenden 1988). Persistent breeding populations of scrub-jays exist only where there are scrub oaks in sufficient quantities to provide an ample winter acorn supply, cover from predators, and nest sites during spring (Woolfenden and Fitzpatrick 1996a).

Nesting is synchronous, normally occurring from 1 March through 30 June (Woolfenden and Fitzpatrick 1990; Fitzpatrick *et al.* 1991). On the Atlantic Coastal Ridge and southern Gulf coast, nesting may be protracted through the end of July (B. Toland, USFWS, pers. comm. 1996; J. Thaxton, Uplands, Inc., pers. comm. 1998). In suburban habitats, nesting is consistently initiated earlier (March) than in natural scrub habitat (Fleischer 1996), although the reason for this difference is unknown.

Clutch size ranges from 1 to 5 eggs, but is typically 3 or 4 eggs. Clutch size is generally larger (up to 6 eggs) in suburban habitats, and the birds try to rear more broods per year (Fleischer 1996). Eggs are incubated for 17 to 18 days, and fledging occurs 16 to 21 days after hatching (Woolfenden 1974, 1978; Fitzpatrick *et al.* 1991). Only the breeding female incubates and broods eggs and nestlings (Woolfenden and Fitzpatrick 1984). Annual productivity must average at least two fledged per pair for a population of scrub-jays to support long-term stability (Woolfenden and Fitzpatrick 1990; Fitzpatrick *et al.* 1991).

Fledglings depend upon adults for food for about 10 weeks, during which time they are fed by both breeders and helpers (Woolfenden 1975; McGowan and Woolfenden 1990). Survival of scrub-jay fledglings to yearling age class averages about 35 percent in optimal scrub, while annual survival of both adult males and females averages about 80 percent (Fitzpatrick *et al.* unpubl. data). Data from Archbold Biological Station, however, suggest that survival and reproductive success of scrub-jays in sub-optimal habitat is substantially lower (Woolfenden and Fitzpatrick 1991). These data help explain why local populations inhabiting unburned, late successional habitats become extirpated. The longest observed lifespan of a Florida scrub-jay is 15.5 years at Archbold Biological Station in Highlands County (Woolfenden and Fitzpatrick 1996b).

Scrub-jays are nonmigratory and permanently territorial. Juveniles stay in their natal (Woolfenden and Fitzpatrick 1984). Once scrub-jays pair and become breeders, generally within two territory for up to five years before dispersing to become breeders and territories of their natal area, they stay on their breeding territory until death. In suitable habitat, fewer than five percent of scrub-jays disperse more than five miles (Fitzpatrick *et al.* 1991). All documented long distance dispersals have been in unsuitable habitat such as woodland, pasture, or suburban plantations. Scrub-jay dispersal behavior is affected by intervening land uses. Protected scrub habitats will most effectively sustain scrub-jay populations if they are located within surrounding habitat types that can be used and traversed by scrub-jays.

Brushy pastures, scrubby corridors along railways and road rights-of-way, and open burned flatwoods offer links for colonization among scrub-jay subpopulations. Stith *et al.* (1996) believed that a dispersal distance of five miles is close to the biological maximum for scrub-jays.

Scrub-jays forage mostly on or near the ground, often along the edge of natural or man-made openings. They visually search for food by hopping or running along the ground beneath the scrub or by jumping from shrub to shrub. Insects, particularly orthopterans (e.g., locusts, crickets, grasshoppers, beetles) and lepidopteran (e.g., butterfly and moth) larvae, form most of the animal diet throughout most of the year (Woolfenden and Fitzpatrick 1984). Acorns are the most important plant food (Fitzpatrick *et al.* 1991). From August to November each year, scrub-jays may harvest and cache 6,000 to 8,000 oak acorns throughout their territory. It is estimated that 1/3 of these acorns are later recovered and eaten. Caching allows scrub-jays to eat acorns every month of the year. This reliance on acorns and caching may constitute a major reason for the scrub-jay's restriction to the oak scrub and sandy ridges within Florida (Fitzpatrick *et al.* 1991).

Status and Distribution

The Florida scrub-jay is found exclusively in peninsular Florida, and is restricted to scrub habitat (U.S. Fish and Wildlife Service 1990). The Florida scrub-jay was listed as a threatened species on June 3, 1987 (52 FR 20715-20719). The main causes responsible for the decline were as follows:

The Present or Threatened Destruction, Modification, or Curtailment of its Habitat or Range:

The existence of scrub-jays throughout their range depends on the existence of a particular seral stage of oak scrub habitat with unvegetated openings in sandy soils. This habitat occurs naturally only in localized patches associated with recent or ancient shoreline deposits. By the time of listing, large proportions of these habitat patches had been converted for human use, or were slated for imminent conversion. Most of the coastal scrub habitat had already been cleared for beachfront hotels, houses, and condominiums, and much of the central Florida scrub had been converted to citrus groves, housing developments, and commercial real estate. It was estimated that 40 percent of occupied scrub habitat had already been converted to other uses, and total population of the species had declined by at least half. As a result of rapid increase in human population numbers throughout central Florida, the pace of housing and agricultural development had accelerated since the 1960s, and it showed no signs of slowing.

Overutilization for Commercial, Recreational, Scientific, or Educational Purposes: Reported shooting of scrub-jays and collection of the species as pets were considered threats.

Disease or Predation: Disease and predation were not believed to be major threats at the time of listing.

The Inadequacy of Existing Regulatory Mechanisms: The only laws protecting the Florida scrub-jay prior to the time of listing were the Migratory Bird Treaty Act of 1918 (MBTA) (16 U.S.C. 703 *et seq.*) and Florida State Law (Chapter 68A-27.004, Florida Administrative Code). Neither of these laws protected the birds from habitat destruction, which constituted the major threat to the species.

Other Natural or Manmade Factors Affecting its Continued Existence: Suppression of fire by humans was identified as a factor in species' decline at the time of the listing. Historically,

lightning strikes started fires, which maintained the sparse low scrub habitat needed by Florida scrub-jays. Human efforts to suppress these fires to protect human interests allowed the scrub to become too dense and tall to support populations of scrub-jays. Vehicular mortality of scrub-jays due to accidental collisions along roadsides was recognized as a cause of the decline in some parts of the species' range.

Continued and current threats to the species include:

The Present or Threatened Destruction, Modification, or Curtailment of its Habitat or Range:

Scrub habitats continued to decline throughout peninsular Florida since listing occurred, and habitat destruction continues to be one of the main threats to the Florida scrub-jay. Cox (1987) noted local extirpations and major decreases in numbers of scrub-jays and attributed them to the clearing of scrub for housing and citrus groves. Eighty percent or more of the scrub habitats have been destroyed along the Lake Wales Ridge since pre-human settlement (Fitzpatrick *et al.* 1991). Fernald (1989), Fitzpatrick *et al.* (1991, 1994), and Woolfenden and Fitzpatrick (1996a) noted that habitat losses due to agriculture, silviculture, and commercial and residential development have continued to play a role in the decline in numbers of scrub-jays throughout the state. State-wide, estimates of scrub habitat loss range from 70 to 90 percent (Bergen 1994; Woolfenden and Fitzpatrick 1996a; Fitzpatrick *et al.* unpubl. data).

Toland (1999) estimated that about 85 percent of pre-European settlement scrub habitats had been converted to other uses in Brevard County. This is due mainly to development activity and citrus conversion, which were the most important factors that contributed to the scrub-jay decline between 1940 and 1990. A total of only 10,656 acres of scrub and scrubby flatwoods remain in Brevard County (excluding federal ownership), of which only 1,600 acres (15 percent) is in public ownership for the purposes of conservation. Less than 1,977 acres of an estimated pre-settlement of 14,826 acres of scrubby flatwoods habitat remain in Sarasota County, mostly occurring in patches averaging less than 2.5 acres in size (Thaxton and Hingtgen 1996). Only 10,673 acres of viable coastal scrubby flatwoods remained in the Treasure Coast region of Florida (Indian River, Saint Lucie, Martin, and Palm Beach Counties) according to Fernald (1989). He estimated that 95 percent of scrub had already been destroyed for development purposes in Palm Beach County.

Habitat destruction not only reduces the amount of area scrub-jays can occupy, but also increases fragmentation of habitat. As more scrub habitat is altered, the habitat is cut into smaller and smaller pieces, separated from other patches by larger distances; such fragmentation increases the probability of genetic isolation, which is likely to increase extinction probability (Fitzpatrick *et al.* 1991; Woolfenden and Fitzpatrick 1991; Snodgrass *et al.* 1993; Stith *et al.* 1996; Thaxton and Hingtgen 1996). Dispersal distances of scrub-jays in fragmented habitat are further than in optimal unfragmented habitats, and demographic success is poor (Thaxton and Hingtgen 1996; Breininger 1999).

Overutilization for Commercial, Recreational, Scientific, or Educational Purposes: The Service knows of only a few cases where scrub-jays have been shot. One was in Volusia County which was investigated and prosecuted under the MBTA (J. Oliveros, USFWS, pers. comm.). The Florida Fish and Wildlife Conservation Commission (FWC) investigated a case in which three

scrub-jays were shot in Highlands County (N. Douglass, FWC, pers. comm.). It does not seem that the small number and infrequent occurrence of scrub-jays taken in this manner has had an impact on the species.

Disease or Predation: Most Florida scrub-jays mortality probably is from predation (Woolfenden and Fitzpatrick 1996b). The second most frequent cause may be disease, or predation on disease-weakened jays (Woolfenden and Fitzpatrick 1996b). Known predators of Florida scrub-jays are listed by Woolfenden and Fitzpatrick (1990), Fitzpatrick *et al.* (1991), Breininger (1999), and K. Miller (FWC, in litt. 2004); the list includes eastern coachwhip (*Masticophis flagellum*, known to eat adults, nestlings, and fledglings), eastern indigo snake (*Drymarchon corais couperi*, known to eat adults and fledglings), rat snake (*Elaphe obsoleta*), and corn snake (*E. guttata*). Mammalian predators include bobcats (*Lynx rufus*), raccoons (*Procyon lotor*), sometimes cotton rats (*Sigmodon hispidus*, known to eat eggs), and domestic cats (*Felis cattus*, known to eat adults). Franzreb and Puschock (2004) also have documented spotted skunks (*Spilogale putorius*) and grey fox (*Urocyon cinereoargenteus*) as mammalian predators of scrub-jay nests. Fitzpatrick *et al.* (1991) suspect that populations of domestic cats are able to eliminate small populations of scrub-jays. Avian nest predators include great horned owls (*Bubo virginianus*), eastern screech-owl (*Otus asio*), red-tailed hawk (*Buteo jamaicensis*), northern harrier (*Circus cyaneus*), fish crow (*Corvus ossifragus*), boat-tailed grackle (*Quiscalus major*), common grackle (*Q. quiscula*), American crow (*C. brachyrhynchos*), blue jay (*Cyanocitta cristata*), and swallow-tailed kites (*Elanoides forficatus*). Fitzpatrick *et al.* (1991) reported that overgrown scrub habitats are often occupied by the blue jay, which may be one factor limiting scrub-jay populations in such areas. Raptors which seem to be important predators of adult scrub-jays are merlin (*Falco columbarius*), sharp-shinned hawk (*Accipiter striatus*), and Cooper's hawk (*A. cooperii*), and northern harrier. During migration and winter, these four raptor species are present in areas which contain scrub habitat, and scrub-jays may experience frequent confrontations (as many as one pursuit a day) with them (Woolfenden and Fitzpatrick 1990). In coastal scrub, Woolfenden and Fitzpatrick (1996b) report that scrub-jays are vulnerable to predation by raptors in October, March, and April, when high densities of migrating accipiters and falcons are present. Woolfenden and Fitzpatrick (1996b) and Toland (1999) suggest that in overgrown scrub habitats, hunting efficiency for scrub-jay predators is increased. Bowman and Averill (1993) noted that scrub-jays occupying fragments of scrub found in or near housing developments were more prone to predation by house cats and competition from blue jays and mockingbirds. Woolfenden and Fitzpatrick (1996a, 1996b) stated that proximity to housing developments (and increased exposure to domestic cats) needs to be taken into consideration when designing scrub preserves. Young scrub-jays are especially vulnerable to ground predators (e.g., snakes and mammals) before they are fully capable of sustained flight.

The Florida scrub-jay hosts 2 protozoan blood parasites (*Plasmodium cathemerium* and *Haemoproteus danilewskyi*), but incidence is low (M. Garvin pers. comm., cited in Woolfenden and Fitzpatrick 1996b). Several scrub-jays sick from these two agents in March 1992 survived to become breeders. The Florida scrub-jay carries at least 3 types of mosquito-borne encephalitis (St. Louis, eastern equine, and "Highlands jay"; M. Garvin and J. Day pers. comm., cited in Woolfenden and Fitzpatrick 1996b). Of particular concern is the arrival of West Nile virus (the agent of another type of encephalitis) in Florida during 2001; since corvids have been

particularly susceptible to the disease in states north of Florida, it is expected that scrub-jays will be affected.

Woolfenden and Fitzpatrick (1996b) noted 3 episodes of elevated mortality (especially among juveniles) in 26 years at Archbold Biological Station. Each of these incidents occurred in conjunction with elevated water levels following unusually heavy rains in the fall, although high mortality does not occur in all such years. During the most severe of these presumed epidemics (August 1979 through March 1980), all but one of the juvenile cohort and almost half of the breeding adults died (Woolfenden and Fitzpatrick 1984; Woolfenden and Fitzpatrick 1990). The 1979-1980 incident coincided with a known outbreak of eastern equine encephalitis among domestic birds in central Florida (J. Day pers. comm., cited in Woolfenden and Fitzpatrick 1996b). From the fall of 1997 through the spring of 1998, the continuing population decline of Florida scrub-jays along the Atlantic coast and in central Florida may have been augmented by an epidemic of unknown origin (Breining 1999).

At CCAFS, Stevens and Hardesty (1999) noted a decline in juvenile survival from 60 to 70 percent in the preceding years to only 16 percent in 1997-98. It stayed low (only 25 percent) in 1998-99 before again climbing into the mid-60 percent range. Also, adult survival dropped from 70 to 80 percent survival in the preceding years to 50 to 60 percent in 1997-98. Overall, their annual surveys documented the largest one-year drop (pairs decreased by 17 percent and birds by 20 percent) in this population at the same time as the presumed state-wide epidemic.

In winter-summer of 1973, 15 species of helminth fauna (including 8 nematodes, 5 trematodes, 1 cestode, and 1 acanthocephalan) were found in 45 Florida scrub-jays collected in south-central Florida; the parasite load was attributed to a varied arthropod diet (Kinsella 1974). These naturally-occurring parasites are not believed to have a negative impact on scrub-jay population levels.

Larvae of a fly, *Philornis* (= *Neomusca*) *porteri*, occur irregularly on scrub-jay nestlings. The species pupates in the base of the nest; larvae locate in nares, mouth flanges, bases of remiges, and toes; apparently no serious effect on the scrub-jay host occurs (Woolfenden and Fitzpatrick 1996b). Additionally, one undescribed chewing louse (*Myrsidea* sp., R. Price pers. comm., cited in Woolfenden and Fitzpatrick 1996b), one wing-feather mite (*Pterodectes* sp.), two chiggers (*Eutrombicula lipovskyana*), and a flea (*Echidnophaga gallinacea*; J. Kinsella pers. comm., cited in Woolfenden and Fitzpatrick 1996b) occur on some individuals, usually at low densities. Nymphs and larvae of four ticks (*Amblyomma americanum*, *A. tuberculatum*, *Haemaphysalis leporispalustris*, and *Ixodes scapularis*) are known to occur on scrub-jays, as well as the larvae of the tick *Amblyomma maculatum* (L. Durden and J. Keirans pers. comm., cited in Woolfenden and Fitzpatrick 1996b). These naturally occurring parasites are not believed to have a negative impact on scrub-jay population levels.

The Inadequacy of Existing Regulatory Mechanisms: Woolfenden and Fitzpatrick (1996a) state the importance of enforcing existing federal laws regarding the management of federal lands as natural ecosystems for the long-term survival of the Florida scrub-jay. The Service consults regularly on activities on federal lands which may affect scrub-jays and also works with private landowners through section 10(a)(1)(B) incidental take permitting process of the Act when take

is likely to occur and no federal nexus is present. Florida's State Comprehensive Plan and Growth Management Act of 1985 is administered mostly by regional and local governments. Regional Planning Councils administer the law through Development of Regional Impact Reviews; at the local level, although comprehensive plans contain policy statements and natural resource protection objectives, they are only effective if counties enact and enforce ordinances. As a general rule, counties have not enacted and/or enforced ordinances that are effective in protecting scrub-jays (Fernald 1989).

The Wildlife Code of the state of Florida (Chapter 68A, Florida Administrative Code) prohibits taking of individuals of threatened species, or parts thereof, or their nests or eggs, except as authorized. The statute does not prohibit clearing of habitat occupied by protected species, which limits the ability of the FWC to protect the Florida scrub-jay and its habitat.

Other Natural or Manmade Factors Affecting its Continued Existence: Human interference with natural fire regimes has continued to play a major part in the decline of the scrub-jay and today may exceed habitat loss as the single most important factor (Woolfenden and Fitzpatrick 1991, 1996a; Fitzpatrick *et al.* 1994). Lightning strikes cause virtually all naturally-occurring fires in south Florida scrub habitat (Abrahamson 1984; Hofstetter 1984). Fire has been noted to be important in maintenance of scrub habitat for decades (Nash 1895; Harper 1927; Webber 1935; Davis 1943; Laessle 1968; Abrahamson *et al.* 1984). Human efforts to prevent and/or control natural fires have allowed the scrub to become too dense and tall to support populations of scrub-jays, resulting in the decline of local populations of scrub-jays throughout the state (Fernald 1989; Fitzpatrick *et al.* 1994; Percival *et al.* 1995; Stith *et al.* 1996; Thaxton and Hingtgen 1996; Woolfenden and Fitzpatrick 1990, 1996a; Toland 1999). Woolfenden and Fitzpatrick (1996a) cautioned, however, that fire applied too often to scrub habitat also can result in local extirpations. Experimental data at Archbold Biological Station (Fitzpatrick and Woolfenden, unpubl. data) show that fire-return intervals varying between 5 and 15 years are optimal for long-term maintenance of productive Florida scrub-jay populations in central Florida. These intervals also correspond with those yielding healthy populations of listed scrub plants (Menges and Kohfeldt 1995; Menges and Hawkes 1998). Optimal fire-return intervals may, however, be shorter in coastal habitats (Breininger and Schmalzer 1990; Schmalzer and Hinkle 1992a, b; Breininger *et al.* 1995, 1998).

Stith *et al.* (1996) estimated that at least 2,100 breeding pairs were living in overgrown habitat. Toland (1999) reported that most of Brevard County's remaining scrub (estimated to be only 15 percent of the original acreage) is extremely overgrown due to fire suppression. He further suggests that the overgrowth of scrub habitats reduces the number and size of sand openings which are crucial to not only scrub-jays, but also many other scrub plants and animals. Reduction in the number of potential scrub-jay nesting sites, acorn cache sites, and foraging sites presents a problem for scrub-jays. Fernald (1989) reported that overgrowth of scrub results not only in the decline of species diversity and abundance but also a reduction in the percentage of open sandy patches (Fernald 1989; Woolfenden and Fitzpatrick 1996b). Fitzpatrick *et al.* (1994) believed that fire suppression was just as responsible as habitat loss in the decline of the scrub-jay, especially in the northern third of its range. Likewise, the continued population decline of scrub-jays within Brevard County between 1991 and 1999 has been attributed mainly to the overgrowth of remaining habitat patches (Breininger *et al.* 2001). Breininger *et al.* (1999a)

concluded that optimal habitat management is essential in fragmented ecosystems maintained by periodic fire, especially to lessen risks of decline and extinction resulting from epidemics and hurricanes.

Fitzpatrick *et al.* (1991, 1994) and Woolfenden and Fitzpatrick (1996a) expressed concern for the management practices taking place on federal lands at Ocala National Forest, MINWR/KSC, and CCAFS, all supporting large contiguous populations of Florida scrub-jays. They predicted that fire suppression and/or too frequent fires (on the latter two) and silvicultural activities involving the cultivation of sand pine on Ocala National Forest would be responsible for continuing decline of scrub-jays in these large contiguous areas of scrub. These areas should be those where populations are most secure because of federal agencies' responsibilities under section 7(a)(1) of the Act. Monitoring of scrub-jay populations, demography, and nesting success is ongoing on all of these properties to assess the effectiveness of management practices in meeting scrub-jay recovery objectives.

Housing and commercial developments within scrub habitats are accompanied by the development of roads. Since scrub-jays often forage along roadsides and other openings in the scrub, they are often killed by passing cars. Research by Mumme *et al.* (2000) along a two-lane paved road indicated that clusters of Florida scrub-jay territories found next to the roadside represented population sinks (breeder mortality exceeds production of breeding-aged recruits), which could be supported only by immigration. Since this species may be attracted to roadsides because of the open habitat characteristics, road mortality presents a significant and growing management problem throughout the remaining range of the Florida scrub-jay (Dreschel *et al.* 1990; Mumme *et al.* 2000), and proximity to high-speed paved roads needs to be considered when designing scrub preserves (Woolfenden and Fitzpatrick 1996a).

Another potential problem in suburban areas supporting Florida scrub-jays is supplemental feeding by humans (Bowman and Averill 1993; R. Bowman unpubl. data, cited in Woolfenden and Fitzpatrick 1996a; Bowman 1998). The presence of additional food may allow scrub-jays to persist in fragmented habitats, but recruitment in these populations is lower than in native habitats. However, even though human-feeding may postpone local extirpations, long-term survival cannot be ensured in the absence of protecting native oak scrub habitat, necessary for nesting.

Scrub-jays in suburban settings often nest high in tall shrubbery. During March winds, these nests tend to be susceptible to destruction (R. Bowman and G.E. Woolfenden unpubl data, cited in Woolfenden and Fitzpatrick 1996b; Bowman 1998).

Hurricanes pose a potential risk for Florida scrub-jays, although the exact impact of such catastrophic events remains unknown. Breininger *et al.* (1999b) modeled the effects of epidemics and hurricanes on scrub-jay populations in varying levels of habitat quality. Small populations of scrub-jays are more vulnerable to extirpation where epidemics and hurricanes are common. Storm surge from a category 3 to 5 hurricane could inundate entire small populations of scrub-jays, and existing habitat fragmentation could prevent repopulation of affected areas. However, this model also predicted that long-term habitat degradation had greater influence on extinction risk than hurricanes or epidemics.

Fernald (1989) reported that many of the relatively few remaining patches of scrub within the Treasure Coast region of Florida had been degraded by trails created by off-road vehicles, illegal dumping of construction debris, abandoned cars and appliances, or household waste. The invasion of these areas by exotic species, including Brazilian pepper (*Schinus terebinthifolius*), cypress pine (*Callitris* sp.), and Australian pine (*Casuarina equisetifolia*) also was a problem. Other human-induced impacts identified by Fernald include the introduction of domestic dogs (*Canis familiaris*) and cats, black rats (*Rattus rattus*), greenhouse frogs (*Eleutherodactylus planirostris*), giant toads (*Bufo marinus*), Cuban tree frogs (*Osteopilus septentrionalis*), brown anoles (*Anolis sagrei*), and other exotic animal species. These exotic species may compete with scrub-jays for both space and food, although scrub-jays sometimes feed on them.

A statewide scrub-jay census was last conducted in 1992-1993, at which time there were an estimated 4,000 pairs of scrub-jays left in the Florida (Fitzpatrick *et al.* 1994). The scrub-jay was considered extirpated in 10 counties (Alachua, Broward, Clay, Dade, Duval, Gilchrist, Hernando, Hendry, Pinellas, and St. Johns), and were considered functionally extinct in an additional 5 counties (Flagler, Hardee, Levy, Orange, and Putnam), where ten or fewer pairs remained. Recent information indicates that there are at least 12 to 14 breeding pairs of scrub-jays located within Levy County, higher than previously though (K. Miller, FWC, pers. comm.. 2004), and there is at least one breeding pair of scrub-jays remaining in Clay County (K. Miller, FWC, pers. comm.. 2004). A scrub-jay has been documented in St. Johns County as recently as 2003 (J.B. Miller, FDEP, in litt. 5/13/03). Populations are close to becoming extirpated in Gulf coast counties (from Levy south to Collier) (Fitzpatrick *et al.* 1994; Woolfenden and Fitzpatrick 1996a). In 1992-1993, population numbers in 19 of the counties were below 30 or fewer breeding pairs. In the past, most of these counties would have contained hundreds or even thousands of groups (Fitzpatrick *et al.* 1994). Based on the amount of destroyed scrub habitat, scrub-jay population loss along the Lake Wales Ridge is 80 percent or more since pre-European settlement (Fitzpatrick *et al.* 1991). Since the early 1980s, Fitzpatrick *et al.* (1994) estimated that in the northern third of the species' range, the Florida scrub-jay has declined somewhere between 25 and 50 percent. The species may have declined by as much as 25 to 50 percent in the last decade alone (Stith *et al.* 1996).

On protected lands, scrub-jays have continued to decline due to inadequate habitat management (Stith 1999). However, over the last several years, steps to reverse this decline have occurred, and management of scrub habitat is continuing in many areas of Florida (Hastie and Eckl 1999; Stith 1999; TNC 2001; A. Birch, Brevard County Environmentally Endangered Lands (EEL), pers. comm.; M. Camardese, CCAFS, pers.comm.).

Analysis of Brevard County historic aerial photography and soil maps suggest that pre-European settlement oak scrub, scrubby pine flatwoods, and coastal scrub/strand covered at least 53,000 acres outside of federal lands (Toland 1999). Assuming average territory size of 25 acres per breeding pair, there were probably originally 2,200 to 2,500 Florida scrub-jay territories within Brevard County. The 1992-1993 statewide survey estimated that on federal lands within Brevard County, there were 860 pairs of Florida scrub-jays remaining; outside of federal lands, 276 breeding pairs of scrub-jays were present (Fitzpatrick *et al.* 1994). The figure on non-federal lands within Brevard County had dropped to 185 in 1999 (Toland 1999), illustrating a

precipitous decline of the scrub-jay population within the county. Part of this decline may be attributed to a possible rare epidemic in 1997-1998. A total of 1,620 acres of scrub habitat have been purchased (outside federal ownership) for preservation by Brevard County EEL, the St. Johns River Water Management District (SJRWMD), and the Florida Department of Environmental Protection (FDEP); 2,500 acres more of potential scrub-jay habitat are proposed for acquisition by EEL and the SJRWMD (Toland 1999). All of these parcels need extensive restoration and management to obtain maximum usage by scrub-jays. Over the last several years, an extensive effort to restore and manage these parcels has been undertaken by EEL, the SJRWMD, and FDEP (A. Birch, pers. comm.).

In some areas of the range of the scrub-jay, it appears that the 1992-1993 state-wide census underestimated populations of scrub-jays, especially in areas where little was known about the status of the species. The state-wide census in 1992-1993 estimated about 145 pairs of scrub-jays remained within Sarasota County (Fitzpatrick *et al.* 1994), although Christman (2000) found 196 pairs of scrub-jays. Likewise, Miller and Stith (2002) documented 54 pairs of scrub-jays within the Deep Creek area of Charlotte County, while the state-wide census in 1992-1993 documented only 19 pairs (Fitzpatrick *et al.* 1994). Given that habitat has continued to degrade and development activity has increased in these areas, it is unlikely that these increased numbers reflect a population increase, but rather a greater effort in the survey process over that undertaken in 1992-1993 (Miller and Stith 2002). Two possible reasons that the 1992-1993 state-wide census underestimated some populations are (1) there was inadequate time and/or resources to survey poorly-known areas and (2) scrubby flatwoods were often overlooked because surveyors relied on soil maps, which are not reliable predictors of where scrubby flatwoods occur.

Stith (1999) utilized a spatially explicit individual-based population model developed specifically for the Florida scrub-jay to complete a metapopulation viability analysis of the species. The species' range was divided into 21 metapopulations demographically isolated from each other. Metapopulations are defined as collections of relatively discrete demographic populations distributed over the landscape; these populations are connected within the metapopulations through dispersal or migration (National Research Council 1995). A series of simulations were run for each of the 21 metapopulations based on different scenarios of reserve design ranging from the minimal configuration consisting of only currently protected patches of scrub (no acquisition option) to the maximum configuration, where all remaining significant scrub patches were acquired for protection (complete acquisition option). The assumption was made that all areas that were protected were also restored and properly managed.

Results from Stith's (1999) simulation model included estimates of extinction, quasi-extinction (the probability of a scrub-jay metapopulation falling below 10 pairs), and percent population decline. These were then used to rank the different state-wide metapopulations by vulnerability. The model predicted that five metapopulations (NE Lake, Martin, Merritt Island, Ocala National Forest, and Lake Wales Ridge, see Figure 1) have low risk of quasi-extinction. Two of the five (Martin and NE Lake), however, experienced significant population declines under the "no acquisition" option; the probability for survival of both of these metapopulations could be improved by more acquisitions.

Eleven of the remaining 21 metapopulations were shown to be highly vulnerable to quasi-extinction if no more habitat was acquired (Central Brevard, N Brevard, Central Charlotte, NW Charlotte, Citrus, Lee, Levy, Manatee, Pasco, St. Lucie, and W Volusia). The model predicted that the risk of quasi-extinction would be greatly reduced for 7 of the 11 metapopulations (Central Brevard, N Brevard, Central Charlotte, NW Charlotte, Levy, St. Lucie, and W Volusia) by acquiring all or most of the remaining scrub habitat. The model predicted that the remaining four metapopulations (Citrus, Lee, Manatee, and Pasco) would moderately benefit if more acquisitions were made.

Stith (1999) classified two metapopulations (S Brevard and Sarasota) as moderately vulnerable with a moderate potential for improvement; they both had one or more fairly stable subpopulations of scrub-jays under protection, but the model predicted large population declines. The rest of the metapopulations could collapse without further acquisitions, making the protected subpopulations there vulnerable to epidemics or other catastrophes.

Three of the metapopulations evaluated by Stith (1999) (Flagler, Central Lake, and S Palm Beach) were classified as highly vulnerable to quasi-extinction and had low potential for improvement, since little or no habitat is available to acquire or restore.

Analysis of the Species/Critical Habitat Likely to be Affected

The Florida scrub-jay's status since its listing in 1987 has not improved. The above analysis clearly shows two items that are essential for recovery of this species: (1) additional purchase of scrub lands for preservation in key areas and (2) restoration and management of publicly-owned scrub lands already under preservation. Without both, it is unlikely that recovery can be achieved.

SOUTHEASTERN BEACH MOUSE (*PEROMYSCUS POLIONOTUS NIVEIVENTRIS*)

Species/Critical Habitat Description

The southeastern beach mouse was listed as a threatened species under the Act in 1989 (54 FR 20598). Critical habitat was not designated for this subspecies.

Life History/Population Dynamics

The following account is from the South Florida Multi-Species Recovery Plan, Southeastern Beach Mouse Chapter (U.S. Fish and Wildlife Service 1999) and includes minor additions and changes to update the information.

Taxonomy

Peromyscus polionotus is a member of the order Rodentia and family Cricetidae. The southeastern beach mouse (SEBM) is one of 16 recognized subspecies of oldfield mice *P. polionotis* (Hall 1981); it is one of the eight of those subspecies that are called beach mice. The SEBM was first described by Chapman (1889) as *Hesperomys niveiventris*. Bangs (1898)

subsequently placed it in the genus *Peromyscus*, and Osgood (1909) assigned it the subspecific name *P. polionotus niveiventris*.

Description

The SEBM is the largest of the eight recognized subspecies of beach mice, averaging 139 mm in total length (range of 10 individuals = 128 to 153 mm), with a 52 mm tail length (Osgood 1909; Stout 1992). Females are slightly larger than males. These beach mice are slightly darker in appearance than some other subspecies of beach mice, but paler than inland populations of *P. polionotus* (Osgood 1909). Southeastern beach mice have pale, buffy coloration from the back of their head to their tail, and their underparts are white. The white hairs extend up on their flanks, high on their jaw, and within 2 to 3 mm of their eyes (Stout 1992). There are no white spots above the eyes as with *P. p. phasma* (Osgood 1909). Their tail is also buffy above and white below. Juvenile *P. p. niveiventris* are more grayish in coloration than adults; otherwise they are similar in appearance (Osgood 1909).

Habitat

Essential habitat of the SEBM is the sea oats (*Uniola paniculata*) zone of primary coastal dunes (Humphrey and Barbour 1981; Humphrey *et al.* 1987; Stout 1992). This subspecies has also been reported from sandy areas of adjoining coastal strand/scrub vegetation (Extine 1980; Extine and Stout; 1987; Rich *et al.* 1993), which refers to a transition zone between the fore dune and the inland plant community (Johnson and Barbour 1990). Beach mouse habitat is heterogeneous, and distributed in patches that occur both parallel and perpendicular to the shoreline (Extine and Stout 1987). Because this habitat occurs in a narrow band along Florida's coast, structure and composition of the vegetative communities that form the habitat can change dramatically over distances of only a few meters.

Primary dune vegetation described from SEBM habitat includes sea oats, dune panic grass (*Panicum amarum*), railroad vine (*Ipomaea pes-caprae*), beach morning glory (*Ipomaea stolonifera*), salt meadow cordgrass (*Spartina patens*), lamb's quarters (*Chenopodium album*), saltgrass (*Distichlis spicata*), and camphor weed (*Heterotheca subaxillaris*) (Extine 1980). Coastal strand and inland vegetation is more diverse, and can include beach tea (*Croton punctatus*), prickly pear cactus (*Opuntia humifusa*), saw palmetto (*Serenoa repens*), wax myrtle (*Myrica cerifera*), rosemary (*Ceratiola ericoides*), sea grape (*Coccoloba uvifera*), oaks (*Quercus sp.*) and sand pine (*Pinus clausa*) (Extine and Stout 1987). Extine (1980) observed this subspecies as far as 1 km inland on Merritt Island; he concluded that the dune scrub communities he found them in represent only marginal habitat for the SEBM. SEBM have been documented in coastal scrub several km from the beach habitat at Kennedy Space Center/Merritt Island NWR and CCAFS (Stout, personal communication, 2004). Extine (1980) and Extine and Stout (1987) reported that the SEBM showed a preference for areas with clumps of palmetto, sea grape, and expanses of open sand.

Within their dune habitat, beach mice construct burrows to use as refuges, nesting sites, and food storage areas. Burrows of *P. polionotus*, in general, consist of an entrance tunnel, nest chamber, and escape tunnel. Burrow entrances are usually placed on the sloping side of a dune at the base of a shrub or clump of grass. The nest chamber is formed at the end of the level portion of the entrance tunnel at a depth of 0.6 to 0.9 m, and the escape tunnel rises from the nest chamber to

within 2.5 cm of the surface (Blair 1951). A beach mouse may have as many as 20 burrows within its home range. They are also known to use old burrows constructed by ghost crabs (*Ocypode quadrata*).

Foraging

Beach mice typically feed on seeds of sea oats and dune panic grass (Blair 1951). The SEBM probably also eats the seeds of other dune grasses, railroad vine, and prickly pear cactus. Although beach mice prefer the seeds of sea oats, these seeds are only available as food after they have been dispersed by the wind. Beach mice also eat small invertebrates, especially during late spring and early summer when seeds are scarce (Ehrhardt 1978). Beach mice will store food in their burrows.

Behavior

P. polionotus is the only member of the genus that digs an extensive burrow for refuge, nesting, and food storage (Ehrhart 1978). To dig the burrow, the mouse assumes a straddling position and throws sand back between the hind legs with the forefeet. The hind feet are then used to kick sand back while the mouse backs slowly up and out of the burrow (Ivey 1949). Burrows usually contain multiple entrances, some of which are used as escape tunnels. When mice are disturbed in their burrows, they open escape tunnels and quickly flee to another burrow or to other cover (Ehrhart 1978). Beach mice, in general, are nocturnal. They are more active under stormy conditions or moonless nights and less active on moonlit nights. Movements are primarily for foraging, breeding, and burrow maintenance. Extine and Stout (1987) reported movements of the SEBM between primary dune and interior scrub on Merritt Island, and concluded that their home ranges overlap and can reach high densities in their preferred habitats.

Reproduction and Demography

Studies on *Peromyscus* species in peninsular Florida suggest that these species may achieve greater densities and undergo more significant population fluctuations than their temperate relatives, partially because of their extended reproductive season (Bigler and Jenkins 1975). Subtropical beach mice can reproduce throughout the year; however their peak reproductive activity is generally during late summer, fall, and early winter. Extine (1980) reported peak reproductive activity for *P. p. niveiventris* on Merritt Island during August and September, based on external characteristics of the adults. This peak in the timing and intensity of reproductive activity was also correlated to the subsequent peak in the proportion of juveniles in the population in early winter (Extine 1980). This pattern is typical of other beach mice as well (Rave and Holler 1992).

Sex ratios in beach mouse populations are generally 1:1 (Extine 1980; Rave and Holler 1992). Blair (1951) indicated that beach mice are monogamous; once a pair is mated they tend to remain together until death. He also found, however, that some adult mice of each sex show no desire to pair. Nests of beach mice are constructed in the nest chamber of their burrows, a spherical cavity about 4 to 6 cm in diameter. The nest comprises about one fourth of the size of the cavity and is composed of sea oat roots, stems, leaves and the chaffy parts of the panicles (Ivey 1949).

The reproductive potential of beach mice is generally high (Ehrhardt 1978). In captivity, beach mice are capable of producing 80 or more young in their lifetime, and producing litters regularly

at 26-day intervals (Bowen 1968). Litter size of beach mice, in general, ranges from two to seven, with an average of four. Beach mice reach reproductive maturity as early as 6 weeks of age (Ehrhart 1978).

Population Dynamics

Status and Trends

The distribution of the beach mouse is limited due to modification and destruction of its coastal habitats. On the Atlantic coast of Florida, the Anastasia Island beach mouse (*P. p. phasma*) and the SEBM were federally listed as endangered and threatened, respectively, in 1989 (54 FR 20602). One additional Atlantic coast subspecies, the pallid beach mouse (*P. p. decoloratus*), was formerly reported from two sites in Volusia County, but extensive surveys provide substantial evidence that this subspecies is extinct (Humphrey and Frank 1992).

The distribution of the SEBM has declined significantly, particularly in the southern part of its range. Historically, it was reported to occur along about 280 km of Florida's central and southeast Atlantic coast from Ponce (Mosquito) Inlet, Volusia County, to Hollywood Beach, Broward County (Hall 1981). Bangs (1898) reported it as extremely abundant on all the beaches of the east peninsula from Palm Beach at least to Mosquito (Ponce) Inlet. During the 1990s, the SEBM was reported only from Volusia County (Canaveral National Seashore); in Brevard County (Canaveral National Seashore, Kennedy Space Center/Merritt Island NWR, and CCAFS); a few localities in Indian River County (Sebastian Inlet SRA, Treasure Shores Park, and several private properties), and St. Lucie County (Pepper Beach County Park and Fort Pierce Inlet SRA) (Humphrey *et al.* 1987; Robson 1989; Land Planning Group, Inc. 1991; Humphrey and Frank 1992; U.S. Fish and Wildlife Service 1993). The SEBM is geographically isolated from all other subspecies of *P. polionotus*.

Populations of the SEBM are still found on the beaches of Canaveral National Seashore, Merritt Island NWR, and CCAFS in Brevard County, all on federally protected lands. In April 2002, a population of SEBM was documented at the Smyrna Dunes Park, at the north end of New Smyrna Beach (A. Sauzo, personal communication, 2004). Populations from both sides of Sebastian Inlet appear to be extirpated (A. Bard, personal communication, 2004).

The status of the species south of Brevard County is currently unknown. The surveys done during the mid-1990s indicate the distribution of this subspecies in the counties south of Brevard was severely limited and fragmented. There are not enough data available to determine population trends for these populations. These surveys revealed that it occurred only in very small numbers where it was found. In Indian River County, the Treasure Shores Park population experienced a significant decline in the 1990s, and it is uncertain whether populations still exist at Turtle Trail or adjacent to the various private properties (D. Jennings, personal communication, 2004). Trapping efforts documented a decline from an estimated 300 individuals down to numbers in the single digits. No beach mice were found during surveys in St. Lucie County and it is possible that this species is extirpated there. The SEBM no longer occurs at Jupiter Island, Palm Beach, Lake Worth, Hillsboro Inlet or Hollywood Beach (U.S. Fish and Wildlife Service 1999).

The primary reason for the significant reduction in the range of the SEBM is the loss and alteration of coastal dunes. Large-scale commercial and residential development on the coast of Florida has eliminated SEBM habitat in the southern part of its range. This increased urbanization has also increased the recreational use of dunes, and harmed the vegetation essential for dune maintenance. Loss of dune vegetation results in widespread wind and water erosion and reduces the effectiveness of the dune to protect other beach mouse habitat. In addition to this increased urbanization, coastal erosion is responsible for the loss of the dune environment along the Atlantic coast, particularly during tropical storms and hurricanes. The extremely active 2004 hurricane season had a pronounced affect on Florida's Atlantic coast beaches and beach mouse habitat.

The encroachment of residential housing onto the Atlantic coast also increases the likelihood of predation by domestic cats and dogs. A healthy population of SEBM on the north side of Sebastian Inlet SRA in Brevard County was completely extirpated by 1972, presumably by feral cats (A. Bard, personal communication 2004). Urbanization of coastal habitat could also lead to potential competition of beach mice with house mice and introduced rats.

Beach mice along the Gulf Coasts of Florida and Alabama generally live about nine months (Swilling 2000). Field trapping research indicates that 68 percent (average) of mice alive in one month will survive to the next month. Actual survival rates indicate that 18.5 to 87 percent of individuals survive no more than four months and some mice live between 12 and 20 months (Blair 1951; Rave and Holler 1992). Holler *et al.* (1997) found that 44.26 percent of beach mice captured for the first time survived to the next season (winter, spring, summer, and fall). The mean survival rate for mice captured for a second time to subsequent capture was higher (53.90 percent). More than ten percent of mice survived three seasons after first capture, and four to eight percent survived more than one year after initial capture. Mice held in captivity by Blair (1951) and at Auburn University (Holler 1995) have lived three years or more.

Analysis of the Species/Critical Habitat Likely to be Affected

The southeastern beach mouse was listed as an endangered species primarily because of the fragmentation, adverse alteration and loss of habitat due to coastal development. The above analysis shows three items that are essential for recovery of this species: (1) purchase of coastal dune habitat for preservation; (2) removal of predation or competition by animals related to human development (cats and house mice); and (3) increase the regulations regarding coastal development.

EASTERN INDIGO SNAKE (*DRYMARCHON CORAIS COUPERI*)

Species/Critical Habitat Description

The eastern indigo snake is one of eight subspecies of a primarily tropical species; only the eastern indigo and the Texas indigo (*Drymarchon corais erebennus*) occur within the United States (U.S. Fish and Wildlife Service 1982). The eastern indigo snake is isolated from the Texas indigo snake by more than 600 miles (Moler 1992). The eastern indigo snake is the longest snake in North America, obtaining lengths of up to 104 inches (Ashton and Ashton

1981). Its color is uniformly lustrous-black, dorsally and ventrally, except for a red or cream-colored suffusion of the chin, throat, and sometimes the cheeks. Its scales are large and smooth (central 3-5 scale rows are lightly keeled in adult males) in 17 scale rows at midbody. Its anal plate is undivided. Its antepenultimate supralabial scale does not contact the temporal postocular scales.

The eastern indigo snake was listed as a threatened under the Act in 1978 (43 FR 4621). No critical habitat has been designated for this species; therefore none will be affected by the proposed project.

Life History/Population Dynamics

Historically, the eastern indigo snake occurred throughout Florida and into the coastal plain of Georgia, Alabama, and Mississippi (Loding 1922; Haltom 1931; Carr 1940; Cook 1954; Diemer and Speake 1983; Moler 1985a). It may have occurred in South Carolina, but its occurrence there cannot be confirmed. Georgia and Florida currently support the remaining endemic populations of eastern indigo snake (Lawler 1977). In 1982, only a few populations remained in the Florida panhandle, and the species was considered rare in that region. Nevertheless, based on museum specimens and field sightings, the eastern indigo snake still occurs throughout Florida, even though they are not commonly seen (Moler 1985a).

In south Florida, the eastern indigo snake is thought to be widely distributed and probably more abundant than in the northern limits of the range, especially compared to the low densities found in the panhandle of Florida. Given their preference for upland habitats, indigos are not found in great numbers in wetland complexes of the Everglades region, even though they are found in pinelands and tropical hardwood hammocks in extreme south Florida (Steiner *et al.* 1983).

Indigo snakes also occur in the Florida Keys. They have been collected from Big Pine and Middle Torch Keys, and are reliably reported from Big Torch, Little Torch, Summerland, Cudjoe, Sugarloaf, and Boca Chica Keys (Lazell 1989). Given the ubiquitous nature of the eastern indigo throughout the remainder of its range, it is likely that it also occurs on other Keys.

Over most of its range, the eastern indigo snake frequents a diversity of habitat types such as pine flatwoods, scrubby flatwoods, xeric sandhill communities, and tropical hardwood hammocks, edges of freshwater marshes, agricultural fields, coastal dunes, and human altered habitats. Eastern indigo snakes need a mosaic of habitats to complete their annual cycle. Interspersion of tortoise-inhabited sandhills and wetlands improves habitat quality for the indigo snakes (Landers and Speake 1980; Auffenberg and Franz 1982). Eastern indigo snakes require sheltered retreats from winter cold and desiccation (Bogert and Cowles 1947). Whenever the eastern indigo snake occurs in xeric habitats, it is closely associated with the gopher tortoise (*Gopherus polyphemus*), the burrows of which shelter the indigo snakes from the winter cold and desiccating sandhills environment (Bogert and Cowles 1947; Speake *et al.* 1978; Layne and Steiner 1996). This dependence seems especially pronounced in Georgia, Alabama, and the panhandle of Florida, where the eastern indigo snake is largely restricted to the vicinity of the sandhill habitats occupied by gopher tortoises (Diemer and Speake 1981; Moler 1985b; Mount 1975). The high use of xeric sandhill habitats throughout the northern portion of the eastern

indigo's range can be attributed primarily to the availability of thermal refuge afforded by gopher tortoise burrows in the winter. No such refugia is widely available off of the sandhills regions of southern Georgia and northern Florida. In wetter habitats that lack gopher tortoises, eastern indigo snakes may take shelter in hollowed root channels, hollow logs, or the burrows of rodents, armadillos (*Dasypus novemcinctus*), or crabs (Lawler 1977; Moler 1985b; Layne and Steiner 1996).

In the milder climates of central and southern Florida, eastern indigo snakes exist in a more stable thermal environment, where the availability of thermal refugia may not be as critical to the snake's survival, especially in extreme southern Florida. Throughout peninsular Florida, the eastern indigo snake can be found in all terrestrial habitats, which have not suffered high urban development. They are especially common in hydric hammocks throughout this region (Moler 1985a). In central and coastal Florida, eastern indigo snakes are typically found in the state's high sandy ridges. In extreme south Florida, these snakes are mainly found in pine flatwoods, pine rockland, tropical hardwood hammock habitats, and in most other undeveloped areas (Kuntz 1977). Eastern indigo snakes also use some agricultural lands (e.g., citrus) and various types of wetlands (Layne and Steiner 1996).

Even though thermal stresses may not be a year-round limiting factor in southern Florida, eastern indigo snakes seek and use underground refugia. On the sandy central and coastal ridges of south Florida, indigo snakes use gopher tortoise burrows (62 percent) more than other underground refugia (Layne and Steiner 1996). Other underground refugia used by indigo snakes include burrows of armadillos, cotton rats (*Sigmodon hispidus*), and land crabs; burrows of unknown origin; natural ground holes; hollows at the base of trees or shrubs; ground litter; trash piles; and in the crevices of rock-lined ditch walls (Layne and Steiner 1996). These refugia sites are used most frequently where tortoise burrows are not available, principally in the low-lying areas off of the central and coastal ridges.

Smith (1987) radio-tagged hatchling, yearling, and gravid eastern indigo snakes and released them in different habitat types on St. Marks National Wildlife Refuge in Wakulla County, Florida, in 1985 and 1986. Smith monitored the behavior, habitat use, and oviposition sites selected by gravid female snakes and concluded that the diverse habitats, including high pineland, pine-palmetto flatwoods, and permanent open ponds were important for the eastern indigo snake's seasonal activity. In this study, habitat use also differed by age-class and season; adult indigo snakes often used gopher tortoise burrows during April and May, while juveniles used root and rodent holes. The indigo snakes used gopher tortoise burrows for oviposition sites in high pineland areas, but stumps were chosen in flatwoods and pond edge habitats (Smith 1987).

Monitoring of radio-fitted indigo snakes on the central ridge of south Florida indicate that snakes in this part of the state use a wide variety of natural, disturbed, and non-natural habitat types throughout the year. On the ridge itself, indigos favor mature oak phase scrub, turkey oak sandhill, and abandoned citrus grove habitats, while snakes found off the sandy ridges use flatwoods, seasonal ponds, improved pasture, and active and inactive agricultural lands. There was no apparent selection for one habitat type over another as the use of habitats closely

reflected the relative availability and distribution of the vegetation types in these areas (Layne and Steiner 1996).

In extreme south Florida (the Everglades and Florida Keys), indigo snakes are found in tropical hardwood hammocks, freshwater marshes, abandoned agricultural lands, coastal prairie, mangrove swamps, and human altered habitats (Steiner *et al.* 1983). It is suspected that they prefer hammocks and pine forests since most observations occur there, and use of these areas are disproportionate compared to the relatively small total area of these habitats (Steiner *et al.* 1983).

Reproduction: Most information on the reproductive cycle of the eastern indigo snake is from data collected in northern Florida. Here, breeding occurs between November and April, and females deposit four to twelve eggs during May or June (Moler 1992). Speake (1993) reported an average clutch size of 9.4 for 20 captive bred females. Young hatch in approximately three months, from late May through August. Peak hatching activity occurs during August and September, while yearling activity peaks in April and May (Groves 1960; Smith 1987). Limited information on the reproductive cycle in south-central Florida suggests that the breeding and egg-laying season may be extended in south-central and south Florida. In this region, breeding extends from June to January, laying occurs from April to July, and hatching occurs during mid-summer to early fall (Layne and Steiner 1996).

Female indigo snakes can store sperm and delay fertilization of eggs; there is a single record of a captive snake laying five eggs (at least one of which was fertilized) after being isolated for more than four years (Carson 1945). There is no information on how long eastern indigo snakes live in the wild; in captivity, the longest an eastern indigo snake lived was 25 years, 11 months (Shaw 1959).

Feeding: The eastern indigo snake is an active terrestrial and fossorial predator that will eat any vertebrate small enough to be overpowered. Layne and Steiner (1996) documented several instances of indigos flushing prey from cover and then chasing it. Though unusual, indigo snakes may also climb shrubs or trees in search of prey. An adult eastern indigo snake's diet may include fish, frogs, toads, snakes (venomous and nonvenomous), lizards, turtles, turtle eggs, juvenile gopher tortoises, small alligators, birds, and small mammals (Keegan 1944; Babis 1949; Kochman 1978; Steiner *et al.* 1983). Juvenile indigo snakes eat mostly invertebrates (Layne and Steiner 1996).

Movements: Indigo snakes range over large areas and into various habitats throughout the year, with most activity occurring during summer and fall (Smith 1987; Moler 1985b; Speake 1993). The average home range of an eastern indigo snake is 12 acres during the winter (December - April), 106 acres during late spring early summer (May - July), and 241 acres during late summer and fall (August - November) (Speake *et al.* 1978). Adult male eastern indigo snakes have larger home ranges than adult females and juveniles; their home range may encompass as much as 553 acres in the summer (Moler 1985b; Speake 1993). By contrast, a gravid female may use from 4 to 106 acres (Smith 1987). These estimates are comparable to those found by Layne and Steiner (1996) in south central Florida, who determined adult male home ranges average about 183 acres, while adult females average about 42 acres.

Status and Distribution

As stated earlier, the eastern indigo snake was listed based on population decline caused by habitat loss, over-collection for the pet trade, and mortality from gassing gopher tortoise burrows to collect rattlesnakes (Speake and Mount 1973; Speake and McGlincy 1981). At the time of listing, the main factor in the decline of the eastern indigo snake was attributed to exploitation for the pet trade. As a result of effective law enforcement, the pressure from collectors has declined, but still remains a concern (Moler 1992).

The eastern indigo snake utilizes a majority of habitats available, but tends to prefer open, undeveloped areas (Kuntz 1977). Because of its relatively large home range, this snake is especially vulnerable to habitat loss, degradation, and fragmentation (Lawler 1977; Moler 1985b). Lawler (1977) noted that eastern indigo snake habitat had been destroyed by residential and commercial construction, agriculture, and timbering. He stated that the loss of natural habitat is increasing because of these threats in Florida and that indigo snake habitat is being lost at a rate of five percent per year. Low-density residential housing is also a potential threat to the species, increasing the likelihood that the snake will be killed by property owners and domestic pets. Extensive tracts of wild land are the most important refuge for large numbers of eastern indigo snakes (Diemer and Speake 1981; Moler 1985b).

Additional human population growth will increase the risk of direct mortality of the eastern indigo snake from property owners and domestic animals. Pesticides that bioaccumulate through the food chain may present a potential hazard to the snake as well pesticide use on crops or for forestry/silviculture would propose a pulse effect to the indigo snake (Speake 1993). Direct exposure to treated areas and secondary exposure by ingestion of contaminated prey could occur. Secondary exposure to rodenticides used to control black rats may also occur (Speake 1993).

The wide distribution and territory size requirements of the eastern indigo snake makes evaluation of status and trends very difficult. We believe that activities such as collecting and gassing have been largely abated through effective enforcement and protective laws. However, despite these apparent gains in indigo snake conservation, we believe that the threats described above are acting individually and collectively against the eastern indigo snake. Though we have no quantitative data with which to evaluate trends of the eastern indigo snake in Florida, we surmise that the population as a whole is declining because of continued habitat destruction and degradation. Natural communities continue to be altered for agriculture, residential, and commercial purposes, most of which are incompatible with the habitat needs of the eastern indigo snake (Kautz 1993). Habitat destruction and alteration is probably most substantial along the coasts, Keys, and high central ridges of southcentral Florida, where human population growth is expected to continue to accelerate. Agricultural interests (principally citrus) continue to destroy large expanses of suitable natural habitat in south Florida.

Even with continued habitat destruction and alterations, indigo snakes will probably persist in most localities where small, fragmented pieces of natural habitat remain. Tracts of appropriate habitat of a few hundred to several thousand acres may be sufficient to support a small number of snakes. Unfortunately, we believe that current and anticipated habitat fragmentation will

result in a large number of isolated, small groups of indigo snakes. Fragmented habitat patches probably cannot support a sufficient number of indigo snakes to ensure viable populations.

One of the primary reasons for listing of the species was the pressure on wild populations caused by over-collecting for the pet trade and commerce. Since the listing of the species, private collectors have engaged in a very active captive breeding program to fulfill the desires of individuals wanting specimens for personal pets. The Service controls the interstate commerce of the species via a permit program. The Service believes that this has significantly reduced the collection pressures on the species.

Analysis of the Species/Critical Habitat Likely to be Affected

The eastern indigo snake was listed in January 1978 as a threatened species primarily due to habitat loss and to over-collecting for the pet trade. The above analysis shows two items that are essential for recovery of this species: (1) acquire and/or manage habitat to maintain viable populations and (2) study their movement, food habitats, and population ecology.

ENVIRONMENTAL BASELINE

Action Area

The action area for this biological opinion is defined as all habitat within the boundaries of CCAFS.

Status of the Species in the Action Area

Florida scrub-jay: The Florida scrub-jay population on CCAFS was approximately 276 birds (99 groups of two or more birds and seven single birds) in 2003-2004. The number of jays decreased slightly (9 percent) from the previous year, and the current population is at its lowest point in the past ten years. The trend in population size over the last ten years has been downward, with an occasional increase in numbers within the ten-year study. The smaller population size was partly due to low reproductive success in 2002-2003, when breeding pairs fledged at a rate of 40 percent and 44 percent, respectively. Significant numbers of young were lost after they fledged (about 50 percent), likely due to predation. Adult survivorship was 74 percent between 2003 and 2004, which is about average for the eight years of study. Breeder survivorship was slightly higher than average (81 percent), and juvenile survivorship was above average (68 percent). Forty-seven percent of the 91 nesting groups produced young, yielding 73 juveniles by the end of the 2003-2004 breeding season (Stevens and Knight 2004).

The populations of scrub-jays occurring on CCAFS are a subset of the larger MINWR/KSC/CCAFS metapopulation. Based on the amount of existing and potentially restorable scrub habitat on the stations, CCAFS has responsibility for approximately one-third of the recovery of this metapopulation. The current INRMP for CCAFS has a goal of 300 breeding pairs of scrub-jays to be established; without continued management and restoration of overgrown scrub on the facility, this number will be impossible to reach.

As stated in the cumulative effects analysis provided by the representatives of the 45th Space Wing, CCAFS has approximately 5,175 acres of unoccupied scrub habitat within existing management compartments. Based upon 25 acres/breeding pair of scrub-jays, restoration of these areas could result in habitat for an additional 206 breeding pairs, bringing the total to 312 breeding pairs at CCAFS, if all available habitat could be managed for scrub-jays.

The restoration of Compartment 6 will occur as part of the proposed action, which is important to the recovery of the metapopulation, as restoration of this area will link the groups of scrub-jays found at CCAFS and KSC. Fire suppression over the years created an area of unsuitable habitat between CCAFS and KSC, and restoration of the scrub in Compartment 6 will provide habitat suitable for occupation between the two facilities. Accordingly, restoration of the habitat will allow mixing of the two existing populations, and lead to further expansion and growth of scrub-jays and their territories.

Southeastern beach mouse: The southeastern beach mouse is found along the entire reach of coastline on CCAFS in addition to the KSC and Cape Canaveral National Seashore. The known distribution is a result of cursory surveys and intermittent trapping involving different construction projects. There has not been a systematic trapping study done in order to determine the status throughout its range on these Federal lands. It is likely that this species is found within the action area.

Eastern indigo snake: The eastern indigo snake is likely to occur within the boundaries of the project site due to the presence of suitable habitat, although none have been seen. The eastern indigo snake standard protection measures will be used during the construction of the project.

Factors Affecting Species' Environment within the Action Area

This analysis describes factors affecting the environment for scrub-jays, southeastern beach mice, and eastern indigo snakes in the action area. There are no State, tribal, local, or private actions affecting the species or that will occur contemporaneously with this consultation. Federal actions have taken place within the action area that have impacted Florida scrub-jays, southeastern beach mice, and eastern indigo snakes. These projects sometimes resulted in incidental take anticipated through section 7 of the Act. The impacts associated with some of these projects resulted in the loss of occupied habitat or habitat suitable for occupation within the action area.

Prescribed burning and restoration of overgrown scrub for the benefit of the scrub-jay are not currently being conducted at a rate that will allow CCAFS to reach its goal of 300 breeding pairs of scrub-jays, as outlined in their INRMP, because existing facilities have placed restrictions on the timing of burns to protect valuable payloads from smoke impacts. While the Service continues to be concerned about the slow rate of restoration and continuous management of already restored habitat on CCAFS, we are working with CCAFS staff to resolve the issues involved in the delays. We are hopeful that we will come to satisfactory resolution of those issues.

The development of a 5-year study to compare mechanical clearing and burning to effectively manage scrub will lead to better management practices in lieu of delayed prescribed burns that have previously led to creation of unsuitable scrub-jay habitat. NRO will have state-of-the-art filtering systems on the EPF. Some flight hardware is extremely susceptible to contamination from byproducts of burning as well as additional safety risk to personnel, facility, and flight hardware due to explosives/propellant residing in facility. During those periods when such flight hardware is within the facility and cannot be protected through shutdown of HVAC or isolating outside makeup air, etc., prescribed burns cannot be conducted in the immediate vicinity of the EPF (i.e., within ½ mile) depending on forecasted conditions (i.e., wind direction, speed, delta T, etc.) at the time of the burn. If no flight hardware/explosives/propellants exist within the facility, there will be no restrictions on prescribed burns. The scrub and the scrub-jay population within the vicinity of the EPF will be assessed annually. If the EPF facility prevents prescribed burn treatments from occurring and the scrub becomes unsuitable habitat and directly affects the scrub-jays utilizing this area, the NRO will have two years in which to schedule work to allow for prescribed burning by CCAFS within the vicinity of the EPF building. The NRO will be active members of the CCAFS burn working group and will make every effort to meet the burn program objectives within mission requirements.

EFFECTS OF THE ACTION

This section includes an analysis of the direct and indirect effects of the proposed action on the species and its interrelated and interdependent activities. To determine whether the proposed action is likely to jeopardize the continued existence of threatened or endangered species in the action area, we focus on consequences of the proposed action that affect rates of birth, death, immigration, and emigration because the probability of extinction in plant and animal populations is most sensitive to changes in these rates.

Factors To Be Considered

The effects of the proposed project of the Florida scrub-jay, southeastern beach mouse, and eastern indigo snake may occur as direct and indirect effects.

Direct Effects

The installation of the EPF may result in the direct "take" of Florida scrub-jays, eastern indigo snakes, and southeastern beach mice as a result of permanent loss of 7 acres of scrub habitat. The probability and level of incidental take is dependent upon the number of Florida scrub-jays, southeastern beach mice, and eastern indigo snakes within the region; their ability to disperse; and the amount and distribution of available suitable habitat. It is possible that as construction proceeds, they will move away from the construction site; however, the Service anticipates that "take" will occur.

The proposed activity will result in the direct permanent loss of 7 acres of scrub habitat occupied by 2 groups of Florida scrub-jays, southeastern beach mice and eastern indigo snakes. The proposed project will impact a portion of each Florida scrub-jay family's territory as these

families of scrub-jays do occupy areas adjacent to this site. Impacts to the species will be minimized by restoring Compartment 6 and developing a 5-year study that will improve management of scrub-jay habitat at CCAFS. Another significant threat to scrub-jay recovery at CCAFS is fire suppression and/or lack of management in scrub habitat. Impacts to the species will be minimized by conducting a 5-year study to determine the best land management techniques at CCAFS to aid in the recovery of the Florida scrub-jay metapopulation.

The proposed project will permanently impact existing southeastern beach mouse burrows and habitat found within the project area. It is possible that as construction proceeds, they will move away from the construction site; however, the Service anticipates that "take" will occur. Similar direct effects are expected for any eastern indigo snakes occurring within the project site.

Indirect Effects

Indirect effects are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. Indirect effects may occur outside of the area directly affected by the action. Indirect effects may include other Federal actions that have not undergone section 7 consultations, but will result from the action under consideration. The indirect effects will occur in two ways: (1) operation of the EPF will add traffic along roadways adjacent to occupied habitat, possibly resulting in scrub-jays and snakes being struck by vehicles or (2) clearing associated with the EPF will isolate groups of scrub-jays from other groups and interrupt dispersal corridors between metapopulations.

Dreschel *et al.* (1990), Fitzpatrick *et al.* (1991), and Mumme *et al.* (2000) provide the best scientific and commercial data on the likelihood of incidental take as the result of scrub-jays being killed by the vehicles. The only scientific documentation of road-kill mortality in Florida scrub-jays are from jays living in a territory immediately adjacent to a road, not from dispersing some unknown distance across a road to a new territory.

The proposed project will result in habitat destruction, which reduces the amount of area scrub-jays can occupy, but also increases fragmentation of habitat. As more scrub habitat is altered, the habitat is cut into smaller and smaller pieces, separated from other patches by larger distances; such fragmentation increases the probability of genetic isolation, which is likely to increase extinction probability (Fitzpatrick *et al.* 1991; Woolfenden and Fitzpatrick 1991; Snodgrass *et al.* 1993; Stith *et al.* 1996; Thaxton and Hingtgen 1996). Dispersal distances of scrub-jays in fragmented habitat are further than in optimal unfragmented habitats (Thaxton and Hingtgen 1996; Breininger 1999).

Indirect effects will result from continued loss of foraging habitat for the southeastern beach mouse.

The eastern indigo snake has a high probability of being impacted by increased traffic on the roads. Since a portion of their suitable habitat will be impacted by the proposed development, the snakes may have to go elsewhere and cause them to cross busy roads which could result in road-kill mortality.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

CONCLUSION

After reviewing the current status of the Florida scrub-jay, southeastern beach mouse, and the eastern indigo snake, the environmental baseline for the action area, the effects of the proposed EPF and the cumulative effects, it is the Service's biological opinion that the EPF, as proposed, is not likely to jeopardize the continued existence of the Florida scrub-jay, the southeastern beach mouse, and the eastern indigo snake. No critical habitat has been designated for the three species; therefore, none will be affected.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation under section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be implemented by the agency so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, in order for the exemption in section 7(o)(2) to apply.

The Federal agency has a continuing responsibility to regulate the activity that is covered by this incidental take statement. If the agency (1) fails to assume and implement the terms and conditions or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the agency must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement. (50 CFR 402.14(I) (3))

Sections 7(b) (4) and 7(o) (2) of the Act do not apply to the incidental take of listed plant species. However, protection of listed plants is provided to the extent that the Act requires a Federal permit for removal or reduction to possession of endangered plants from areas under Federal jurisdiction, or for any act that would remove, cut, dig up, or damage or destroy any such species on any State or in the course of any violation of a State criminal trespass law.

AMOUNT OR EXTENT OF TAKE ANTICIPATED

The Service has reviewed the biological information for this species, information presented by the applicant's consultant, and other available information relevant to this action, and based on our review; incidental take in the form of harm or harassment is anticipated for two (2) Florida scrub-jay groups.

The Service expects the level of incidental take of southeastern beach mice and eastern indigo snakes will be difficult to determine for the following reasons: eastern indigo snakes are wide-ranging and elusive; southeastern beach mice are elusive because of their burrowing habits; finding a dead or impaired specimen is unlikely; losses may be masked by predators removing dead or injured animals. The Service has reviewed the biological information for these species, information provided by representatives of the 45th Space Wing, and has determined that incidental take in the form of harm or harassment is anticipated for all the southeastern beach mice and eastern indigo snakes utilizing the 7-acre area.

If during the course of this action, the project description changes, this would represent new information requiring review of the reasonable and prudent measures provided. The Federal agency must immediately provide modification of the reasonable and prudent measures.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and minimize impacts of incidental take of Florida scrub-jays, southeastern beach mice, and eastern indigo snakes:

Florida scrub-jay

1. Avoid construction during the nesting season from March 1 through June 30 to the maximum extent practicable.
2. Notify the Service of any unauthorized take of Florida scrub-jays identified during the construction of the proposed facility.
3. Restore and manage 166 acres of scrub habitat within Compartment 6 by using prescribed burning and mechanical means.

4. Conduct a research study in Compartments 97 & 101 on the effectiveness of mechanical clearing and burning as techniques that most effectively manage scrub on the CCAFS. The Service must approve the study design prior to the study being carried out.

Southeastern beach mouse

1. Notify the Service of any unauthorized take of southeastern beach mice identified during the construction activity.

Eastern indigo snake

1. Minimize impacts to eastern indigo snakes from heavy equipment by implementing the standard protection measures.
2. Only individuals with permits should attempt to capture the eastern indigo snakes.
3. If an eastern indigo snake is held in captivity, it should be released as soon as possible in release sites approved by the Service on the CCAFS.
4. Notify the Service of any unauthorized take of eastern indigo snakes identified during the construction of the proposed facility.

TERMS AND CONDITIONS

To implement the above reasonable and prudent measures, the Service has outlined the following terms and conditions for incidental take. In accordance with the Interagency Cooperation Regulation (50 CFR 402), these terms and conditions must be complied with to implement the reasonable and prudent measures for incidental take:

Florida scrub-jay

1. If clearing of habitat occupied by Florida scrub-jays is to occur within the species' nesting season (typically March 1 through June 30), that area should be surveyed prior to clearing to determine if there are any active scrub-jay nests located within the vegetation. If an active scrub-jay nest is located, to the maximum extent practicable, clearing activities cannot take place within 150 feet of the nest site until nestlings have fledged or until it has been determined that the nest has failed.
2. Unauthorized take of scrub-jays associated with the proposed activity should be reported immediately by calling the Jacksonville Field Office of the U.S. Fish and Wildlife Service in Jacksonville at 904-232-2580. If a dead Florida scrub-jay is found on the project site, the specimen should be thoroughly soaked in water and frozen for later analysis of cause of death or injury.
3. NRO will provide funding to the 45th Space Wing to clear 166 acres of compartment 6 for scrub jay habitat within one year of beginning construction of the EPF facility. A prescribed burn of this compartment will follow as soon as it is deemed ready for burning.

4. NRO will provide funding for a 5-year study within one year of beginning construction of the EPF facility. The study goals will be to determine the effectiveness of different land management practices as a temporary management tool when prescribed burning has not occurred on the Florida scrub-jay habitat. The results of this study will be used, in part, to develop a sound management plan for scrub restoration and maintenance when there has been a delay in the prescribed burn treatments on the CCAFS and further allow CCAFS to meet their goal of 300 groups as stated in the INRMP.

Southeastern beach mouse

1. If a dead southeastern beach mouse is found on the project site, the specimen should be thoroughly soaked in water and frozen, and the applicant should notify the Jacksonville Field Office immediately at (904) 232-2580. Care should be taken in handling sick or injured individuals and in the preservation of specimens in the best possible state for later analysis of cause of death or injury.

Eastern indigo snake

1. An eastern indigo snake protection/education plan shall be developed by the 45th Space Wing for all construction personnel to follow. The plan shall be provided to the Service for review and approval at least 30 days prior to any clearing activities. The educational materials for the plan may consist of a combination of posters, videos, pamphlets, and lectures (*e.g.*, an observer trained to identify eastern indigo snakes could use the protection/education plan to instruct construction personnel before any clearing activities occur). Informational signs should be posted throughout the construction site and contain the following information:
 - a. A description of the eastern indigo snake, its habits, and protection under Federal Law;
 - b. Instructions not to injure, harm, harass or kill this species;
 - c. Directions to cease clearing activities and allow the eastern indigo snake sufficient time to move away from the site on its own before resuming clearing; and,
 - d. Telephone numbers of pertinent agencies to be contacted if a dead eastern indigo snake is encountered. The dead specimen should be thoroughly soaked in water, and then frozen.
2. Only an individual who has been either authorized by a section 10(a)(1)(A) permit issued by the Service, or authorized by the Florida Fish and Wildlife Conservation Commission for such activities, is permitted to come in contact with or relocate an eastern indigo snake.
3. If necessary, eastern indigo snakes shall be held in captivity only long enough to transport them to a release site; at no time shall two snakes be kept in the same container during transportation.

4. An eastern indigo snake monitoring report must be submitted to the Jacksonville Field Office within 60 days of the conclusion of clearing activity. The report should be submitted when any eastern indigo snakes are observed or relocated. The report should contain the following information:
 - a. Any sightings of eastern indigo snakes;
 - b. Summaries of any relocated snakes if relocation was approved for the project (e.g., locations of where and when they were found and relocated);
 - c. Other obligations required by the Florida Fish and Wildlife Conservation Commission, as stipulated in the permit.
5. If a dead eastern indigo snake is found on the project site, the specimen should be thoroughly soaked in water and frozen, and the applicant should notify the Jacksonville Field Office immediately at (904) 232-2580. Care should be taken in handling sick or injured individuals and in the preservation of specimens in the best possible state for later analysis of cause of death or injury.

These reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. The Service believes that no more than two groups of Florida scrub-jays, and all the southeastern beach mice, and all eastern indigo snakes utilizing the 7-acre area will be incidentally taken. If, during the course of the action, this level of incidental take is exceeded (e.g., burning restrictions placed on scrub habitat adjacent to the new NRO Processing Facility which results from payloads in the facility), such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Federal agency must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

Section 7(a) (1) of the Act directs Federal agencies to use their authority to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help carry out recovery plans, or to develop information.

1. Incorporate the southeastern beach mouse and eastern indigo snake in the 5-year study of scrub management techniques in Compartment 93.
2. Leave and use native scrub vegetation in landscaping around the retention areas and the right-of-way to provide scrub habitat for the scrub-jays utilizing the site.
3. Signs should be placed on the fences that explain to the occupants the importance of the onsite and adjacent scrub areas for the listed species.
4. In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation measures.

REINITIATION NOTICE

This concludes formal consultation on the action outlined in the request. As provided in 50 CFR Section 402.16, reinitiation of formal consultation is required when discretionary Federal agency involvement or control over the action has been retained and if: (1) the amount or extent of incidental take is exceeded (specifically if adjacent scrub habitat is fire suppressed due to the new NRO EPF); (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this biological opinion; (3) the Air Force's action is later modified in a manner that causes an effect to the listed species or critical habitat not considered in this biological opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

For this biological opinion, the incidental take would be exceeded when the take exceeds two (2) groups of Florida scrub-jays, and all the southeastern beach mice and eastern indigo snakes utilizing the 7 acres of scrub, which is what has been exempted from the prohibitions of section 9 by this opinion. The Service appreciates the cooperation of the Air Force during this consultation. We would like to continue working with you and your staff regarding the NRO EPF project. For further coordination please contact Ann Marie Maharaj at (904) 232-2580 ext. 111 of this office.

Sincerely,



for David L. Hankla
Field Supervisor

cc: Joe Johnston
Atlanta RO, FWS

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APPENDIX F

Potential Future Projects Considered for Cumulative Impact Analysis

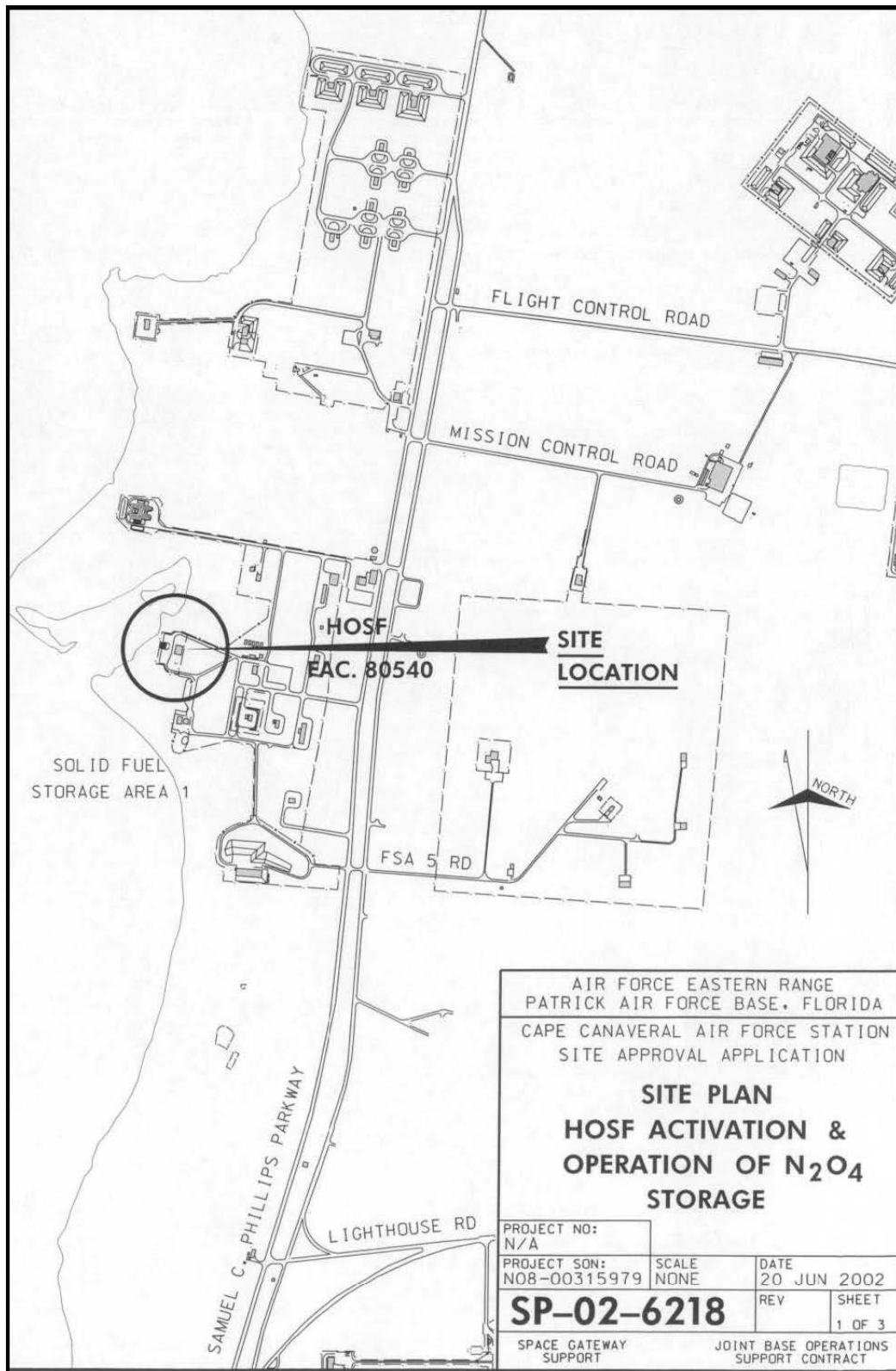


Figure F-1. General location of proposed hypergolic oxidizer storage facility.

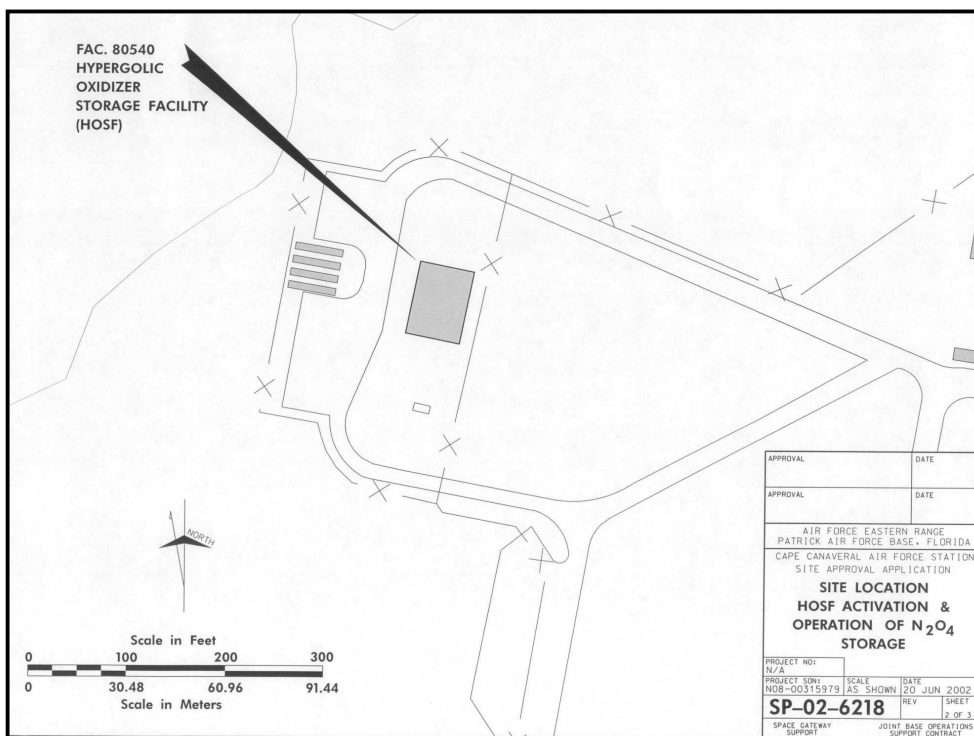


Figure F-2. Site for proposed hypergolic oxidizer storage facility.

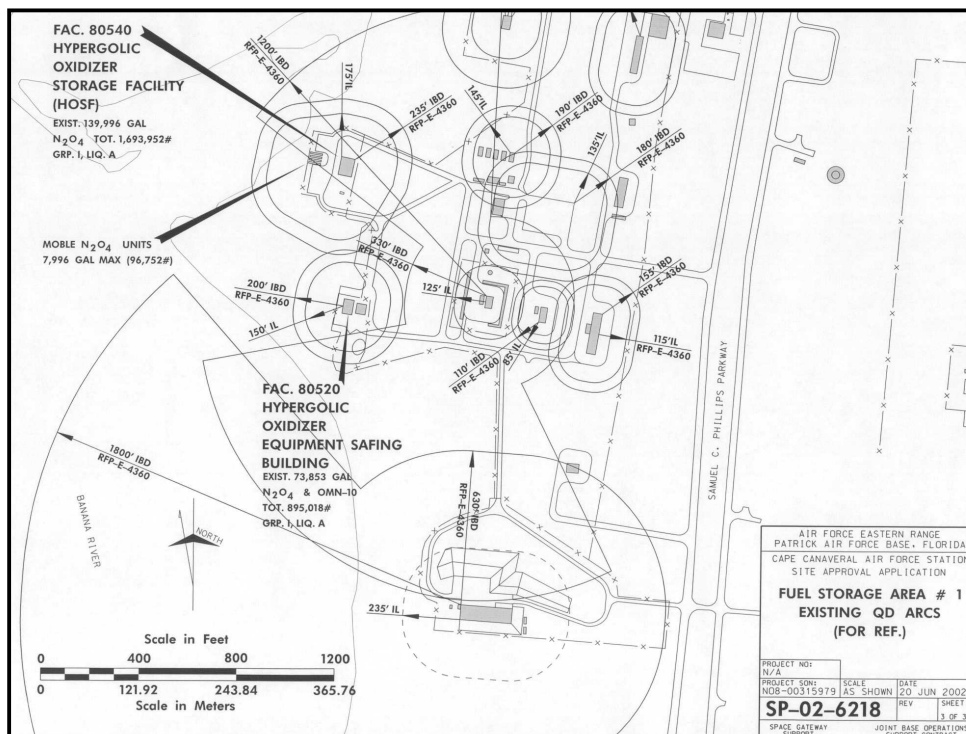


Figure F-3. Proposed layout of Fuel Storage Area 1.

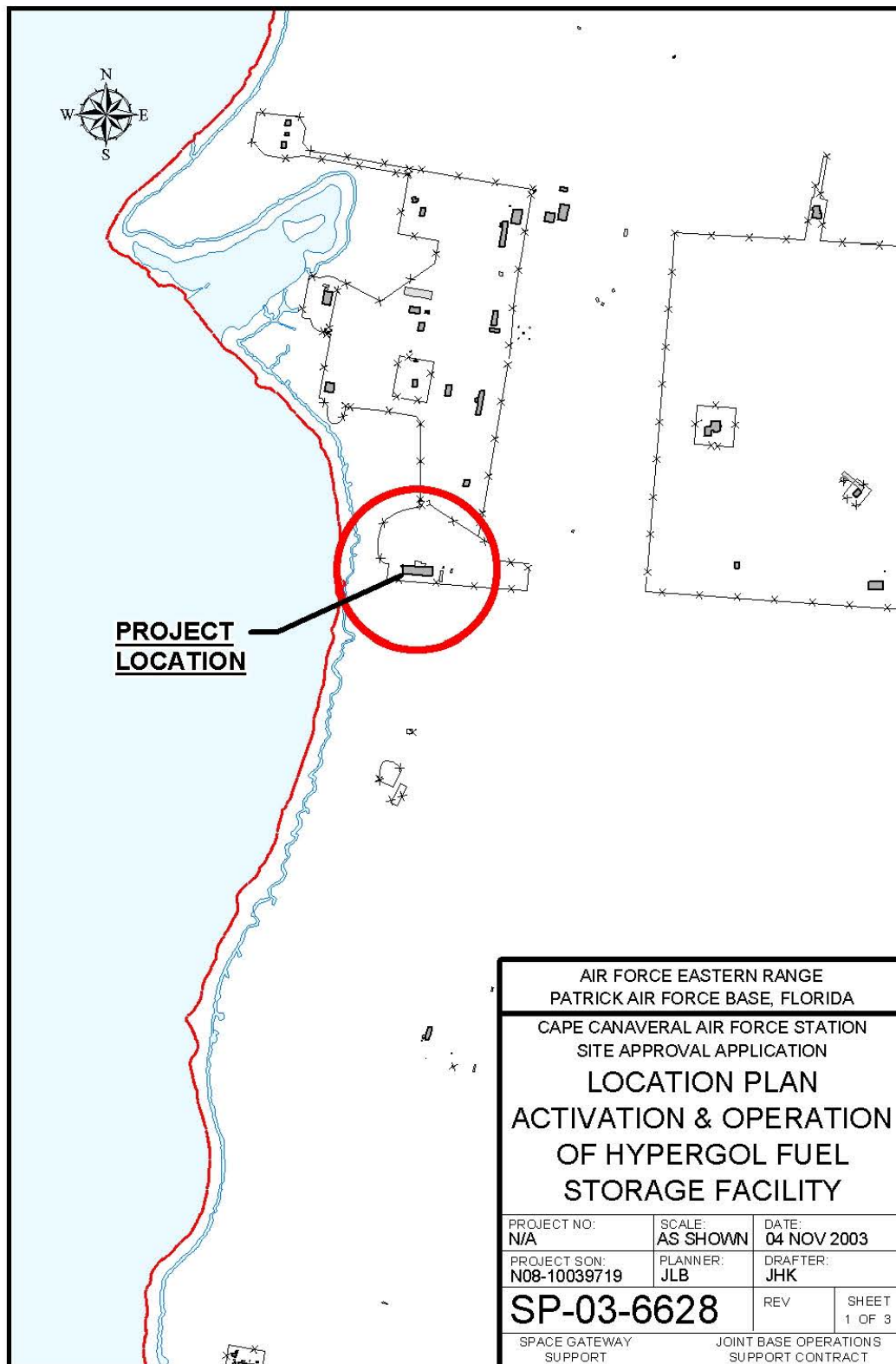


Figure F-4. General location of proposed hypergol fuel storage area.

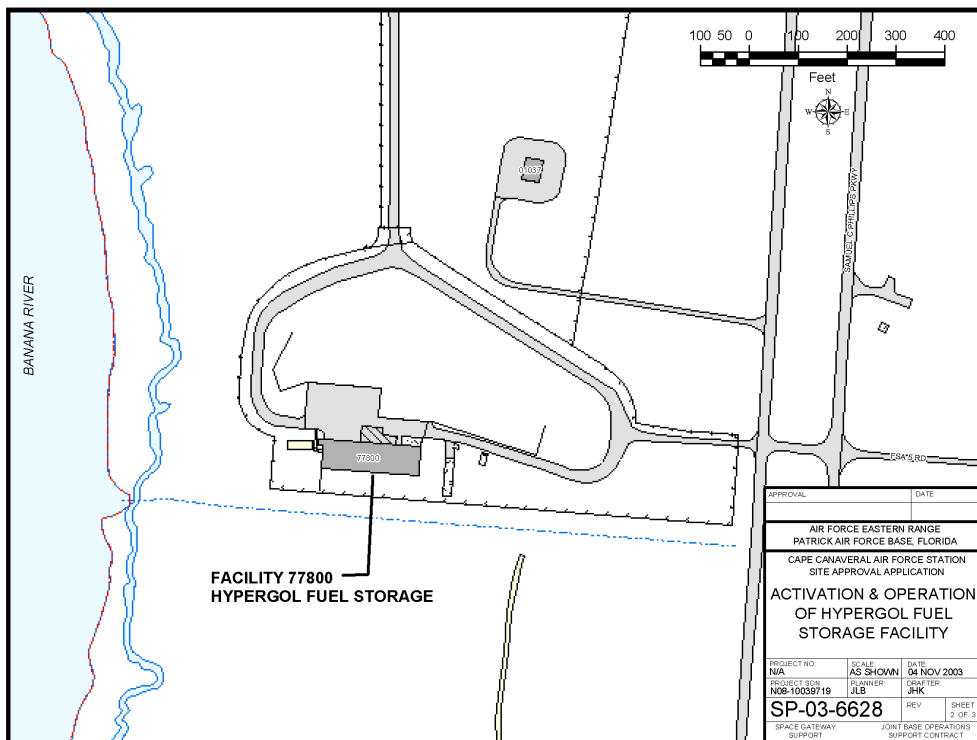


Figure F-5. Site for proposed hypergol fuel storage facility.

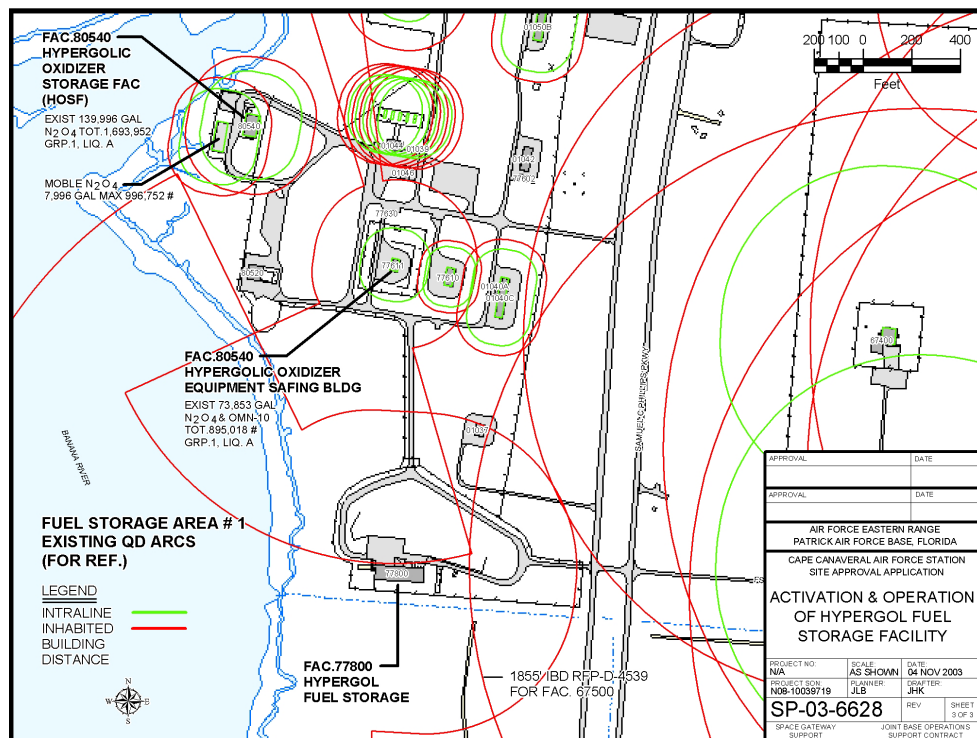


Figure F-6. Proposed layout of Fuel Storage Area 1.

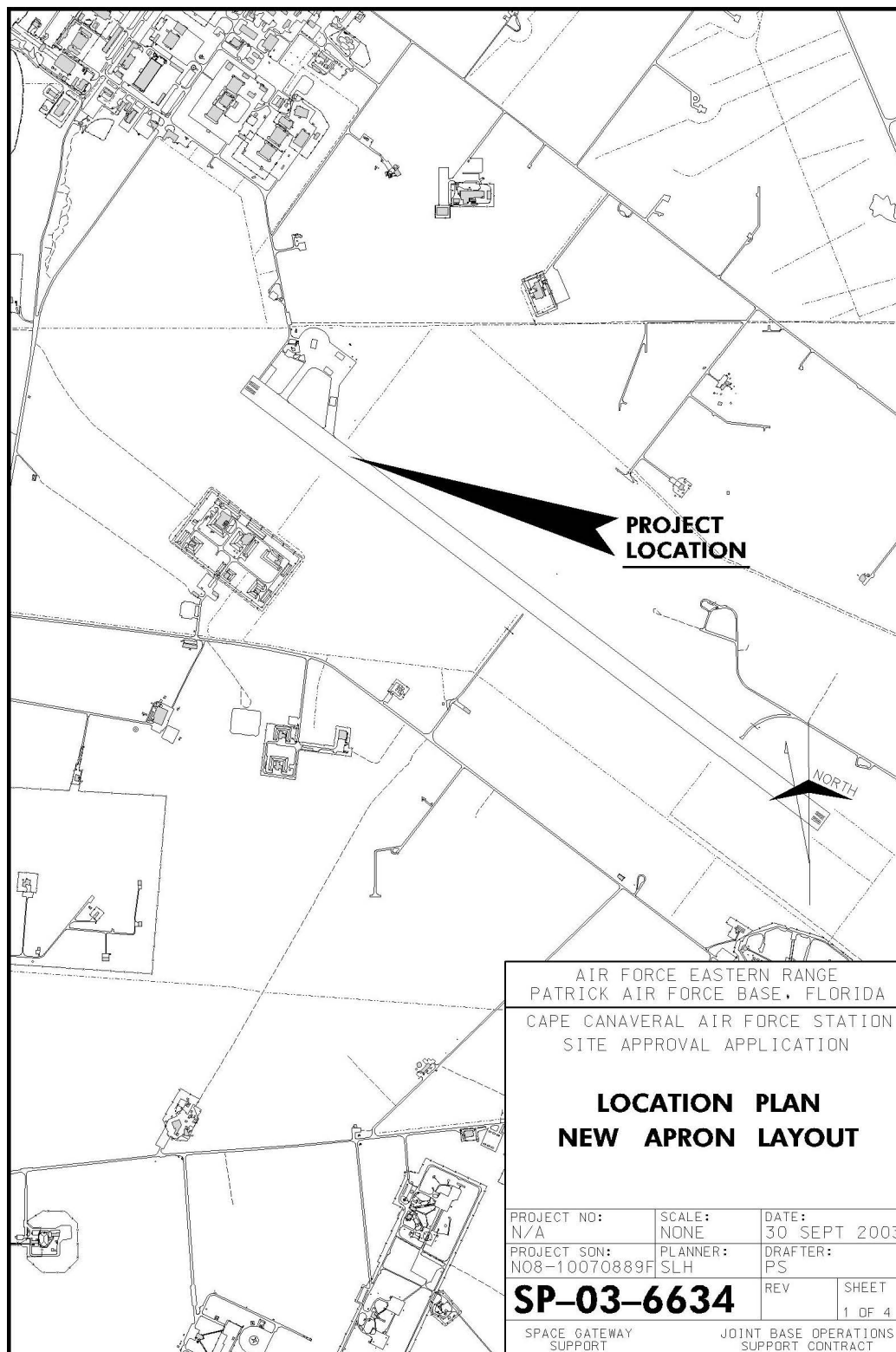


Figure F-7. General location of proposed new facilities at the Skid Strip.

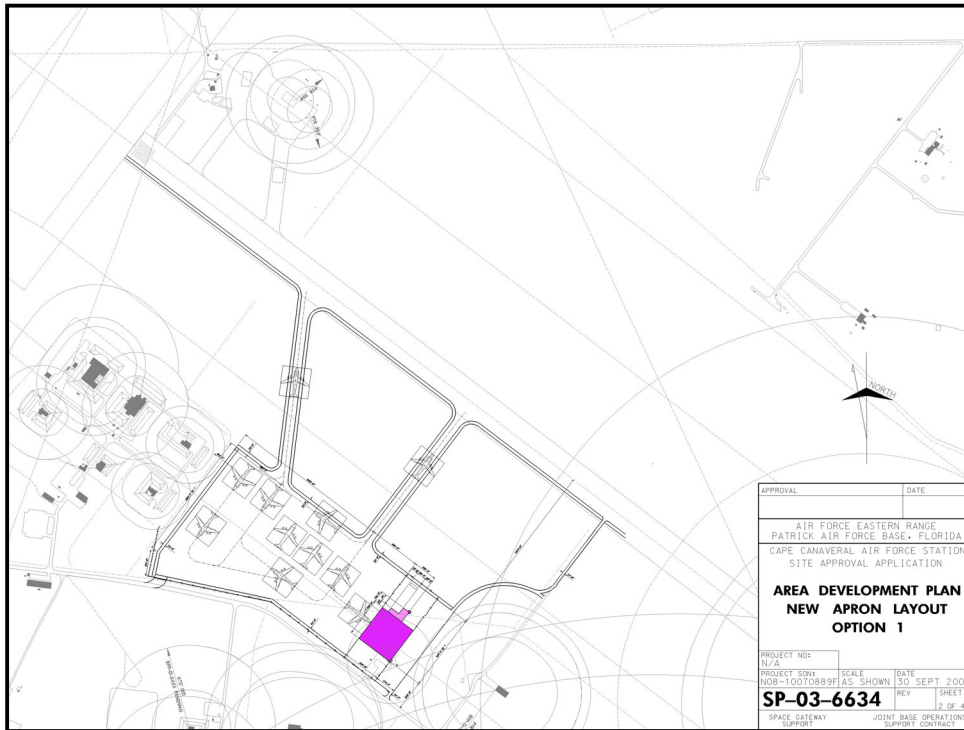


Figure F-8. Site of proposed new facilities south of the Skid Strip (Option 1).

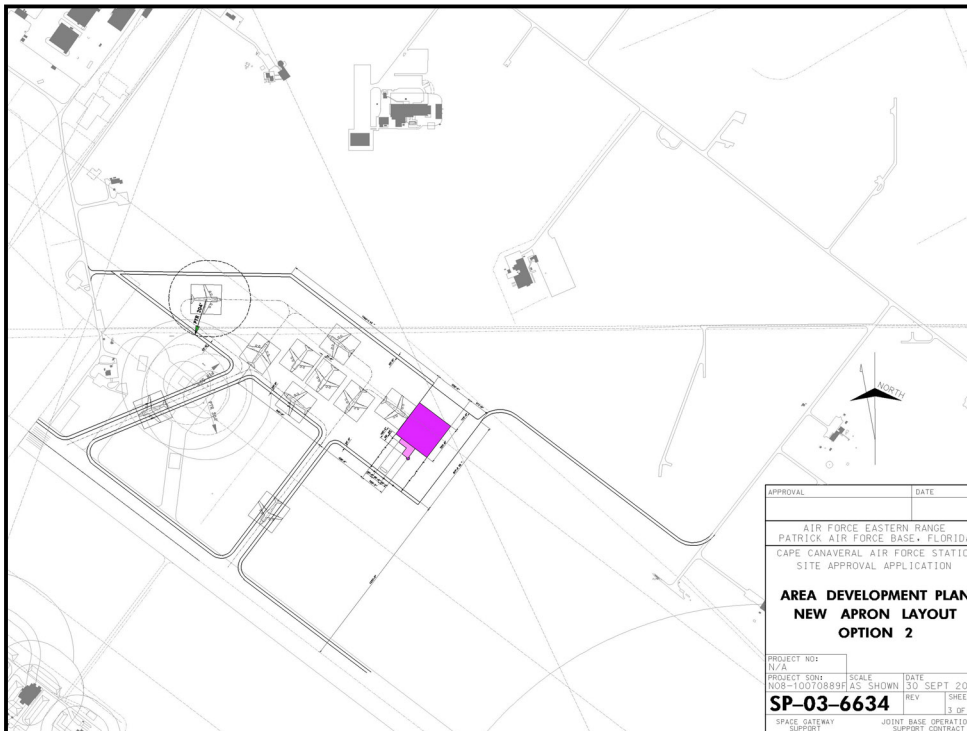


Figure F-9. Site of proposed new facilities north of the Skid Strip (Option 2).

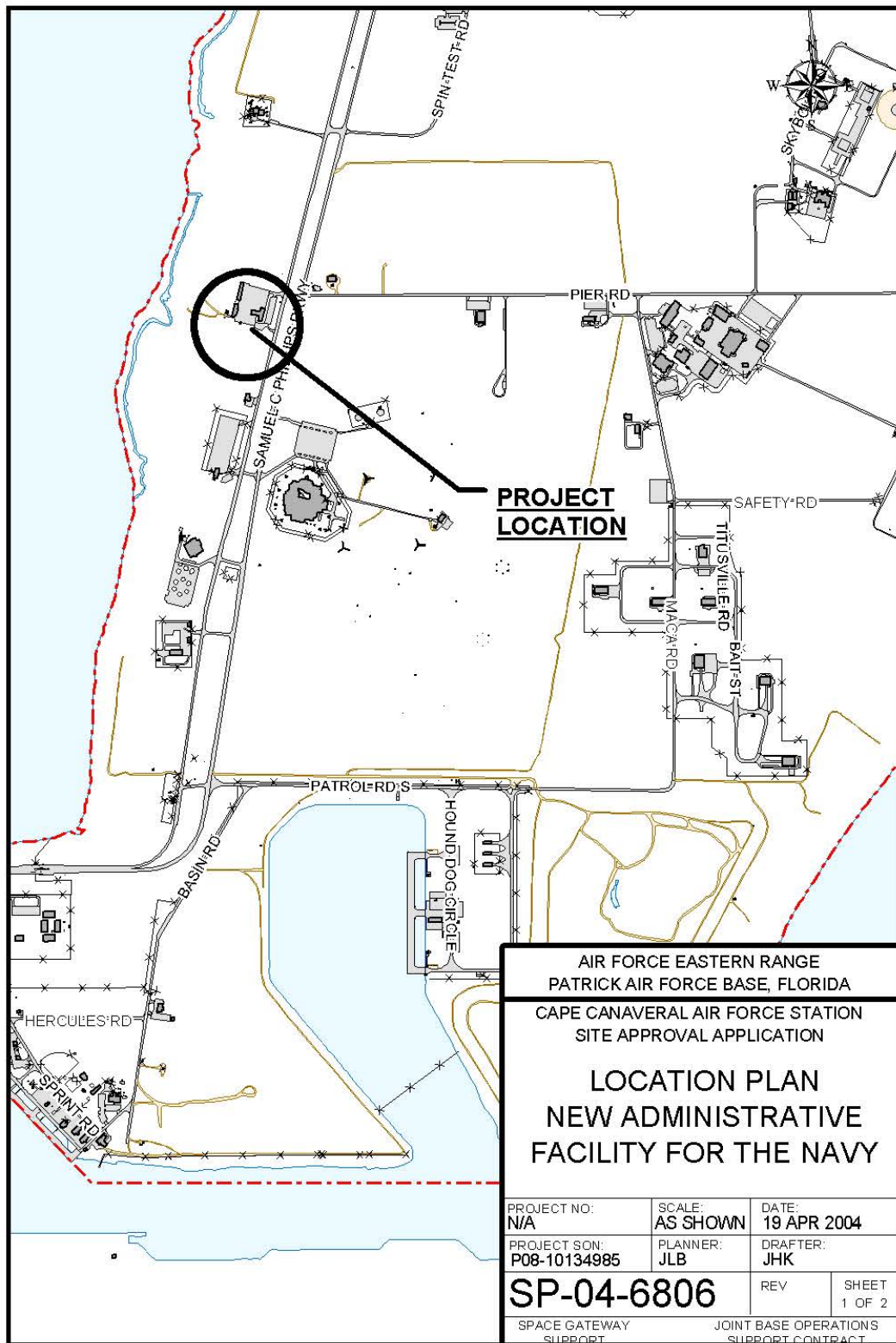


Figure F-10. General location of proposed Navy Administration Facility.

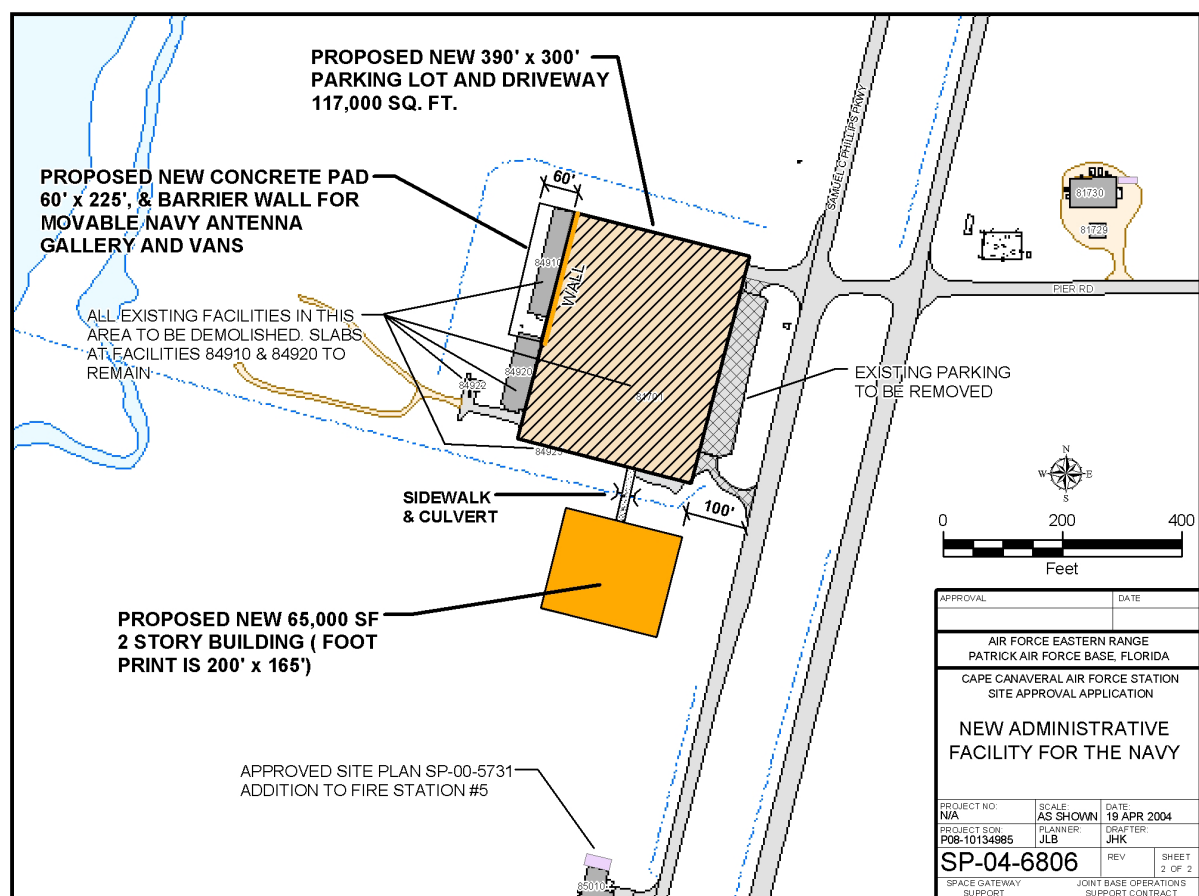


Figure F-11. Site of proposed Navy Administration Facility.



Jeb Bush
Governor

Department of Environmental Protection

Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000

Colleen M. Castille
Secretary

May 5, 2005

Ms. Angy L. Chambers
Department of the Air Force
45 CES/CEV
1224 Jupiter Street, MS 9125
Patrick AFB, FL 32925-3343

RE: Department of the Air Force – Final Draft Environmental Assessment, New NRO
Eastern Processing Facility at Cape Canaveral Air Force Station – Cape
Canaveral, Brevard County, Florida.

SAI # FL200503090546C

Dear Ms. Chambers:

The Florida State Clearinghouse, pursuant to Presidential Executive Order 12372, Gubernatorial Executive Order 95-359, the Coastal Zone Management Act, 16 U.S.C. §§ 1451-1464, as amended, and the National Environmental Policy Act, 42 U.S.C. §§ 4321, 4331-4335, 4341-4347, as amended, has coordinated a review of the referenced final draft environmental assessment (FDEA).

The St. Johns River Water Management District (SJRWMD) states that an Environmental Resource Permit (ERP) will be required prior to development of this site. It notes that wetlands are likely present within the swale areas of the interdunal/swale ecosystem. The location and extent of wetlands and other surface waters will need to be identified during the design phase of the project. Every effort will need to be made to avoid and or minimize impacts to these resources. Unavoidable direct and secondary impacts will require mitigation in accordance with the Unified Mitigation Assessment Method found in Chapter 62-345, *Florida Administrative Code* (F.A.C.). The SJRWMD notes that compliance with the environmental review criteria in Chapter 12 of the Applicant's Handbook will also be required. Please contact Michelle Reiber, Supervising Regulatory Scientist, in the Palm Bay service center at (321) 676-6615 or mreiber@sjrwmd.com with any questions.

The Department of State (DOS) notes that a Phase I cultural resource survey will need to be performed on the preferred project location (Alternative 1). The survey report, which must conform to the specifications set forth in Chapter 1A-46, F.A.C., will need to be forwarded to the DOS for review to determine if the proposed project will impact historic properties.

"More Protection, Less Process"

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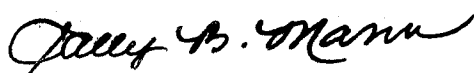
Ms. Angy L. Chambers
May 5, 2005
Page 2 of 2

Department (DEP) staff notes that the facility will discharge to a DEP permitted wastewater treatment plant. It advises that a revision or a new permit will be required if the option of onsite groundwater discharge is desired. For further information please contact Mr. Ali Kazi, in the DEP Central District Office in Orlando, at (407) 893-3316.

Based on the information contained in the FDEA and the enclosed comments provided by our reviewing agencies, the state has determined that, at this stage, the proposed activity is consistent with the Florida Coastal Management Program (FCMP). The applicant must, however, address the concerns identified the reviewing agencies prior to project implementation. All subsequent environmental documents must be reviewed to determine the project's continued consistency with the FCMP. The state's continued concurrence with the project will be based, in part, on the adequate resolution of issues identified during this and subsequent reviews. The state's final concurrence of the project's consistency with the FCMP will be determined during the environmental permitting stage.

Thank you for the opportunity to review this project. If you have any questions regarding this letter, please contact Ms. Suzanne E. Ray at (850) 245-2172.

Sincerely,



Sally B. Mann, Director
Office of Intergovernmental Programs

SBM/ser

Enclosures

cc: Barbara Bess, DEP, Central District
Geoffrey Sample, SJRWMD
Scott Edwards, DOS



Florida

Department of Environmental Protection

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Project Information

Project: FL200503090546C

Comments Due: 04/08/2005

Letter Due: 05/08/2005

Description: DEPARTMENT OF THE AIR FORCE - FINAL DRAFT ENVIRONMENTAL ASSESSMENT, NEW NRO EASTERN PROCESSING FACILITY AT CAPE CANAVERAL AIR FORCE STATION - CAPE CANAVERAL, BREVARD COUNTY, FLORIDA.

Keywords: USAF - NEW NRO EASTERN PROCESSING FACILITY - CAPE CANAVERAL, BREVARD CO.

CFDA #: 12.200

Agency Comments:

E. CENTRAL FL RPC - EAST CENTRAL FLORIDA REGIONAL PLANNING COUNCIL

The proposed project, as presented for review and when considered in its entirety, is consistent with the adopted Goals, Policies and Objectives of the East Central Florida Regional Planning Council.

BREVARD -

No Comment

FISH and WILDLIFE COMMISSION - FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION

No comment by Steve Lau 4-27-05

STATE - FLORIDA DEPARTMENT OF STATE

The DOS notes that the preferred project location (Alternative 1) will have a Phase I cultural resource survey performed. The resultant survey report shall conform to the specifications set forth in Chapter 1A-46, Florida Administrative Code, and will need to be forwarded to the DOS in order to complete the process of reviewing the impact of this proposed project on historic properties.

TRANSPORTATION - FLORIDA DEPARTMENT OF TRANSPORTATION

No Comment

ENVIRONMENTAL PROTECTION - FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Department (DEP) staff notes that the facility will discharge to a DEP permitted wastewater treatment plant. It advises that a revision or a new permit will be required if the option of onsite groundwater discharge is desired. For further information please contact Mr. Ali Kazi, in the DEP Central District Office in Orlando, at (407) 893-3316.

ST. JOHNS RIVER WMD - ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

An Environmental Resource Permit will be required prior to development of this site. Although there is little discussion about potential wetlands on the project site, it is likely that wetlands are present within the *čzwaleč* areas of the interdunal/swale ecosystem. The location and extent of wetlands and other surface waters will need to be identified during the design phase of the project and every effort should be made to avoid and or minimize impacts to these resources. Unavoidable direct and secondary impacts would require mitigation in accordance with the Unified Mitigation Assessment Method found in Chapter 62-345, F.A.C. Compliance with the environmental review criteria in Chapter 12 of the Applicant's Handbook would also be required. Please contact Michelle Reiber, Supervising Regulatory Scientist, in the Palm Bay service center at (321) 676-6615 or mreiber@sjrwm.com if there are any questions.

For more information please contact the Clearinghouse Office at:

3900 COMMONWEALTH BOULEVARD MS-47
TALLAHASSEE, FLORIDA 32399-3000
TELEPHONE: (850) 245-2161
FAX: (850) 245-2190

Visit the [Clearinghouse Home Page](#) to query other projects.