APPENDIX C

BIOLOGICAL ASSESSMENT AND THE BIOLOGICAL OPINION FOR THE INTERNATIONAL SPACE RESEARCH PARK AT THE JOHN F. KENNEDY SPACE CENTER, FLORIDA

BIOLOGICAL ASSESSMENT
FOR THE
INTERNATIONAL SPACE RESEARCH PARK
AT THE
JOHN F. KENNEDY SPACE CENTER, FLORIDA

Prepared for:

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1.0 Introduction

Section 7 of the Endangered Species Act of 1973, as amended (ESA), requires any federal agency whose actions may affect listed plant or wildlife species or designated or proposed critical habitat to assess the effects on those species or habitat in consultation with the U.S. Fish and Wildlife Service (USFWS) (16 USC §1536 (c)). This evaluation is documented in the form of a Biological Assessment (BA). Listed species evaluated under a BA are any wildlife or plant species determined to be endangered or threatened or proposed for listing under Section 4 of the ESA (50 CFR 402.02) and as set forth in 50 CFR 17.11-17.12. Critical habitat refers to areas determined in accordance with Section 4 of the ESA to be essential to the conservation of the species (50 CFR 402.02). Critical habitat areas are listed in 50 CFR parts 17 or 226.

The purpose of this BA is to evaluate possible effects of proposed action, development of the International Space Research Park™ at the John F. Kennedy Space Center, on listed species potentially occurring on two alternative development sites and to determine whether the proposed action is “likely to adversely affect” these species (50 CFR 402.12). An additional purpose of this BA is to determine if formal consultation with the USFWS is necessary on this proposed Federal action.

2.0 Description of Proposed Action

The National Aeronautics and Space Administration’s (NASA) John F. Kennedy Space Center (KSC) has entered into an agreement with the State of Florida’s Florida Space Authority (FSA) to study the development of an International Space Research Park™ (ISRP) on up to 160 ha (400 ac) of land on KSC as a Research and Development (R&D) facility. KSC, which is located in Brevard County on the east coast of Florida (Figure 1), is a major locus within NASA for the Shuttle and International Space Station (ISS) activities and is adjacent to Cape Canaveral Air Force Station (CCAFS) from which many NASA missions are launched.

The FSA has already been given approval to develop on tract of property on KSC; some 16 ha (40 ac) for the Space Experiments Research and Processing Laboratory (SERPL). The SERPL is primarily designed to handle the high volume of ISS experiments expected to cycle through KSC over the next several decades. Completion of SERPL is anticipated in August 2003. The State of Florida and NASA propose to augment SERPL by developing the ISRP on an additional 140 ha (345± ac) of property in phases during the next 20 to 25 years. The purpose of the ISRP is to provide a location and environment closely associated with the launch and processing infrastructure of KSC and CCAFS to attract and foster research, technology development, education, and associated commercial activities that will benefit both the public and private space sectors. Privately-financed and operated capabilities in the ISRP can both enable NASA to better achieve its mission at lower cost to the taxpayers while enabling the growth of commercial use of space and application of space-related technologies.

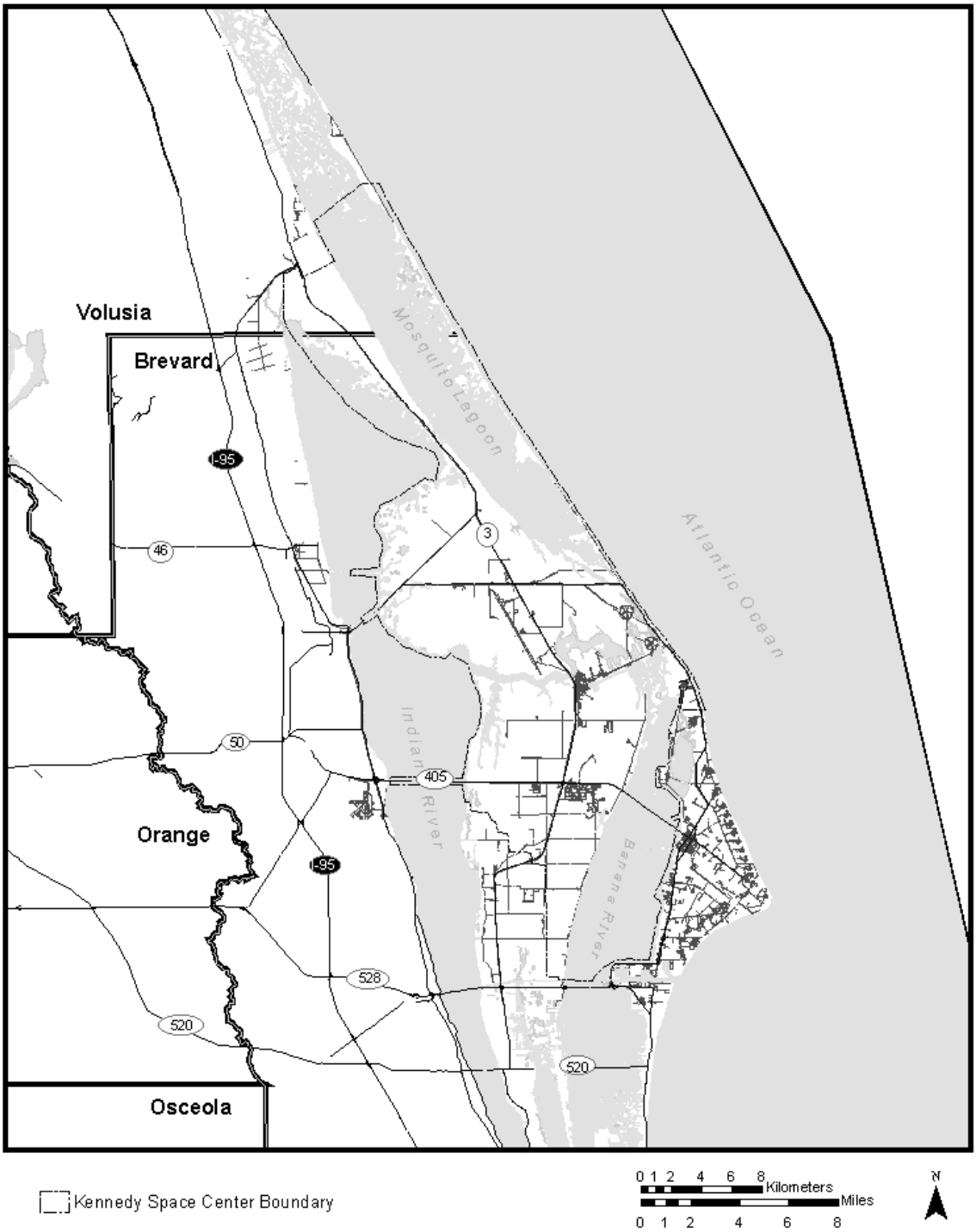

Figure 1. Regional Area of Interest on John F. Kennedy Space Center, Florida.

3.0 ISRP Alternative Sites - Proposed Land Use Plan Descriptions

Development of the ISRP is proposed on one of two alternative sites located on KSC in proximity to the SERPL. Each alternative site includes a large main parcel comprising approximately 130 ha (320 ac) and an auxiliary parcel, the SERPL Expansion parcel. The SERPL Expansion parcel is a 10 ha (24 ac) parcel adjoining the western boundary of the existing SERPL site. Figure 2 provides the location of the ISRP alternative sites, Alternative 1 and Alternative 2, each inclusive of the SERPL Expansion parcel.

NASA and FSA considered several primary site development and implementation criteria in the selection of the ISRP alternative site locations. These criteria include: 1.) avoidance and minimization of direct and cumulative environmental impacts, 2.) clear 24-hr. public access, and 3.) integration into the transportation and other infrastructure provisions of KSC. Both ISRP alternative site locations are readily accessed from Kennedy Parkway South (State Road 3), the major north-south transportation arterial that allows public ingress and egress through KSC into Merritt Island and Titusville. Kennedy Parkway South is a divided, four-lane highway. The current construction of the Space Commerce Way, planned as a four-lane road at the time of complete build-out, will serve to provide 24-hr public access to both alternative site locations via Kennedy Parkway South or NASA Parkway West (State Road 405), a limited access, divided four-lane road. Application of these criteria, in conjunction with the findings of this BA, have resulted in NASA's determination that Alternative 1, inclusive of the SERPL Expansion site, is the preferred development area for the proposed action and is referenced herein as the "Preferred Alternative 1".

The ISRP proposed land use plan concept for both alternative sites employs a campus-like layout with an overall 35% open space requirement. The open space is composed of preserved wetlands and a central master stormwater system that forms the backbone of a pedestrian-friendly greenway designed to promote interaction and collaboration among the ISRP tenants. The ISRP development implementation plan uses a phased-construction approach accomplished by subdividing the overall site development plan into multiple parcels ranging in size from approximately 2 to 10 ha (5 to 25 ac). The parcel plan design provides opportunities for phasing and maximum flexibility for different types and sizes of businesses, combining or dividing parcels based on user needs. The internal roadway system for the ISRP includes a mix of two- and four-lane roads with a maximum speed limit of 40-48 km/hr (25-30 mi/hr). The roadways are divided with landscaped medians consisting of mainly low shrubs and groundcover. At full build-out, the ISRP would provide facilities with a combined floor space of more than 185,000 sq m (2 million sq ft) of R&D and related facility space and a total estimated population of 8,000 to 10,000 workers.

3.1 Preferred Alternative 1 and SERPL Expansion - Proposed Land Use Plan Description

The proposed land use plan for the Preferred Alternative 1 site is provided in Figure 3. It is sub-divided into 24 parcels and the auxiliary SERPL Expansion parcel. The total 25

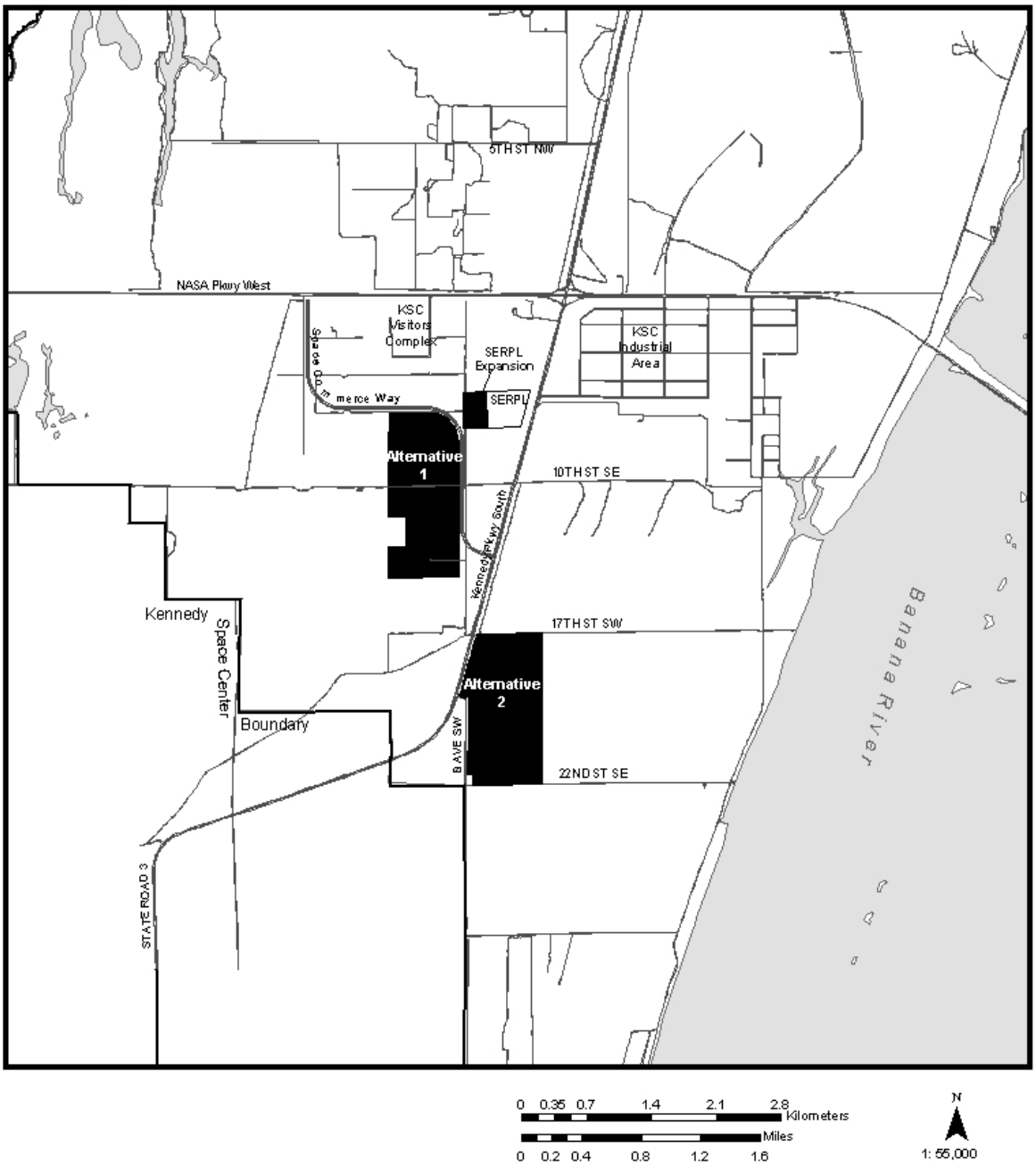

Figure 2. Location of Alternatives for the International Space Research Park on John F. Kennedy Space Center, Florida.

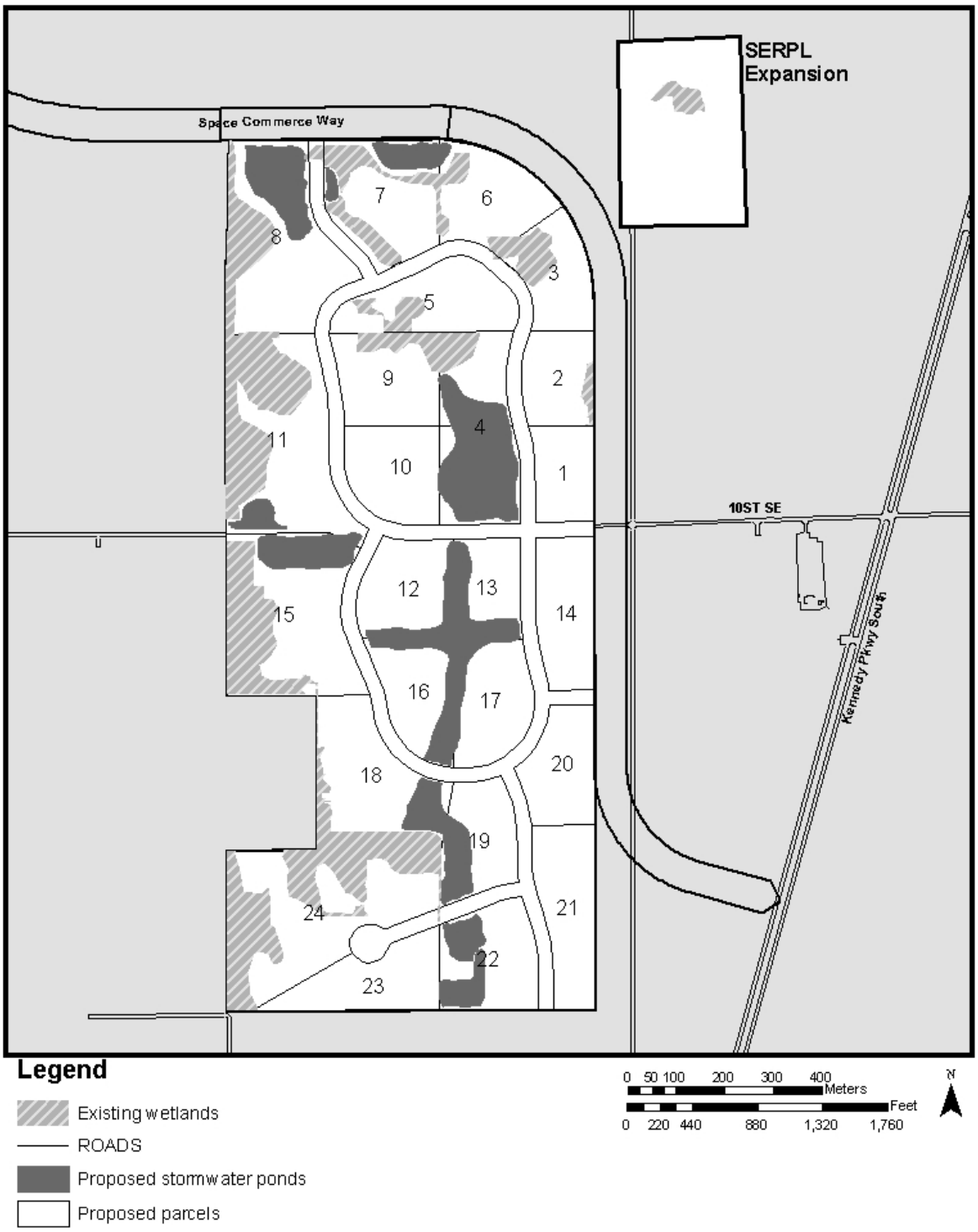

Figure 3. Proposed Land Use of Preferred Alternative 1 and SERPL Expansion

parcels would to be developed in up to five individual phases. The parcels range from 2 to 10 ha (4.9 to 24.7 ac) in size with developable acreage varying between 2 to 10 ha (4.9 and 24.7 ac) (JEA 2002). Some parcels have dedicated no-build zones due to existing wetlands that are to be preserved and required stormwater ponds. Approximately 4.5 km (2.8 mi) of internal access road are planned under this Preferred Alternative 1 concept plan.

3.2 Alternative 2 and SERPL Expansion - Proposed Land Use Plan Description

The proposed land use plan for the Alternative 2 site is provided in Figure 4. It is subdivided into 24 parcels. Although not shown on Figure 4, the SERPL Expansion parcel is also included in the Alternative 2 analysis as an auxiliary parcel resulting in a total of 25 development parcels to be developed in up to five individual phases. The parcels, including the SERPL Expansion, range in size from 1.6 to 10 ha (4.0 to 24.7 ac) with developable acreage varying from 1.1 to 10 ha (2.8 to 24.7 ac). The Alternative 2 proposed land use plan integrates a 34.7 ha (85.7 ac) conservation out-parcel to protect an area dominated by an expansive freshwater swale marsh with embedded upland pine flatwoods habitat from the proposed development action. The development parcels, master stormwater system and road alignment were designed to minimize development impacts to existing wetlands located outside the boundaries of the conservation out-parcel. Approximately 5.7 km (3.5 mi) of internal access roads are proposed under the Alternative 2 concept plan.

4.0 Methodology

Information on listed or proposed species potentially affected by the proposed ISRP action was derived largely from results of biological studies previously conducted at KSC. A list of the primary documents and studies used to support this assessment are provided in Appendix A. The published resource documents are available from NASA for review. Other references used are listed as cited in the following text in Appendix B.

Fieldwork was conducted on-site to verify and fill gaps in existing data and to provide additional information about the existing resources in the study areas. Specifically, biologists with Jones, Edmunds & Associates, Inc. (JEA) performed wetland delineations on the Preferred Alternative 1 and SERPL Expansion sites in January 2002. To document wildlife use they performed two morning and two evening pedestrian survey events, each approximately 2.5 hrs in length, during the time period May 22-24, 2002. Dynamac Corporation biologists completed wetland delineations on the Alternative 2 site on January 23, 2003. Two (2) pedestrian survey events, each approximately five hours in length, were performed on January 30, 2003 and March 7, 2003 to qualitatively document wildlife use and to verify existing habitat use data for the Federally-listed Florida scrub-jay (*Aphelocoma coerulescens*) and population density data for the gopher tortoise (*Gopherus polyphemus*), listed as a species of special concern by the State of Florida.

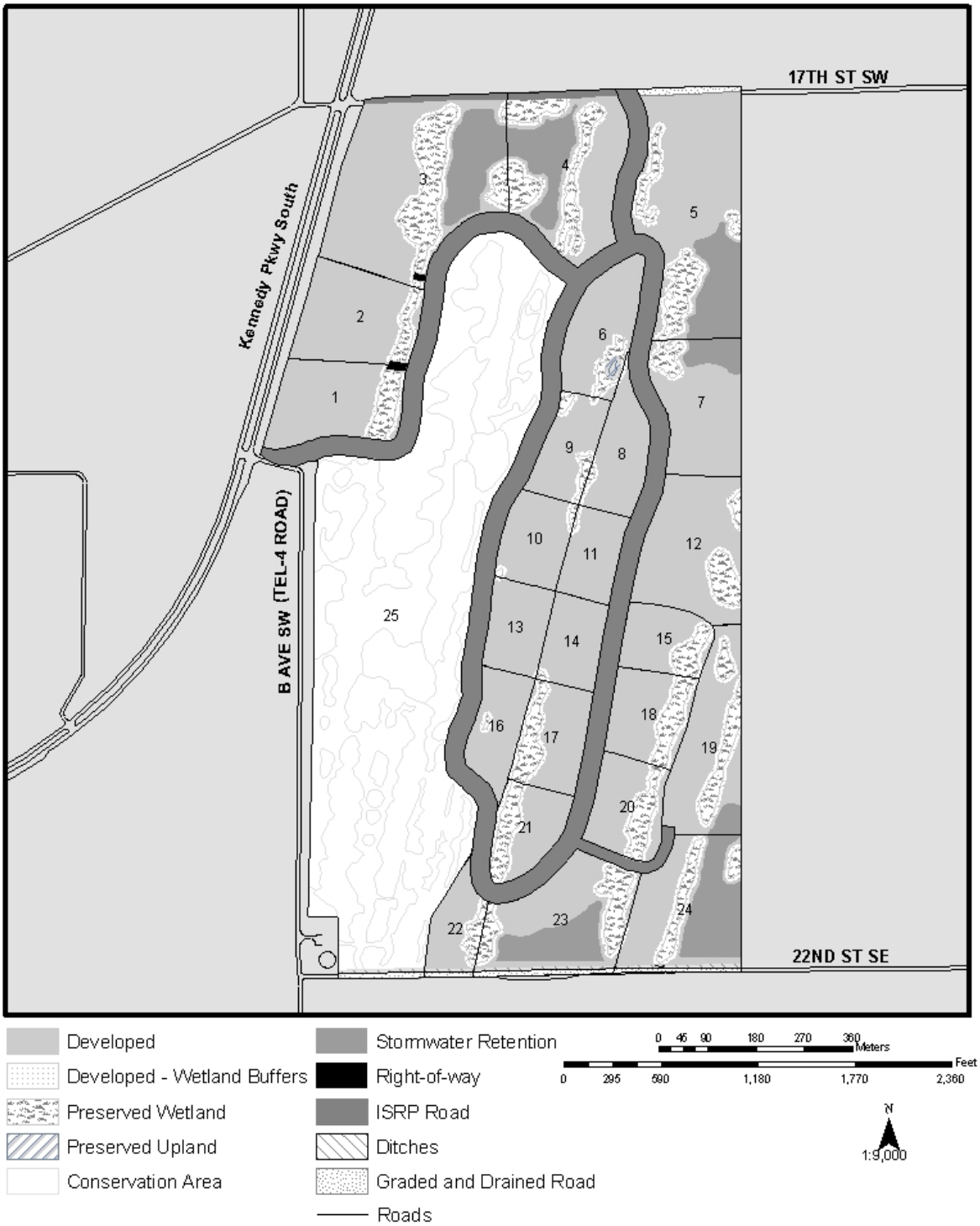

Figure 4. Proposed Land Use of Alternative 2 Not Showing SERPL Expansion. Parcels are numbered.

The wetland delineations were conducted in accordance with methods specified in the U.S. Army Corps of Engineers (Corps) Technical Report Y-87-1, *Corps of Engineers Wetlands Delineation Manual* (January 1987) and State of Florida's (State) *Delineation of the Landward Extent of Wetlands and Surface Waters* (Chapter 62-340, Florida Administrative Code (F.A.C.)). Results of the wetland delineations conducted on the Preferred Alternative 1 and SERPL Expansion sites were verified by the Corps and District representatives on January 28, 2002 (JEA 2002). Wetland delineations conducted on the Alternative 2 site were verified by the Corps representative on February 18, 2002 and by the District representative on March 6, 2003.

The existing land use for each of the ISRP alternative sites was classified using Level IV of the Florida Land Use, Cover and Forms Classification System (FLUCCS) (Florida Department of Transportation (FDOT) January 1999). The FLUCCS classification system, based on land use, predominant vegetative composition, or landform, is a widely used standardized method. The FLUCCS classification system broadly describes the predominant natural communities occurring in the State of Florida. It does not attempt to accurately describe the multiple natural community variations that are exhibited for a specific community type across the landscape within the State. Therefore, the FLUCCS classification type that best describes the general vegetative and hydrological condition of the natural community under consideration was selected.

The total area of each land use/land cover type classified on the Preferred Alternative 1, Alternative 2, and the SERPL Expansion parcel is provided in Table 1.

5.0 ISRP Alternative Sites – Existing Land Use Descriptions

The ISRP alternative sites lie on the northern part of Merritt Island within the boundaries of KSC and are currently managed by the USFWS as part of the Merritt Island National Wildlife Refuge (MINWR). Merritt Island developed as a prograding barrier island complex; the eastern edge of Merritt Island at its contact with the Mosquito Lagoon and the Banana River forms a relict cape aligned with False Cape (White 1958, 1970, Schmalzer and Hinkle 1992). Elevations range from sea level to about 3 m (10 ft) in the inland areas of Merritt Island (Schmalzer and Hinkle 1992). Multiple dune ridges parallel to the present shore inland on Merritt Island appear to represent successive stages of growth (Schmalzer and Hinkle 1992). The western portion of Merritt Island is substantially older than the east (Brooks 1981). Erosion has reduced the western side to a nearly level plain (Brown et al. 1962). Interestingly, the geologic history of Merritt Island is portrayed on the alternative sites with Preferred Alternative 1 representing the nearly level plains characterizing the older western side of Merritt Island and the multiple dune ridges found within the Alternative 2 site representing the younger eastern relict dune landscape. Merritt Island is characterized by a warm, humid climate with an average annual precipitation of 131 cm (52 in) of which most rainfall is received during the wet season months extending from May to October.

Table 1. Summary of Existing Land Use on ISRP Alternative Sites

FLUCCS Classification Code	Classification Description	Area (hectares)	Area (acres)
Alternative 1			
2211	Citrus Grove	99.7	246.4
5100	Upland Ditch	3.0	7.3
5340	Reservoirs<10ac	1.9	4.8
6170	Mixed Wetland Hardwoods	1.2	2.9
6190	Exotic Wetlands	4.6	11.4
6300	Wetland Forest Mixed	16.9	41.8
6410	Freshwater Marsh	0.6	1.5
TOTALS		**127.9**	**316.1**
SERPL Expansion			
2211	Citrus Grove	7.6	18.8
4140	Pine-Mesic Oak	1.8	4.5
6170	Mixed Wetland Hardwoods	0.5	1.1
TOTALS		**9.9**	**24.4**
Alternative 2			
4111	Scrubby Pine Flatwood	74.6	184.4
4210	Oak Scrub	21.4	52.9
5100	Upland Ditch	0.5	1.1
5340	Reservoirs<10ac	1.7	4.1
6170	Mixed Wetland Hardwoods	4.0	10.0
6190	Exotic Wetlands	0.2	0.4
6410	Freshwater Marsh	22.9	56.5
7400	Disturbed Scrubby Flatwoods	3.4	8.3
8145	Unpaved and Drained Roads	1.4	3.6
TOTALS		**130.1**	**321.3**

5.1 Preferred Alternative 1 – Existing Land Use Description

The Preferred Alternative 1 site is approximately 128 ha (316 ac) located on the west side of Space Commerce Way (Figure 2). This site has been historically converted for citrus production. Citrus groves (FLUCCS – 2211) cover 78% (100 ha (246 ac)) of the site. Remaining land features are wetland community types and artificial surface waters constructed to support the citrus operations. Wetland community types were classified as: Mixed Wetland Hardwoods (FLUCCS-6170), Wetland Forest Mixed (FLUCCS-6300), Exotic Wetland Hardwoods-Brazilian pepper (*Schinus terebinthifolius*) (FLUCCS-6190), and Freshwater Marsh (FLUCCS-6410). Wetland community types comprise a

total of 23.4 ha (57.7 ac). Artificial surface water features are: Reservoirs less than 4.0 ha (10.0 ac) (FLUCCS-5340) and upland-cut Ditches (5100) and encompass 1.9 ha (4.8 ac) and 2.9 ha (7.1 ac), respectively. Unaltered upland habitat types are absent on the Alternative 1 site. Figure 5 provides an existing land use map for the Alternative 1 site.

5.2 SERPL Expansion Parcel– Existing Land Use Description

The auxiliary SERPL Expansion parcel is approximately 10 ha (24 ac) located east of the Space Commerce Way and adjoining the existing SERPL development site (Figure 2). Citrus groves (FLUCCS-2211) comprise 77% of this parcel. A 1.8 ha (4.5 ac) remnant Pine-Mesic Oak (FLUCCS-4140) forest embedded with a 0.5 ha (1.1 ac) Mixed Wetland Hardwoods (FLUCCS-6170) persist within the northern one-half of this parcel. The existing land use map for the SERPL Expansion parcel is shown with the Preferred Alternative 1 site on Figure 5.

5.3 Alternative 2 – Existing Land Use Description

The Alternative 2 site is approximately 130 ha (321 ac) located east of Kennedy Parkway South (S.R. 3), about one mile south of Space Commerce Way at Tel-4 Road (B Avenue SW) (Figure 2). The site is generally characterized as a scrubby pine flatwoods matrix with slightly elevated oak scrub ridges and numerous depressional freshwater wetland swales oriented north-to-south. The majority of the Alternative 2 site is undisturbed natural habitat. Upland community types classified on Alternative 2 are Scrubby Pine Flatwoods (FLUCCS-4111), Oak Scrub (FLUCCS-4210), and Disturbed Scrubby Flatwoods (FLUCCS-7400). The upland habitat areas occupy a total of 99.3 ha (245.3 ac). Wetland community types are Freshwater Marshes (FLUCCS-6410), Mixed Wetland Hardwoods (FLUCCS-6170), and a 0.2 ha (0.4 ac) Exotic Wetlands-Brazilian pepper (FLUCCS-6190) patch. The freshwater marshes are the primary wetland habitat type covering 22.8 ha (56.3 ac) of the Alternative 2 site. The mixed wetland hardwoods forests, comprising 4.0 ha (10.0 ac), have developed in deeper pockets within the swales exhibiting longer hydroperiods. Artificial surface water features identified on Alternative 2 are a shallow Reservoir<10 ac. (FLUCCS-5340) located along the northern boundary that is densely colonized by cattail (*Typha* spp.) and an upland-cut Ditch (FLUCCS-5100) along the southern boundary. Man-made features within the Alternative 2 boundaries are limited to two dirt land management roads (Roads and Highways (Graded and Drained (FLUCCS-8145)). The site is adjacent to a Government Building and the Tel-4 Road right-of way. Figure 6 provides the existing land use map for the Alternative 2 site.

6.0 Potentially Affected Listed Species

Federally listed species are plants and animals that are determined by the USFWS to be endangered or threatened pursuant to Section 4 of the ESA and listed in 50 CFR 17.11 & 17.12. There is currently 111 plant and animal species listed by the USFWS as threatened or endangered in the State of Florida (USFWS 2003).

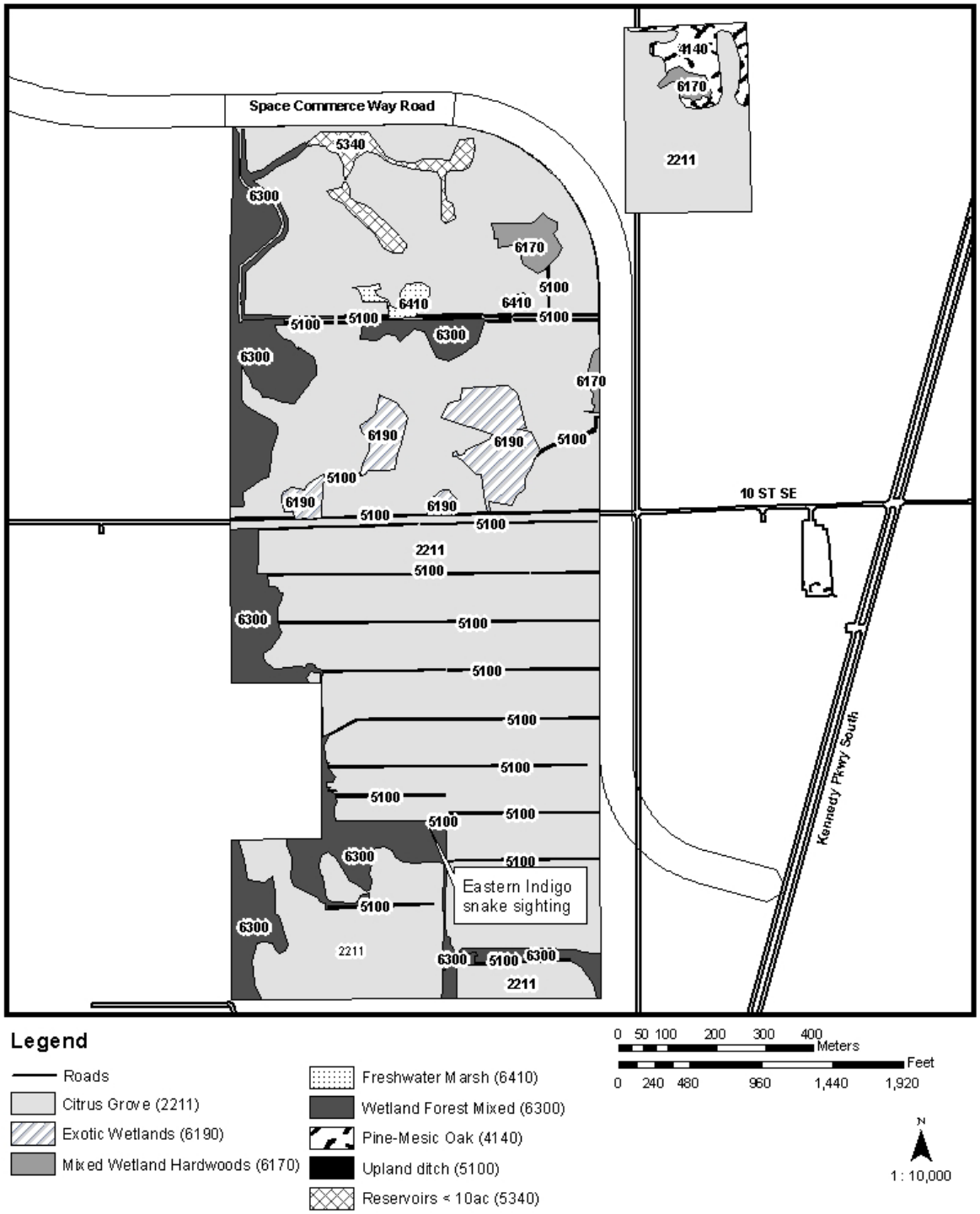

Figure 5. Existing Land Use of Preferred Alternative 1 and SERPL Expansion

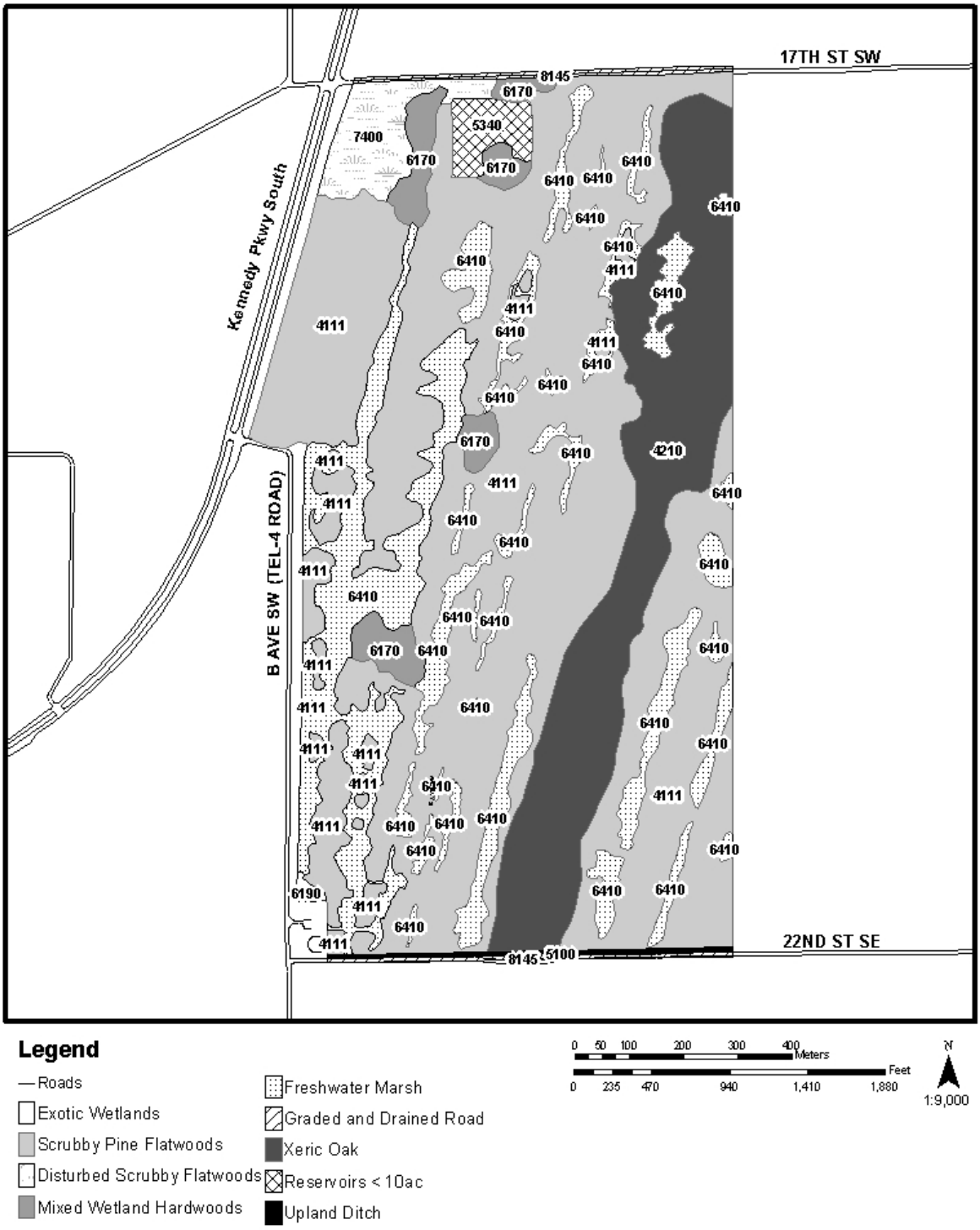

Figure 6. Existing Land Use of Alternative 2 Not Showing SERPL Expansion

The Florida Endangered and Threatened Species Act, set forth in Section 372.072 – 074, Florida Statutes, defines endangered and threatened species and provides for the State's intent to protect these species. The lists of protected wildlife species are maintained by the Florida Fish and Wildlife Conservation Commission (FFWCC) and categorized as endangered, threatened and species of special concern, and constitute Rules 39-27.003, 39-27.004 and 39-27.005, respectively, Florida Administrative Code (F.A.C.). The state lists of plants are categorized into endangered, threatened and commercially exploited, and are administered and maintained by the Florida Department of Agriculture and Consumer Services via Chapter 5B-40, F.A.C.

Of the total 27 state and Federally protected wildlife species known to regularly use the lands and waters of KSC (NASA 1997, 2000, 2002), 11 are Federally listed as threatened or endangered. Table 2 lists these species and also identifies those species potentially affected by the proposed ISRP development action for each alternative site. Although the American alligator is Federally listed as SAT (Similarity of Appearance to a Threatened Taxon), it was delisted throughout its entire range on June 4, 1987 (52 FR 21059-21064). The USFWS reclassified the species to SAT primarily to minimize enforcement problems regarding other crocodilians that are threatened (52 FR 21059-21064). The final delisting of this species is formal recognition that the American alligator is biologically secure throughout its range. The final delisting rule results in the removal of federal agency responsibility under Section 7 of the ESA (52 FR 21059-21064). Therefore, potential effects of the proposed ISRP action to the American alligator are not considered under this BA.

Critical habitat, designated or proposed, has not been determined under Section 4 of the ESA for any of the four Federally listed species identified as occurring or potentially occurring on Preferred Alternative 1, Alternative 2, or the SERPL Expansion parcel.

KSC does not provide habitat to any Federally protected plant species; however, nine plant species were formerly candidates for federal listing (Schmalzer et al. 2002), including Curtiss reedgrass (*Calamovilfa curtissii*) found in the shallow wetland swales on the Alternative 2 site.

In accordance with 50 CFR 402.12, this BA does not address the potential effects of the proposed ISRP action on state listed plant and animal species. This analysis is conducted in the Biological Resources section of the Environmental Impact Statement (EIS) that is currently being drafted by NASA for the proposed action.

Table 2 provides the total number of state and Federally listed wildlife species known or expected to occur at each alternative site. It should be recognized that Alternative 2 provides suitable to optimal habitat for 16 Federally and state listed wildlife species. A total of nine Federally and state listed wildlife species have been determined to potentially occur on the Preferred Alternative 1 site. Seven of these nine are wading birds that are expected to occasionally feed in the man-made drainage ditches and reservoirs constructed on this site in support of the citrus operation.

Table 2. State and Federally Listed Species Occurring at KSC and Potentially Occurring within Habitats on ISRP Alternative Sites

SCIENTIFIC NAME	COMMON NAME	STATUS OF PROTECTION		PREFERRED ALT. 1	SERPL EXPANSION	ALT. 2
Amphibians and Reptiles		**STATE**	**FEDERAL**			
Alligator mississippiensis	American alligator[a]	SSC	SAT	X		X
Caretta caretta	Atlantic loggerhead turtle	T	T			
Chelonia mydas	Atlantic green turtle	E	E			
Dermochelys coriacea	Leatherback turtle	E	E			
Drymarchon corais couperi	Eastern indigo snake	T	T	X	X	X
Gopherus polyphemus	Gopher tortoise	SSC				X
Nerodia fasciata taeniata	Atlantic salt marsh snake	T	T			
Rana capito aesopus	Florida gopher frog	SSC				X
Pituophis melanoleucus mugitus	Florida pine snake	SSC				X
Birds						
Ajaia ajaja	Roseate spoonbill	SSC				X
Aphelocoma coerulescens	Florida scrub-jay	T	T			X
Charadrius melodus	Piping plover	T	T			
Egretta caerulea	Little blue heron	SSC		X		X
Egretta rufescens	Reddish egret	SSC		X		X
Egretta thula	Snowy egret	SSC		X		X
Egretta tricolor	Tricolored heron	SSC		X		X
Eudocimus albus	White ibis	SSC		X		X
Falco peregrinus tundrius	Arctic peregrine falcon	E				
Falco sparverius paulus	Southeastern American kestrel	T		X	X	X
Haliaeetus leucocephalus	Bald eagle	T	T			X
Mycteria americana	Wood stork	E	E	X		X
Pelecanus occidentalis carolinensis	Eastern brown pelican[b]	SSC				
Sterna antillarum	Least tern	T				
Rynchops niger	Black skimmer	SSC				

Table 2. (cont.) **State and Federally Listed Species Occurring at KSC and Potentially Occurring within Habitats on ISRP Alternative Sites**

SCIENTIFIC NAME	COMMON NAME	STATUS OF PROTECTION		PREFERRED ALT. 1	SERPL EXPANSION	ALT. 2
Mammals		**STATE**	**FEDERAL**			
Peromyscus polionotus niveiventris	Southeastern beach mouse	T	T			
Podomys floridanus	Florida mouse	SSC				X
Trichechus manatus	West Indian manatee	E	E			
	TOTALS	**27**	**11**	**2 F/9 ST**	**1 F/2 ST**	**4 F/16ST**

Source: Breininger et al. 1994, Logan, T. 1997, USFWS 2003, NASA 1997, 2000, 2002

[a]The American alligator is not included in totals for Federally listed species; it was delisted on June 04, 1987 (53FR 21059-21064).
[b]The Brown Pelican is endangered by Federal Status in the U.S., except it was delisted due to recovery in Florida and Alabama (50FR49384945 dated 02/04/85)

State = Florida Fish and Wildlife Conservation Commission
Federal = United States Fish and Wildlife Service
E = Endangered; T = Threatened; SAT = Similarity of Appearance to Threatened Taxon; SSC = Species of Special Concern

Table 3 provides the list of Federally protected wildlife species potentially affected by the proposed ISRP development action and the alternative site with which the species is associated. Each species and the potential effects of the action on these species and their habitat are discussed below, organized by the alternative site.

Table 3. Federally Listed Wildlife Species Potentially Affected by the Proposed International Space Research Park Development Action

Species Common Name	Scientific Name	Preferred Alt-1	SERPL Exp.	Alt-2
Amphibians and Reptiles				
Eastern indigo snake	*Drymarchon corais couperi*	X	X	X
Birds				
Bald Eagle	*Haliaeetus leucocephalus*			X
Florida scrub-jay	*Aphelocoma coerulescens*			X
Wood stork	*Mycteria americana*	X		X
	TOTALS	**2**	**1**	**4**

6.1 Preferred Alternative 1

The Preferred Alternative 1 site, severely altered by historic citrus cultivation, has the potential to be used by two Federally listed species, the eastern indigo snake and wood stork (Table 3). JEA biologists confirmed the use of the Preferred Alternative 1 by the eastern indigo snake in January 2002 (JEA unpublished data 2002). The approximate location of this sighting is shown on Figure 5.

6.1.1 Wood Stork

The ditch and canal habitat type (FLUCCS-5100) and open water reservoirs (FLUCCS-5340) identified on the Preferred Alternative 1 site provide suitable feeding habitat to wood storks. On KSC this species commonly uses the edges of ditches and canals and open water impoundments to feed on small fish that are often abundant in these artificial freshwater habitats (Breininger et al. 1994, Rodgers et al. 1996). Wood storks fly great distances between roost or colonies and feeding sites (Rodgers et al. 1996). Storks studied at several central Florida colonies flew 5-35 km (3.1-21.7 mi) to feeding grounds (Rodgers et al. 1996). Wood storks commonly nest in colonies located in woody vegetation usually over standing fresh or brackish water (Breininger et al. 1994). Mangroves are a common nesting tree for wood storks on KSC (Breininger et al. 1994). JEA scientists observed numerous wading birds, although no Federally or state listed species, using the ditches within the orange groves and particularly the canal along Ransom Road (JEA unpublished data 2002). It is expected that woods storks and state listed wading birds periodically feed within the ditch and reservoir habitat types on Preferred Alternative 1 due to the documented common use of this disturbed habitat type by these species (Smith and Breininger 1995, Breininger et al. 1994).

6.1.2 Eastern Indigo Snake

A large, approximately 2.1m (7-ft.), adult indigo snake was observed in the southern part of the Preferred Alternative 1 site by a JEA scientist during the performance of a wetland survey in January 2002 (JEA unpublished data 2002). The approximate location of this sighting was along the interface of a forested wetland hammock rimmed by a ditch and citrus grove habitat types as shown on Figure 5. The eastern indigo snake is the longest snake in the U.S., reaching lengths greater than 2.5 m (8 ft.). Although they are Federally listed as a threatened species, protection and conservation are difficult (Breininger et al. 1994).

A four-year radio-telemetry study of indigo snakes was conducted at KSC during the time period 1998 through 2002 (R. Smith unpublished data). Although this study was not conducted on the Preferred Alternative 1 site, it provides information on habitat utilization and extent of home ranges that can be applied in evaluating potential impacts of the proposed action on this species. Of 59 indigos radio-tracked, 41 snakes were documented using hammock habitat. Thirteen of those snakes regularly used hammock habitat (between 10 and 41 separate tracking events, dependant on the length of time tracked). The researchers documented many observations of indigos feeding in hammocks, and using tree stumps, sphagnum bogs, and ditches within hammocks as den sites (R. Smith unpublished data). The forested wetland hammocks on Preferred Alternative 1, particularly those located along the western project site boundary, are recognized to provide excellent feeding habitat and potential den sites (R. Smith pers. comm.).

Of 59 indigos radio-tracked, 42 snakes were documented using disturbed habitats, including citrus groves. Twenty of those snakes regularly used disturbed habitats (between 10 and 55 separate tracking events, dependant on the length of time tracked). These sites were not always orange groves, but all had the common characteristic of highly disturbed ground cover or shrub layer. Exotic or nuisance vegetation was often abundant. Numerous woody debris piles formed from dead citrus trees were observed within the citrus groves on Preferred Alternative 1. These debris piles potentially provide excellent shelter and den sites for indigo snakes (R. Smith pers. comm., Speake et al. 1978, Moler 1986, Kehl et al. 1991).

Data from several radiotagged indigo snakes at KSC suggest that they frequently travel along and feed within the shallow-sloped ditches and surrounding vegetation (Kehl et al. unpublished data, R. Smith, unpublished data). Of 59 indigos tracked, 22 were documented using ditches for feeding or den sites (37%) (R. Smith unpublished data). Three of those were documented using culverts to cross under roads (R. Smith unpublished data).

The average homerange estimates, derived from a radio-telemetry study of 10 adult indigo snakes, were 279.4 ha (690 ac) for males and 99.8 ha (247 ac) for females (Kehl et al. unpublished data). Although the majority of the natural community types historically occurring on the Preferred Alternative 1 site have been altered, this site is

part of a large contiguous landscape presently characterized by few features that fragment the habitat, such as roads. Road mortality and intentional killing by humans were determined to be the two major sources of mortality (R. Smith unpublished data).

6.1.3 Bald Eagle

Bald eagles on KSC select the largest pines as nest sites that are generally located in open stands far from occupied buildings (>1.5 km (0.9 mi)) and roads (>0.15 km (0.09 mi)) and near water (0.6 to 1.7 km (0.4 to 1mi)) (Hardesty and Collopy 1991, Breininger et al. 1994). Bald eagles prefer to feed on fish, but small mammals, water birds, and carrion are also utilized (Rodgers et al. 1996, Breininger et al. 1994).

Based on 2002 data collected by the MINWR and USFWS, the closest Bald eagle nest to the Preferred Alternative 1 is located approximately 3.4 km (2.1 mi) due east of the site near the shoreline of the Indian River Lagoon (MINWR and USFWS unpublished 2002 data). This same nest is located more than 4 km (2.5 mi) from the SERPL Expansion site (MINWR and USFWS unpublished 2002 data). Figure 7 provides the approximate location of the nearest eagle nests to the ISRP alternative sites. Based on the absence of suitable nesting and feeding habitat and the significant distance to the nearest nest, implementation of the proposed action on the Preferred Alternative 1 and SERPL Expansion parcel alternative site is not likely to adversely affect this listed species.

6.2 SERPL Expansion Parcel

6.2.1 Eastern Indigo Snake

Similar to the Preferred Alternative 1 site, the SERPL Expansion parcel is primarily composed of historically altered habitat types. As indicated on Table 3, the SERPL Expansion parcel has the potential to be periodically used by one Federally listed species, the eastern indigo snake.

Although not observed, it is expected that the SERPL Expansion site is part of the home range of at least one indigo snake. This is based on the proximity of the SERPL expansion parcel to the above referenced indigo sighting, observed use of disturbed and hammock habitat types (R. Smith, pers. comm.), and documentation that the adjacent SERPL site currently being developed was expected to be occupied by at least one indigo snake, and potentially contributes to a number of indigo home ranges (NASA 2000).

6.3 Alternative 2

Alternative 2 is located within a large contiguous landscape exhibiting relatively high natural habitat heterogenity with most habitats in optimal condition for use by dependent wildlife. As a result of the availability of high quality habitat, a total of 16 federal and state listed wildlife species are expected to use this site (Table 2). As indicated on Table 3, the site provides potential habitat for four Federally listed species; Florida

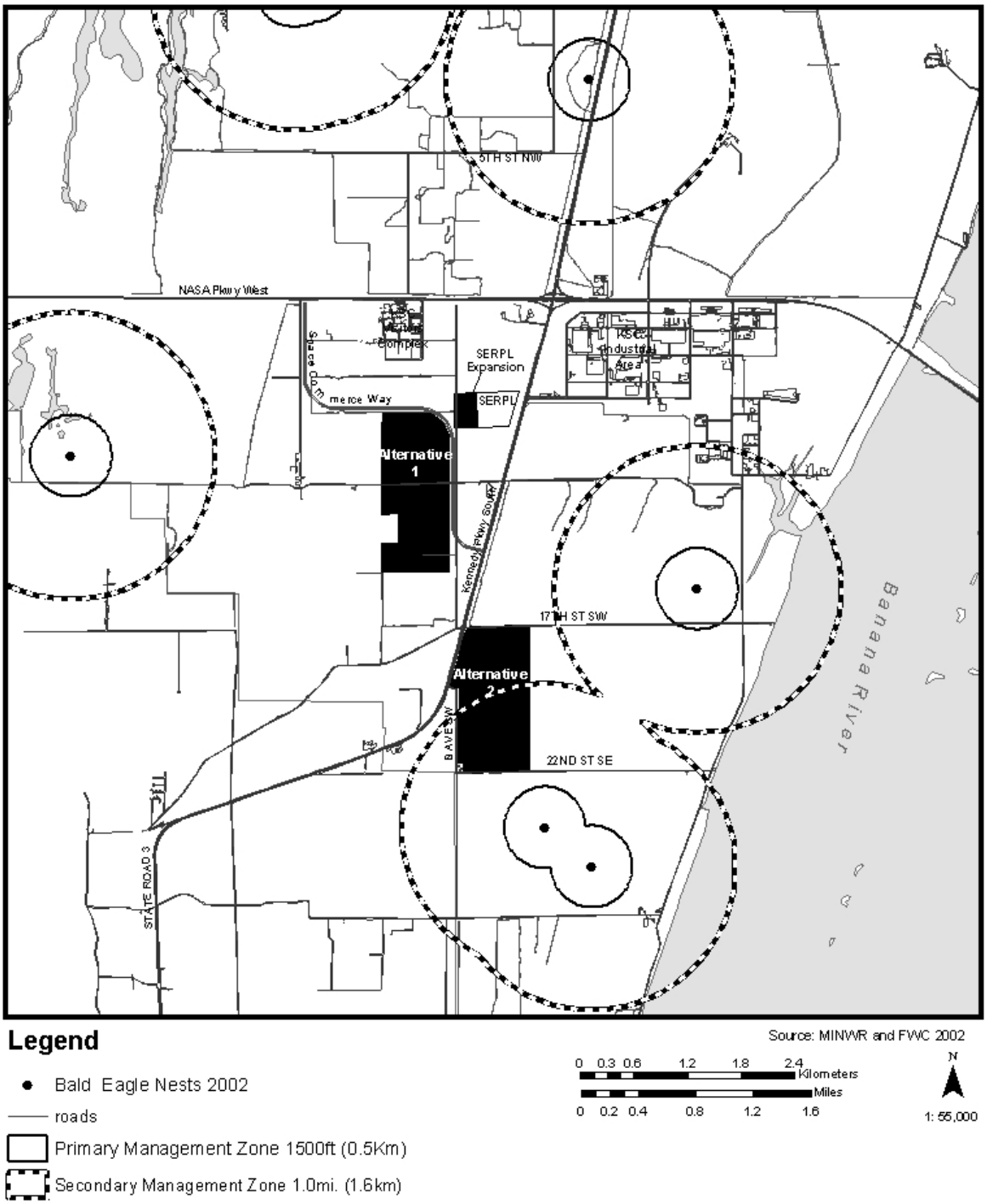

Figure 7. 2002 Bald Eagle Nest Locations

scrub-jay, eastern indigo snake, bald eagle, and wood stork. Of these species, which are also protected under the State of Florida's wildlife laws, only the Florida scrub-jay has been observed on the site.

6.3.1 Florida Scrub-Jay

Florida scrub-jay habitat occurs as a mosaic of oak scrub patches (focal habitat), embedded within a low and open mesic shrub landscape (matrix habitats) (Breininger et al. 1996, 2001). Optimal habitat quality features consider percentage of oak cover (>50%), open space (numerous open sandy areas among oaks), percentage of tree canopy cover (<15%), and shrub height (120 to170 cm (3.9 to 5.6 ft) without patches of tall scrub 170 cm (5.6 ft) comprising areas larger than 0.4 ha (1 acre)). Breininger and Oddy (2001) recommend the use of structural habitat features; particularly scrub height, for identifying habitat suitability. Application of these scrub-jay habitat suitability criteria determined that the entire Alternative 2 site is considered potential habitat for use by the Federally threatened Florida scrub-jay. A wildfire that swept across the Alternative 2 site in 1998 and subsequent harvesting of damaged pine trees resulted in extremely optimal habitat conditions for scrub-jays throughout most of this site.

The Alternative 2 site is part of long-term demographic studies of a scrub-jay population center inhabiting the predominant mesic pine flatwood landscape located east of Kennedy Parkway South and Tel-4 Road. Within the study area, inclusive of Alternate 2, oak scrub occurs on the ridges, and marshes occur in troughs with pine flatwoods dominating the intermediate areas (Breininger and Oddy 2001). The 2002 scrub-jay territory maps for the Alternative 2 show that the site contributes wholly or partially to 10 scrub-jay territories (Breininger, Oddy, and Carter unpublished data 2002). Based on this data, the 2002 scrub-jay territories occupy the entire Alternate 2 site with the exception of approximately 4 ha (10 ac) of disturbed flatwoods habitat located in the extreme northwest corner of the site. Based on recent field observations of scrub-jay use of the subject disturbed flatwoods habitat area by Dynamac biologists, all potential habitat on Alternative 2 is occupied.

6.3.2 Eastern Indigo Snake

The Alternative 2 scrub (FLUCCS-4210) and pine flatwoods (FLUCCS-4110) habitat structure and composition is also optimal for use by the eastern indigo snake. The scrub and pine flatwoods habitat type is considered critical for the continuation of this species on KSC (Breininger et al. 1994). Eastern indigo snakes use all habitats within the pine flatwoods landscape feeding on amphibians within marshes and using the numerous gopher tortoise burrows that occur on the scrub ridges and in the intermediate mesic areas as den sites (Breininger et al. 1994). Although indigo snakes have not been documented within the Alternative 2 project boundaries, radio-telemetry studies conducted during 1998-2002 tracked them using similar nearby flatwoods habitat areas located just south of the Alternative 2 site (R. Smith unpublished data). It is expected that Alternative 2 is occupied by at least one indigo, and likely contributes to several indigo snake home ranges (R. Smith pers. comm.).

6.3.3 Bald Eagle

Pine flatwoods are the primary nesting habitat type for bald eagles at KSC and are considered critical to the continuation of this species on KSC (Breininger et al. 1994). Bald eagle nesting is not documented within the Alternative 2 site boundaries, however two active bald eagle nests are within 1 km of the southeast boundary of the site (MINWR and USFWS unpublished 2002 data). The closest nest is 650 m (2112.5 ft) from the southeast corner of Alternative 2. An additional active eagle nest is within 2 km of the northeast boundary of the site (MINWR and USFWS unpublished 2002 data) (Figure 7).

6.3.4 Wood Stork

The classified reservoirs <10 ac (borrow area) (FLUCCS-5340) located along the northern boundary of Alternative 2 and the ditch (FLUCCS-510) along the southern boundary provide potential feeding habitat to the wood stork.

The freshwater wetland swale marshes (FLUCCS-6410) have important roles in community structure within the scrub and mesic pine flatwoods landscape (Breininger et al. 1994). The swale marshes on Alternate 2 provide suitable feeding habitat for the eastern indigo snake and bald eagle. (Breininger et al. 1994, R. Smith pers. comm.) However, wood storks rarely use freshwater swale marshes at KSC (Breininger 1992, Stolen et al. 2002), preferring the numerous ditches and canals and open-water impoundments (Breininger et al. 1994).

7.0 Analysis of the Effects of the Proposed Action on Listed Species

In accordance with 50 CFR 402.12 (4), this section provides an evaluation of the effects of the proposed ISRP development action on Federally listed species documented to occur or potentially occur on the two alternative sites, each inclusive of the SERPL Expansion parcel. It considers direct, indirect and cumulative effects, as defined in 50 CFR 402.02, of the proposed development and operation of the ISRP on the potentially affected species and its habitat. The terms “effects” and “impacts” as used in the National Environmental Policy Act (NEPA) regulations are synonymous (40 CFR §1508.8.

“Direct effects” are caused by the proposed action and occur at the same time and place (50 CFR 402.02). Examples are impacts from construction, such as immediate habitat loss. “Indirect effects” are caused by the proposed action and occur later in time (after the action is completed), but are still reasonably certain to occur (50 CFR 402.02). Examples are impacts related to habitat fragmentation, effects of increased human access, and operational impacts, such as noise and lighting. “Cumulative effects” are those effects of *future* State and private activities, not involving Federal activities, that are *reasonably certain to occur* within the *action area* of the proposed Federal action (50 CFR 402.02). Federal actions that are unrelated to the proposed action are not

considered in a BA because they require independent consultation pursuant to Section 7 of the ESA (50 CFR 402.02).

For purposes of this BA, the action area is considered the boundaries of the proposed ISRP alternative properties and nearby areas directly or indirectly affected by the proposed action (50 CFR 402.02). This includes areas identified as potential mitigation for the proposed action and the surrounding contiguous landscape that would be potentially affected by fragmentation of the habitat.

For the proposed action, the only future non-federal activity that is reasonably certain to occur within the action area that would cause cumulative effects is the approval of regulatory permits required for ISRP construction and operation, over the projected 20-25 year build-out time frame, by the State of Florida's St. Johns River Water Management District under the Environmental Resource Permit (ERP) program. The cause-and-effect relationship between indirect and cumulative effects overlap under this analysis since no other state or private action is foreseen in the action area that would result in additional compounding cumulative effects outside of the proposed action. Therefore, for purposes of this assessment the cumulative effect of the proposed action has been determined to be the threshold event of completing the ISRP project.

Impacts resulting from the construction and operation of the nearby SERPL and Space Commerce Way have been analyzed as part of the Environmental Assessment completed for each project in 2000 and 2002, respectively (NASA 2000, 2002). This analysis is not repeated herein. These past actions are not interdependent or interrelated (50 CFR 402.02, USFWS 1998) to the proposed ISRP action.

Table 4 provides a summary of the total habitat impacts, categorized by community type, resulting from the proposed action for each alternative site. Table 5 identifies potential direct, indirect, and cumulative effects of the proposed action and classifies the significance of these effects on Federally listed species considered under this BA as high, moderate, or low. These classification terms are defined in Table 5. Information supporting the significance determination for predicted effects on each species is provided below.

7.1 Preferred Alternative 1 and SERPL Expansion Parcel:

The proposed land use plan for the Preferred Alternative 1, inclusive of the SERPL Expansion parcel (Figure 3), would cause, at complete build-out projected over a 20 to 25 year time frame, the loss of approximately 117.8 ha (291 ac) or 86% of the existing habitat (Table 4). Upland habitat types that would be impacted include all the citrus groves (FLUCCS-2211) and the pine-mesic oak (FLUCCS-4140) area (Table 4). The upland-cut agricultural ditches (FLUCCS-5100) will be filled to facilitate construction of the master stormwater system. Approximately 4.6 ha (11.4 ac) of low quality exotic wetlands (FLUCCS-6190) and 0.5 ha (1.1ac) of medium quality mixed wetland hardwoods (FLUCCS-6170) on the SERPL Expansion parcel would be impacted to provide for an economically viable development (JEA 2002).

Approximately 18.7 ha (46 ac) of wetland habitat types would be preserved under the Preferred Alternative 1 proposed land use plan. This includes 100% of the high quality Wetland Forest Mixed (FLUCCS-6300) habitat occurring along the western boundary of the Preferred Alternative 1 site. Development of the master stormwater system would result in the creation of a total of 13.4 ha (33.2 ac) of open surface water habitats to augment the existing 1.9 ha (4.8 ac) of reservoirs (FLUCCS-5340) proposed for integration into the stormwater system.

Table 4. Summary of Proposed Development Impacts to Habitat Types Classified on ISRP Alternative Sites

FLUCCS Classification Code	Classification Description	Area (hectares)	Area (acres)
Alternative 1 and SERPL Expansion			
2211	Citrus Grove	107.3	265.2
4140	Pine-Mesic Oak	1.8	4.5
5100	Upland Ditch	3.0	7.3
6170	Mixed Wetland Hardwoods	0.5[1]	1.1[1]
6190	Exotic Wetlands	4.6	11.4
6410	Freshwater Marsh	0.6	1.5
TOTALS		**117.8**	**291.0**
Alternative 2 and SERPL Expansion			
2211	Citrus Grove	7.6	18.8
4111	Scrubby Pine Flatwood	49.6	122.5
4140	Pine-Mesic Oak	1.8	4.5
4210	Oak Scrub	20.8	51.3
5340	Reservoirs<10ac	1.5	3.7
6170	Mixed Wetland Hardwoods	0.5[1]	1.1[1]
6410	Freshwater Marsh	1.4	3.6
7400	Disturbed Scrubby Flatwoods	3.1	7.6
8145	Unpaved and Drained Roads	0.5	1.3
TOTALS		**86.8**	**214.4**

[1] Isolated wetland located on SERPL Expansion parcel

Table 5. Summary of Potential Direct, Indirect, and Cumulative Effects and Significance of Potential Effects of the Proposed ISRP Action on Federally Listed Species at ISRP Alternative Sites

			Preferred Alternative 1 and SERPL Expansion						Alternative 2 and SERPL Expansion											
Types of Potential Effects			Potentially Effected Listed Species (Status of Protection)																	
Direct (D)	Indirect (In)	Cumulative (C)	Wood Stork (E)			Eastern Indigo Snake (T)			Florida Scrub-Jay (T)			Eastern Indigo Snake (T)			Bald Eagle (T)			Wood Stork (E)		
			Significance of the Effect [1]																	
			D	In	C	D	In	C	D	In	C	D	In	C	D	In	C	D	In	C
Construction of Infrastructure and Facilities: Immediate loss of foraging, resting, and breeding habitat; Filling or dewatering of wetlands; Short-term modification of species behavior routes; Creation of impervious surfaces; Potential for individual mortality from land clearing equipment.	**Habitat Availability and Disruption of Natural Processes:** Availability of suitable habitat within species dispersal range; Changes in drainage and fire patterns degrading habitat quality.	**Habitat Disturbances:** Loss of individual or significant impact to population due to absence of suitable habitat within species dispersal range; Degradation of habitat quality or risks associated with dispersal.	L	L	L	M	H	H	H	H	H	M	H	H	L	L	L	L	L	L
	Roads and Boundary Effects: Modification of species behavior routes; Isolation of species or populations; Introduction of exotic species and mesopredators; Changes in habitat structure along boundaries; Introduction of road contaminants in wetlands.	**Habitat Fragmentation:** Loss of individual or significant impact to population due to additive road-related impacts and boundary effects of habitat fragmentation.		L	L		H	H		H	H		H	H		M	M		L	L

Table 5. (cont.) Summary of Potential Direct, Indirect, and Cumulative Effects and Significance of Potential Effects of the Proposed ISRP Action on Federally Listed Species at ISRP Alternative Sites

			Preferred Alternative 1 and SERPL Expansion						Alternative 2 and SERPL Expansion											
Types of Potential Effects			Potentially Effected Listed Species (Status of Protection)																	
Direct (D)	Indirect (In)	Cumulative (C)	Wood Stork (E)			Eastern Indigo Snake (T)			Florida Scrub-Jay (T)			Eastern Indigo Snake (T)			Bald Eagle (T)			Wood Stork (E)		
			Significance of the Effect [1]																	
			D	In	C	D	In	C	D	In	C	D	In	C	D	In	C	D	In	C
Construction Noise and Lighting: Short-term modification of behavior due to construction noise and lighting	**Operation Noise, and Lighting:** Long-term modification of behavior due to operation noise, lighting.	**Operation Disturbances:** Loss of individual or significant impact to population due to severe modification of behaviors resulting from operation disturbances	L	L	L	M	M	M	H	H	H	M	M	M	M	M	M	L	L	L
Human Presence: Short-term potential for species harassment due to increased presence of humans.	**Growth Induction:** Long-term potential for species harassment due to increased presence and numbers of humans.	**Human Disturbances:** Loss of Individual or significant impact to population due to persistent and increased human presence	L	L	L	M	H	H	L	H	H	M	H	H	L	M	M	L	L	L

[1]Significance of the Effect:

L= Low, Impacts to species or habitat that are too small to cause any substantial adverse effects to the species or population.

M= Moderate, Impacts may alter important species behavior or important habitat, but can be compensated for or minimized, so that impacts are not considered to cause substantial adverse effects to the individual or substantial changes in the population.

H= High, Impacts that have great potential to cause substantial adverse effects to the species or population by alteration of important species behavior or important habitat.

The magnitude of potential adverse effects of the proposed action to listed species on the Preferred Alternative 1 and SERPL Expansion parcel are minimized due to several contributing factors:

1.) The persistent negative influence from the historic conversion of the much of the sites for citrus production limits their potential to provide suitable habitat to a wide variety of listed and non-listed species. Natural drainage patterns have been severely altered. Historically, fire was not likely a major influencing factor in habitat quality on this site as it was dominated by hydric hammock habitat types, which rarely burn.

2.) The proposed phased development approach of the ISRP initially minimizes the direct effects of widespread habitat loss by limiting the duration and extent of construction disturbances. However, over time these short-term events would be cumulative resulting in permanent alteration of much of the existing habitat on the Preferred Alternative 1 and SERPL Expansion parcel.

3.) The Preferred Alternative 1 proposed land use plan design maximizes development disturbances to those habitat areas that have been historically altered (citrus groves) and exotic wetlands (Brazilian pepper infested) and/or are artificially created and are locally common (ditches) and avoids and minimizes impacts to the more functional intact habitats (hardwood wetlands). The existing disturbed habitats comprise almost 98% of the total area to be impacted. This design measure serves to minimize the severity of potential cumulative effects of the action on listed species.

7.1.1 Wood Stork

The existing ditches and reservoirs on the Preferred Alternative 1 were determined to provide potential feeding habitat for the wood stork. The SERPL Expansion parcel does not contain this habitat type. Direct impacts to wood storks from loss of feeding habitat via filling of the 3.0 ha (7.3 ac) of ditches, construction noise, and presence of humans are expected to immediately reduce the availability and preference of the site for use by foraging wood storks. Due to the abundance of the ditch and impoundment habitat type throughout KSC and the expansive foraging range of the wood storks the significance of these direct impacts are predicted to be low.

The creation of surface water habitat to provide stormwater management would be implemented on the subject site as part of each construction phase. This would serve to compensate for the loss of existing feeding areas for wood storks, over time. At build-out, the stormwater management system would consist of a total of 15.3 ha (33.2 ac) of open water habitats, the edges of which would provide suitable feeding habitat to wood storks. The potential that environmental contaminants within the proposed stormwater management system may negatively influence this species over time is not considered to be any greater than the existing exposure levels within ditches and impoundments. In

consideration of the above, the proposed action is determined "not likely to adversely affect" this listed species.

7.1.2 Eastern Indigo Snake

The indirect and cumulative effects of immediate and long-term loss of habitat resulting in fragmentation of the contiguous landscape, in which the preferred Alternative 1 site is currently positioned, is considered to be the single most significant impact of the proposed action on eastern indigo snake populations (Table 5). This is based on two primary factors: 1.) snakes are forced to cross more roads to fulfill their spatial needs and 2.) they are more likely to be seen and possibly killed by people (R. Smith unpublished data). At build-out, a total of 4.5 km (2.8 mi) of roads would be constructed to serve the 8,000 to 10,000 personnel expected to be employed at the ISRP. Roads are one of the main causes of land fragmentation and thus a major reason for decline and isolation of many wildlife species (Moler 1992, Hartmann 2002). Research at KSC has found distinct avoidance patterns by indigo snakes when roadways intersect a home range (M.J. Barkaszi & R. Smith and R. Smith & M. Legare in NASA 2000). Roadways effectively change behavioral routes (dispersal, foraging, finding mates, etc.) that are required for survival. These effects are minimized on the SERPL Expansion parcel due to the existing fragmentation of this parcel from the main Preferred Alternative 1 site by Space Commerce Way and the existing SERPL facility.

The direct effects associated with construction operations phase, including the potential for individual mortality from encounters with humans or construction equipment, are expected to be moderated by implementation of the USFWS guidelines "Standard Protection Measures for the Eastern Indigo Snake". These guidelines, set forth below in Section 8.0 Reasonable and Prudent Measures, are directed at educating construction personnel of the protected status of this species and providing clear instructions that reduce the likelihood for intentional or accidental injury, harm, harassment, or killing of this species.

The direct impacts associated with habitat loss are expected to be moderated due to the phased approach to construction and the permanent availability of the 16.9 ha (41.8 ac) of forested wetland hammocks located along the western project site boundary. This wetland hammock is recognized to provide excellent feeding habitat and potential den sites (R. Smith pers. comm.). Additionally it is part of a contiguous landscape that extends westward, with minimal fragmenting barriers, from the Preferred Alternative 1 site to the Indian River Lagoon.

The significance of the indirect and cumulative effect of development of the proposed ISRP action to build-out, over-time, have been classified on Table 5 as high due to the increased potential for road mortality and encounters with humans. The "Figure 8" configuration of the road network proposed for the Preferred Alternative 1 site causes a snake to negotiate multiple road crossings to travel through the site, unless the individual selects the intact wetland hammock corridor to be maintained along the western boundary. Data from several radiotagged indigo snakes at KSC suggest that

indigo snakes frequently travel along and feed within the shallow-sloped ditches and surrounding vegetation (Kehl et al. unpublished data, R. Smith, unpublished data). This presents a concern that the proposed centrally-located stormwater management system design for Preferred Alternative 1 site may attract snakes into the complex road network to forage along the vegetated shallow slopes, increasing the potential for vehicular impacts. A factor that slightly reduces the likelihood for road mortality is the lower speed limits of 40 to 48 km/hr (25-30 mph) to be established on the interior access roads.

The indirect and cumulative effects of the proposed action, primarily the adverse habitat fragmentation effects of roads and the increased human presence, over time, are determined “likely to adversely affect” the Eastern indigo snake. The potential for the proposed action to result in “take” (Section 3 (18) of the ESA) of the indigo snake in the form of “harm” is likely. Harm is defined as an act that actually kills or injures wildlife. Such act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering (50 CFR §17.3).

7.2 Alternative 2 and SERPL Expansion Parcel

The proposed land use plan for Alternative 2 (Figure 4), inclusive of the SERPL Expansion parcel, would cause, at complete build-out projected over a 20 to 25 year time frame, the loss of approximately 86.8 ha (214.4 ac) of existing habitat. This comprises 59% of the total habitat on the Alternative 2 site and 100% of the SERPL Expansion parcel (Table 4). Upland habitat types that would be impacted include 97% of the oak scrub (FLUCCS-4210), 66% of the scrubby flatwoods (FLUCS-4111), and 92% of the disturbed scrubby flatwoods (7400) on the Alternative 2 site and 100% of the upland habitats on the SERPL Expansion parcel (Table 4). Approximately 1.4 ha (3.6 ac) of high quality freshwater swale marshes (FLUCCS-6410) and 1.5 hectare (3.7 ac) of reservoir (FLUCCS – 5340) impacts are required on Alternative 2. The 0.5 ha (1.1 ac) of medium quality mixed wetland hardwoods (FLUCCS-6170) on the SERPL Expansion parcel would also be impacted under the proposed ISRP land use plan.

Upland habitats that would not be impacted under the Alternative 2 proposed land use plan include approximately 19.4 ha (48 ac) located within the conservation area and 6.9 ha (17.1 ac) contained within the 25 ft (7.6 m) buffers surrounding each preserved wetland. Approximately 21.4 ha (52.9 ac) or 94% of the freshwater swale marshes (FLUCCS-6410) and 100% of the mixed wetland hardwood wetlands (FLUCCS-6170) would also be maintained under the Alternative 2 proposed land use plan. Development of the master stormwater system would result in the creation of a total of 8.5 ha (21.0 ac) of open surface water habitat, including the integration of the existing reservoir located along the Alternative 2 north boundary into the stormwater system.

In contrast to the Preferred Alternative 1, the main Alternative 2 site provides optimal habitat conditions to listed species throughout most of the site.

7.2.1 Florida Scrub-Jay

As discussed above, the Tel-4 Florida scrub-jay population, consisting of a minimum of 41 contiguous territories in 2002 (Breininger, Oddy, and Clark unpublished data) occupying the scrub and flatwoods landscape located east of Kennedy Parkway South (S.R. 3), inclusive of the Alternative 2 site, has been the subject of long-term demographic and dispersal studies (Breininger and Oddy 2001, Breininger et al. 1995, 1996a, 1996b, 1998). A recently published study by Breininger and Oddy 2001 is summarized below to partially support the determination that the proposed action is "likely to adversely affect" the scrub-jay population on and surrounding the Alternative 2 site.

This referenced study focused on the Tel-4 scrub-jay population to describe the source-sink dynamics within the frequently burned Tel-4 landscape that is dominated by flatwoods with different arrangements of scrub oak. Three categories of scrub oak ridges were designated: 1.) primary ridges are oak scrub located on well-drained soils; 2.) secondary ridges occur on poorly drained soils and have oak patches >0.4 ha (1 ac); and 3.) tertiary ridges occur on poorly drained soils with oak patches < 0.4 ha (1 ac). Scrub-jay territories were correlated with the coverage of oak scrub with primary territories designated as including primary ridges; secondary territories included secondary but not primary ridges, and tertiary territories lacked primary and secondary ridges. Primary territories were usually sources because recruitment exceeded mortality. Secondary territories were usually sources when enough oak was at optimal height (>0.13 ha (0.3 ac)) and when population densities were not too high (<5 pairs/40 ha (100 ac)). During high population densities, most secondary territories were psuedo-sinks where mortality temporarily exceeded reproduction. Tertiary territories were mostly sinks because mortality exceeded recruitment and immigration exceeded emigration (Breininger and Oddy 2001).

The oak scrub habitat classified on Alternative 2 would be considered primary ridge habitat. The scrubby flatwoods, including the disturbed scrubby flatwoods, would be mostly classified as secondary ridge habitat. The patches of flatwoods embedded within the large freshwater swale marsh system located in the southeastern quadrant of the site would likely be classified as tertiary ridge habitat due to the sparse coverage of oak.

Seven of the 10 scrub-jay territories mapped on the Alternative 2 site in 2002 would be considered primary territories with two of the remaining classified as secondary territories and the final territory partially located in the extreme southeast corner of the site classified as a tertiary territory. Based on the Breininger and Oddy (2001) study, the majority of the territories presently occurring on the Alternative 2 site are likely sources to the local KSC scrub-jay population.

The proposed land use plan for Alternative 2 site would cause, over time, the direct loss of 72.8 ha (179.9 ac). This includes the entire primary ridge habitat, 64% of the secondary ridge habitat, and none of the tertiary habitat. Each of the seven primary territories and both of the secondary territories would be directly impacted. The only

territory that would not be impacted is the tertiary territory partially located in the southeast corner of the site and extending off-site to the south. Most of the habitat within this territory is freshwater swale marshes with embedded tertiary ridges. It is likely, using the above data, that this may be the only territory on the Alternative 2 site that is functioning as a “sink”.

The negative effects of habitat fragmentation on Florida scrub-jays are well documented (Fitzpatrick et al. 1994, Thaxton and Hingtgen 1996, Breininger 1999, Breininger et al. 1994, 1996b, 2001). A recent study of the demography of scrub-jays within a suburban matrix found that urbanization has a negative effect on scrub-jays in preserves that are adjacent to suburbs and that these effects were independent of development density (R. Bowman 2001). Juvenile recruitment is reduced by nestling brood reduction mortality and increased post-fledging (R. Bowman 2001). This study may have negative implications here for those territories that adjoin the Alternative 2 territories. Within habitat fragments, densities and hunting efficiency of avian and mesopredators increase; habitat quality declines due to disruptions in fire patterns leading mostly to fire exclusion and from introduction of exotic plants; and displaced scrub-jays are forced to disperse greater distances through hostile landscapes (Fitzpatrick et al. 1994, Breininger et al. 1994, Breininger 1999).

The proposed construction of 4.7 km (2.9 mi) interior access roads is also expected to have a negative influence on the local scrub-jay population, immediately and over time, although the low speed limits may reduce these the number of vehicular collisions. Noise associated with construction and operation is greater along edges altering critical behaviors (mating, foraging, resting) and influences predator detection, and prey location (Brown et al. 1990, Breininger et al. 1994).

Implementation of the proposed action on the Alternative 2 site, exclusive of SERPL Expansion site, would result in the direct “take”, in the form of “harm”, of a minimum of eight Florida scrub-jay territories. The indirect and cumulative effects of the proposed action are also expected to adversely affect the surrounding Tel-4 population with the negative influence of the proposed action potentially extending beyond to the regional KSC population. The Tel-4 population is the only population on KSC that is not in decline and is known to be actually increasing (Breininger et al. 1994, D. Breininger email–2/7/03). The significant impacts to Florida scrub-jays that would result from the proposed ISRP action on Alternative 2 could be detrimental to core recovery efforts at KSC (D. Breininger email– 2/7/03).

7.2.2 Eastern Indigo Snake

With regard to this listed species, the direct, indirect and cumulative effect determinations described for implementation of the proposed action on the Preferred Alternative 1 site apply on the Alternative 2 site. However, the significance of these effects is considered greater on the Alternative 2 site. The baseline habitat conditions for indigo snakes on Alternative 2 are excellent; therefore changes to this system over time would have much greater ecological consequences to this dependent species. The

scrub and pine flatwoods habitat type covering Alternative 2 site is considered critical for the continuation of this species on KSC (Breininger et al. 1994).

The indirect and cumulative effects of the proposed action on Alternative 2, primarily the adverse habitat fragmentation effects of roads and the increased human presence, over time, have been determined “likely to adversely affect” the eastern indigo snake.

7.2.3 Bald Eagle

Bald eagle nesting is not documented within the Alternative 2 site boundaries, however as shown on Figure 7 two active bald eagle nests are within 1.6 km (1 mi) of the site (MINWR and USFWS unpublished 2002 data). The closest nest is 0.6 km (0.4 mi) from the southeast corner of Alternative 2. An additional active eagle nest is within 2 km of the northeast boundary of the site (Figure 7) (MINWR and USFWS unpublished 2002 data). Pine flatwoods are the primary nesting habitat type for bald eagles at KSC and are considered critical to the continuation of this species on KSC (Breininger et al. 1994).

As indicated on Table 5, the primary adverse effects of the proposed action on this species is predicted to be associated with construction noise in the short-term and operation noise and lighting in the long-term. This disturbance has the potential to cause eagles to forego nesting and perhaps completely abandon the nest site (Wood et al. 1989). The majority of the bald eagle nest sites on KSC are located approximately 1.5 km (0.9 mi) from occupied buildings, which may indicate individual intolerance for operational noise, lighting and human presence. This is reflected in the management and monitoring objectives for KSC and nearby populations prepared by Hardesty and Collopy (1991). They recommended increasing the primary management zones to a 1 km (0.6 mi) radius and secondary zones to a 2 km (1.2 mi) radius and limiting human access within 1 km (0.6 mi) of the nest site during August 15-April 30) and within 1 km (0.6 mi) of foraging areas (October 1-April 30). These KSC-specific guidelines are more conservative than the USFWS *Habitat Management Guidelines for the Bald Eagle in the Southeast Region* (1987). These guidelines recommend a primary zone extending a minimum of 750 ft (0.2 km) to a maximum of 1500 ft (0.5 km) from the nest tree and a secondary zone extending from the outward boundary of the primary zone a minimum distance of 750 ft (0.2 km) to maximum of 1 mi (1.6 km). Figure 7 provides a delineation of the maximum primary and secondary zones around each of the closest eagle nest sites. The USFWS guidelines further recommend that no construction occur within 1500 ft (0.5 km) of the nest tree during the nesting season (October 1-May 15) (USFWS 1987). Review of Figure 7 shows that Alternative 2 lies just outside the 1500 ft (0.5 km) primary zone of the closest eagle nest site. The tolerance of individual eagle pairs to human disturbance, defined as a change in eagle behavior that is induced by human activity (Fraser et al. 1985) or habitat alteration, vary widely (USFWS 2002). In order to evaluate the actual response of the subject eagles to development on the Alternative 2 site, NASA would implement a monitoring program, conducted in accordance with Bald Eagle Monitoring Guidelines (USFWS 2002), for any development activities occurring within 1 km (0.6 mi) of a bald eagle nest tree. Until the actual response is established,

the significance of the indirect and cumulative effects of operation noise, lighting and human presence on this listed species is predicted to be high or "likely to adversely affect" based on the proximity of the nest site to the Alternative 2 site (Table 5).

Bald eagles are the subject of vehicular collisions when feeding on carrion along roadways (Hardesty and Collopy 1991, Breininger et al. 1994). However, the slow speed limits to be applied to the interior access roads proposed for Alternative 2 and large size of this species should minimize the potential for road mortality.

7.2.4 Wood Storks

The use of the Alternative 2 site by wood storks is expected to be limited to the upland cut ditch located on the southern boundary of the site. Development impacts to this ditch, over and above baseline maintenance conditions presently conducted by the MINWR, are not proposed immediately or over time. Due to the common availability of ditch habitat and large foraging range of wood storks, the proposed action has been determined "not likely to adversely affect" this listed species.

8.0 Reasonable and Prudent Measures

The above impact analysis clearly demonstrates that the adverse effects of the proposed action on federally listed species would be significantly minimized by building the ISRP development project on the Preferred Alternative 1 site and SERPL Expansion parcel.

Federally listed species for which a "likely to adversely affected" or "take" determination was predicted are listed below for each alternative site with corresponding reasonable and prudent measures provided to minimize impacts on the individual species affected by the proposed ISRP action.

8.1 Preferred Alternative 1 and SERPL Expansion Parcel

8.1.1 Eastern Indigo Snake

The following measures established by the USFWS would be implemented by NASA to minimize the direct effects on this listed species associated with construction operations:

STANDARD PROTECTION MEASURES FOR THE EASTERN INDIGO SNAKE

1. An eastern indigo snake protection/education plan shall be developed by the applicant or requestor for all construction personnel to follow. The plan shall be provided to USFWS for review and approval at least 30 days prior to any clearing activities. The educational materials for the plan could 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 USFWS, or designated as an agent of the State of Florida by the FFWCC 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 USFWS North Florida Field Office within 60 days of the conclusion of clearing phases. The report should be submitted whether or not eastern indigo snakes are observed. 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. thorough description of the preserve area for eastern indigo snakes if a preserve area was approved (*e.g.*, types of habitats, percent cover of dominant species); and
   d. summaries of maintenance activities and schedules for the preserve area.

8.2 Alternative 2 and SERPL Expansion Parcel

8.2.1 Florida Scrub-Jay

A scrub habitat compensation plan for impacts to scrub-jay habitat resulting from past NASA construction actions was completed in consultation with the Endangered Species Office of the USFWS in 1994 (Schmalzer et al. 1994). The compensation ratio established under this plan was 2:1 (scrub habitat restored or created: scrub habitat lost). Application of this compensation ratio to the 72.8 ha (179.9 ac) of occupied scrub-jay impacts that would result from the proposed action at Alternative 2 would require NASA to develop a plan to restore or create a total of 145.6 ha (359.8 ac). This plan would be developed in consultation with the USFWS if Alternative 2 and the SERPL

Expansion Parcel were selected by NASA as the ISRP action site. Due to the importance of the Tel-4 scrub-jay population to the recovery of the regional KSC population, the issuance of an incidental take statement would be contingent upon a finding of “no jeopardy” by the USFWS.

8.2.2 Eastern Indigo Snake

The USFWS Standard Protection Measures for the eastern indigo snake, as provided above, would be implemented to reduce the direct effects of the proposed ISRP construction action.

8.2.3 Bald Eagle

A monitoring program conducted in accordance with Bald Eagle Monitoring Guidelines (USFWS 2002) would be implemented by NASA if proposed construction is planned on Alternative 2 within 1 km (0.6 mi) of the closest nest trees during the nesting season. This monitoring program would serve to establish the significance of the effects of the proposed action on the nesting behavior of this listed species.

9.0 Summary

The analysis of the effects of the proposed ISRP action on federally listed species was conducted in accordance with 50 CFR 402.12. Although, not specifically required by 50 CFR 402.12, this analysis considered two alternative sites, the Preferred Alternative 1 and SERPL Expansion parcel and the Alternative 2 and SERPL Expansion parcel. This analysis, which evaluated direct, indirect, and cumulative effects, determined that significant adverse impacts of the proposed action could be substantially minimized by NASA’s selection of the Preferred Alternative 1 and SERPL Expansion parcel location for ISRP project development. The predicted effects and the significance of the effect on federally listed wildlife considered under this BA are summarized in Table 5.

The baseline environmental conditions of most (86%) of the existing habitats types on the Preferred Alternative 1 and SERPL Expansion Parcel are highly degraded due to historical conversion of both sites for citrus production and the development of an extensive drainage system to support this production. Only two of the 11 federally listed wildlife species known to occur at KSC are expected or documented to occur on the Preferred Alternative 1 site and SERPL Expansion parcel. This includes the wood stork and eastern indigo snake, of which the indigo snake has been observed on the Preferred Alternative 1 site.

The ISRP action is expected to have no or minimal effects on the wood stork potentially using the ditches on the main Preferred Alternative 1 site due to the abundance of the artificial habitat type on KSC and the wide ranging foraging habits of the wood stork. The direct adverse effects associated with construction of the proposed action on the eastern indigo snake would be minimized by implementing the USFWS Standards Protection Measures for the eastern indigo snake as a reasonable and prudent measure during

construction. The indirect and cumulative effect determination of the action associated with habitat fragmentation and construction of 4.5 km (2.8 mi) of road, at the time of total build-out, is determined “likely to adversely affect”. This is based primarily on the high probability of the proposed action resulting in individual road mortality to this wide-ranging species and increased potential for encounters with humans. The preservation of 16.9 ha (41.8 ac) of preferred wetland hammock habitat located along the western property boundary of the Preferred Alternative 1 site would provide a corridor through the site and may serve to reduce the likelihood for vehicular collision and harassment by the increased human population. Additionally, the slow speed limit of 40 to 48 km/hr (25-30 mph) proposed for the internal access roads may serve to reduce road mortality.

The Alternative 2 site located east of Kennedy Parkway South (S.R. 3) is mostly undisturbed scrubby flatwoods with scrub oak on ridges and freshwater marshes in swales. This site has burned periodically over time with a recent burn in 1998. Openings in the scrub are present, the pine canopy is open, and the native shrub understory is low (< 170 cm (5.6 ft)) providing optimal habitat conditions for 16 state listed and four federally listed wildlife species, particularly the Florida scrub-jay. A minimum of 10 scrub-jay territories are documented to occupy the entire Alternative 2 site. The pine flatwoods matrix habitat also provides important habitat to the eastern indigo snake and the bald eagle. Neither of these species has been documented to occur on the site.

The effects analyses for the proposed action on Alternative 2 resulted in a “likely to adversely affect” determination for the Florida scrub-jay, eastern indigo snake, and bald eagle. The direct, indirect, and cumulative effects of the proposed action on the Florida scrub-jay population occupying Alternative 2 would have significant adverse local, and potentially regional, effects. Compensation, if authorized by the USFWS, for the direct “take” of as many as nine scrub-jay territories would be substantial. Habitat fragmentation and road mortality is expected to significantly impact the eastern indigo snake, likely resulting in a “take” of individuals of this species over time. Construction noise, operation noise and lighting, and increased human presence may significantly disturb nesting behaviors of nearby eagles potentially causing nest abandonment. Because the tolerance of individual eagles to disturbance varies, a reasonable and prudent measure that would be implemented is the monitoring of eagle response to construction noise during the nesting season.

The wood stork is identified as potentially using the ditch located along the southern boundary of Alternative 2. Based on the common habitat occurrence and broad foraging range, a “not likely to adversely affect” determination was made for this species on Alternative 2.

APPENDIX A
Primary Resource Documents Used to Prepare Biological Assessment

Endangered and Potentially Endangered Wildlife on John F. Kennedy Space Center and Faunal Integrity as a Goal For Maintaining Biological Diversity. March 1994. NASA Technical Memorandum 109204. by Breininger, D.R., M.J. Barkaszi, R.B. Smith, D.M. Oddy, and J.A. Provancha.

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Literature Cited and Personal Communications

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IN REPLY REFER TO:
FWS/R4/ES-JAFL

June 11, 2003

Mr. Mario Busacca
NASA Environmental Management
Office
Mail Code TA-C3
Kennedy Space Center, Fl. 32899

Dear Mr. Busacca:

This document transmits the Fish and Wildlife Service's biological opinion based on our review of the proposed International Space Research Park (ISRP) at National Aeronautics and Space Administration (NASA) Kennedy Space Center (KSC) (Service Log No: 03-1161) located in Brevard County, Florida, and its effects on the eastern indigo snake, wood stork and Florida scrub jay, in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (Act). Your May 23, 2003 letter, requesting formal consultation was received on May 29, 2003 and formal consultation was initiated on that date.

This biological opinion is based on information provided in the May 29, 2003, letter; Biological Assessment for the project and a meeting at KSC. A complete administrative record of this consultation is on file in the Jacksonville Field Office.

CONSULTATION HISTORY

On March 25, 2003, Service representatives met with representatives from KSC and their consultant to discuss the project.

On May 29, 2003, KSC initiated consultation with the Service.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

The KSC has entered into an agreement with the State of Florida's Florida Space Authority to study the development of an ISRP on KSC land. The BA identifies two alternatives. The

Preferred Alternative site is about 316 acres and historically converted for citrus production. The second alternative is about 321 acres and is characterized as scrubby pine flatwoods matrix with elevated oak ridges. The majority of this site is undisturbed natural habitat. As previously discussed, this consultation addresses only the Preferred Alternative. If KSC selects another alternative, reinitiation of consultation will be required.

The results of the wildlife surveys within the Preferred Alternative site resulted in the sighting of one eastern indigo snake. The habitat is not suitable for the Florida scrub jay. While wood storks may be found feeding in the road side ditches, no wood storks were observed. The closest bald eagle nest is located about 2.1 miles from the proposed site. Therefore, the Service has determined that the use of Preferred Alternative site is not likely to adversely affect either the wood stork or the Florida scrub jay.

STATUS OF THE SPECIES/CRITICAL HABITAT

Species/critical habitat description

The eastern indigo snake is the largest nonpoisonous snake in North America, attaining lengths of up to 104 inches (Ashton and Ashton 1981). The adult eastern indigo snake is glossy black in color with red, rust, or white under the chin; juveniles have a light, blotched pattern.

Threats to this species are habitat destruction from development, gassing of gopher tortoise (*Gopherus polyphemus*) burrows, highway mortality, residual pesticides, and blatant killing (Diemer and Speake 1981, U.S. Fish and Wildlife Service 1982). Low density development is also a potential threat to indigo snakes, increasing the likelihood of snakes being killed by property owners and domestic pets. Lawler (1977) noted that habitat has been destroyed by real estate development and farming agriculture. He stated that the loss of natural sandhill habitat from agricultural production, construction, and forestry is increasing, with losses at the rate of five percent per year in Florida. Bioaccumulation of pesticides may pose a potential hazard to the snake as well (Speake unpublished data).

Life history/Population Dynamics

Over most of its range in Florida, the indigo snake frequents diverse habitats such as pine flatwoods, scrubby flatwoods, flood plain edges, sand ridges, dry glades, tropical hammocks, muckland fields, and xeric sandhill communities. On the central east coast, indigos can be found in orange groves and near ditches and canals. In south Florida, they are found in pine woods and tropical hammocks, or in most undeveloped areas (Kuntz 1977). The snake also utilizes agricultural lands and various types of wetlands, with higher population concentrations occurring in sandhill/pineland regions in northern and central Florida.

Adult male eastern indigo snakes have larger home ranges than adult females and juveniles, encompassing as much as 553 acres (224 hectares) in winter and 390 acres (158 hectares) in

summer (Moler 1986). A gravid female may use from 3.4 acres (1.4 hectares) to 106 acres (42.9 hectares) (Smith 1987).

Status and Distribution

The indigo snake (*Drymarchon corais*) ranges from southeastern United States to Argentina. *Drymarchon corais* has eight recognized subspecies, two of which occur in the United States (Conant 1975, Moler 1985). At one time, the eastern indigo snake (*Drymarchon corais couperi*) occurred throughout the coastal plain of the southeastern United States, ranging from South Carolina to Florida and west to Louisiana. Georgia and Florida currently support the remaining populations of the eastern indigo snake (Lawler 1977).

Analysis of the Species/Critical Habitat Likely to be Affected

The proposed site is a citrus grove intermixed with ditches.

ENVIRONMENTAL BASELINE

Action Area

The action area for this consultation is the 316-acre site identified as the Preferred Alternative.

Status of the Species in the Action Area

This species has been observed on-site. Based on radio telemetry studies conducted at KSC and reported in the BA, this species has been documented using citrus groves. Intermixed throughout the site are ditches that are also used by these snakes.

Factors affecting species environment within the action area

The construction of the ISRP and use of the facilities will more than likely result in the incidental take of eastern indigo snakes. Snakes may be killed during construction as well as killed on the road ways after the facility becomes operational.

EFFECTS OF THE ACTION

This section includes an analysis of the direct and indirect effects of the proposed action on the species and critical habitat 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 effect 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

Animals that are unable to move away from the construction may be injured or killed; otherwise they will move off-site. Based on results from radio telemetry on KSC, snakes will more than likely be observed on the property from time to time.

Species' response to the proposed action

Eastern indigo snakes will attempt to move away from areas of construction; however, it is inevitable that a snake maybe injured or killed as a result of the construction or use of the facilities.

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. The Service has considered cumulative effects, and determined they do not apply in this instance.

CONCLUSION

After reviewing the current status of the eastern indigo snake, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the Service's biological opinion that the proposed project is not likely to jeopardize the continued existence of the eastern indigo snake. No critical habitat has been designated for this species, therefore, none will be affected.

INCIDENTAL TAKE

Sections 4(d) and 9 of the Act, as amended, prohibit taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect or to attempt to engage in any such conduct) of listed species of fish or wildlife without a special exemption. "Harm" and "harass" are further defined in Service regulations (50 CFR 17.3). "Harm" is defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. "Harass" is defined as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns, which include, but are not limited to, breeding, feeding or sheltering.

Under the terms of sections 7(b)(4) and 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking 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 require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

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

The Service has reviewed the biological information for this species, information presented by the applicant's consultants, and other available information relevant to this action, and based on our review, incidental take, in the form of harm or harassment, is reasonably certain to occur for all eastern indigo snakes and their eggs on the 316-acre project site.

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

When providing an incidental take statement the Service is required to give reasonable and prudent measures it considers necessary or appropriate to minimize the take along with terms and conditions that must be complied with, to implement the reasonable and prudent measures. Furthermore, the Service must also specify procedures to be used to handle or dispose of any individuals taken. The Service believes the following reasonable and prudent measures are necessary and appropriate to reduce take:

Implement on-site procedures to avoid take of the eastern indigo snake.

Terms and Conditions

To implement the above reasonable and prudent measure, 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 measure(s) for incidental take.

1. An eastern indigo snake protection/education plan shall be developed by the applicant or requestor 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 could 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, then frozen.

2. Only an individual, who has been either authorized by a section 10(a)(1)(A) permit issued by the Service, or designated as an agent of the State of Florida 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 South Florida Field Office within 60 days of the conclusion of clearing phases. The report should be submitted whether or not eastern indigo snakes are observed. 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. thorough description of the preserve area for eastern indigo snakes if a preserve area was approved (*e.g.*, types of habitats, percent cover of dominant species);

and

d. summaries of maintenance activities and schedules for the preserve area.

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.

REINITIATION OF SECTION 7 CONSULTATION

This concludes formal consultation on the actions outlined in the request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required when discretionary Federal agency involvement or control over the action has been retained and if: (1) new information reveals effects of the agency action that may effect listed species or critical habitat in a manner or to an extent not considered in this biological opinion, (2) NASA action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this biological opinion, (3) a new species is listed or critical habitat designated that may be effected by the action, or (4) another alternative is selected for the ISRP.

Sincerely,

Don Palmer

for Peter M. Benjamin
Assistant Field Supervisor

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