

FINAL
ENVIRONMENTAL ASSESSMENT
FOR THE
SHUTTLE LAUNCH SIMULATOR FACILITY

May 2005

KSC TA DIRECTORATE

National Aeronautics and
Space Administration

John F. Kennedy Space Center

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NOTE: DIMENSIONS ARE IN METRIC AND ENGLISH UNITS.



ENVIRONMENTAL ASSESSMENT
FOR THE
SHUTTLE LAUNCH SIMULATOR

PREPARED BY
BRPH Companies

PREPARED FOR
National Aeronautics and Space Administration
John F. Kennedy Space Center
Environmental Program Branch
Kennedy Space Center, FL

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ABBREVIATIONS AND ACRONYMS

ac	Acre
ADA	American with Disabilities Act
ALS	Advanced Life Support
AMF	Astronaut Memorial Foundation
ASCE	American Society of Civil Engineers
ASTs	aboveground storage tanks
BMPs	Best Management Practices
BTU	British Thermal Units
CBS	Controlled Biological Systems
CCAFS	Cape Canaveral Air Force Station
CD&SC	Communications Distribution and Switching Center
CIF	Central Instrumentation Facility
CNS	Canaveral National Seashore
CO	carbon monoxide
COE	U.S. Army Corps of Engineers
dBA	decibels, weighted to the A-scale
EA	Environmental Assessment
EDL	Engineering Development Lab
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ETDC	Engineering Technology Development Complex
FCREPA	Florida Committee on Rare and Endangered Plants and Animals
fc	foot candles
FDER	Florida Department of Environmental Regulation
FEMA	Federal Emergency Management Agency
FLUCFCS	Florida Land Use, Cover and Forms Classification System
FPL	Florida Power and Light
ft	feet
ft ²	square feet
FWCC	Florida Fish and Wildlife Conservation Commission
gal	gallons
GPD	gallons per day
gsf	gross square feet
ha	hectares
HDPE	high-density polyethylene
IRL	Indian River Lagoon
ISS	International Space Station

in	inch
kg	kilogram
km	kilometers
KSC	Kennedy Space Center
kVA	kilovolt/amps
L	liters
LC	Launch Complex
LEED	Leadership in Energy and Environmental Design
LETF	Launch Equipment Test Facility
Lf	linear feet
LOS	level of service
lpd	liters per day
m	meters
m ²	square meters
MBH	Million BTU per hour
mgd	million gallons per day
mld	million liters per day
mg/L	milligrams per liter
mi	miles
MINWR	Merritt Island National Wildlife Refuge
mLd	million liters per day
MMPA	Marine Mammal Protection Act
MW	Megawatt
N/A	Not Applicable
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NGVD	National Geodetic Vertical Datum
NMI	NASA Management Instruction
NO ₂	nitrogen dioxide
NPS	National Park Service
O&C	Operations and Checkout
O ₃	ozone
OSHA	Occupational Safety and Health Administration
PAMS	Permanent Air Monitoring System
R&D	Research and Development
SJRWMD	St. Johns River Water Management District
SLF	Shuttle Landing Facility
SO ₂	sulfur dioxide
SLSF	Space Shuttle Launch Simulator Facility
SSPF	Space Station Processing Facility

STDN	Spaceflight Tracking and Data Network
STS	Space Transportation System
STP	Sewage Treatment Plant
SWMU	Solid Waste Management Unit
U.S.	United States
USFWS	U.S. Fish and Wildlife Service
VAB	Vehicle Assembly Building

ABSTRACT

ENVIRONMENTAL ASSESSMENT
FOR
SHUTTLE LAUNCH SIMULATOR
Kennedy Space Center, Florida

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Abstract

This Environmental Assessment (EA) addresses the Proposed Action to construct the Space Shuttle Launch Simulation Facility (SLSF) at the KSC Visitor Complex, Florida. The Proposed Action development consists of approximately 9.10-hectares (ha) (22.50-acres (ac)) of land located within the northeast corner of the KSC Visitor Complex at Space Port USA and within an existing abandoned citrus grove east of the main entrance to the KSC Visitor Complex and south of NASA Parkway West. The Proposed Action would construct a new Shuttle Launch Simulator and associated infrastructure providing educational outreach regarding the shuttle program and manned space flight for the enhancement of the Kennedy Space Center's mission.

The Proposed Action and the No Action Alternative were evaluated to determine the extent of impacts to the environment at KSC. The Proposed Action development location is three parcels totaling 9.10- ha (22.50-ac) south of NASA Parkway West and east of the main entrance to the KSC Visitor Complex. The No Action Alternative would consist of not constructing the SLSF.

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

This Environmental Assessment (EA) addresses the Proposed Action to construct the Space Shuttle Launch Simulation Facility (SLSF) at KSC Visitor Complex, Florida, on three parcels totaling 9.10-ha (22.50-ac) located south of NASA Parkway West within the KSC Visitor Complex and east of the Visitor Complex entrance. The Proposed Action will use an existing stormwater retention area and other existing infrastructure for redevelopment and an abandoned citrus grove. The SLSF would provide a location for educational outreach regarding the Shuttle program and manned space flight for the enhancement of NASA's mission.

The Proposed Action location consists of three parcels totaling 9.10-ha (22.5-ac) located south of NASA Parkway West, within the KSC Visitor Complex and east of its main entrance. This alternative contains an existing stormwater retention and infrastructure to construct the SLSF, bus drop-off area, sidewalks, entrance road into an existing employee parking area. An existing abandoned citrus grove would become the location of new stormwater retention and a mechanical chiller enclosure. Each parcel is evaluated and discussed in detail within this document.

The No Action Alternative was evaluated to determine the impact of not constructing the SLSF to the environment at KSC.

This document describes those portions of the KSC environment that relate to each of the alternatives. Issues identified are transportation, utilities, air quality, noise, surface water quality, groundwater quality, socioeconomic, and land use. The impacts affecting each issue were considered from the perspectives of construction and operation of the proposed action and the no action alternative.

The results of the assessment of the environmental issues related to construction indicate that there are potential minor impacts of the Proposed Action on *existing facilities* due to construction occurring within the Visitor's Center that may restrict tourists' use of a facility and *socioeconomics* due to the temporary addition of a local construction workforce. This analysis identified minimal impacts of the Proposed Action to *transportation* due to increased construction traffic within Visitor's Center area of KSC; *surface water* impacts due to site preparation and stormwater system; and *threatened and endangered species* due to removal of habitat by impacting abandoned agricultural land. Minimal impacts would be expected to *land use* at the Proposed Action location—the land use is currently abandoned citrus grove and it would become urban with the addition of the SLSF. Minimal impacts are also expected to *air quality* at the Proposed Action location due to land clearing, vegetation removal, heavy equipment operation, and increased *noise* levels during construction of the Proposed Action and

by increased traffic. Minimal impacts are expected to *vegetation, wildlife and geology*. No impacts from construction are expected to *utilities, cultural resources, or groundwater*.

The results of the assessment of the environmental issues related to the operation of the Proposed Action indicate that there are minor impacts due to increased loads to some existing *utilities*, such as *water* and *electric, air quality*, increased *socioeconomics* due to an increase in employment and tourism opportunities, and *existing facilities* due to the addition of a new attraction which may cause long lines and decrease the visitation of the other facilities at the Visitor's Center. The Proposed Action would also be expected to produce minimal impact to traffic both on the off of KSC. However, as compared to the existing traffic loads and the capacity of the roads to accommodate the expected increases, there is no expectation that any reduction in service will occur. Minimal impacts are expected to some *utilities, noise, and surface water quality* once the Proposed Action is in operation. Minimal impacts are also expected to *threatened and endangered species* due to construction on existing agricultural land. Minimal impacts are also expected to *transportation* due to the potential of new KSC employees and visitors. No impacts to operation are expected to some *utilities, line-of-sight, land use, vegetation, wildlife cultural resources, geology and soils, or groundwater*.

SECTION I

PURPOSE AND NEED FOR ACTION

SECTION I

PURPOSE AND NEED FOR ACTION

1.1 PURPOSE

The purpose of the Proposed Action is to construct a new state-of-the-art tourist facility for use by visitors to KSC. The Shuttle Launch Simulation Facility (SLSF) would contain a visitor's attraction that would allow guests to experience a simulated Space Shuttle launch. The SLSF would provide the visitors with educational information on manned space flight systems and details about past and future Space Shuttle missions. Additional development would be for supporting infrastructure including a stormwater system to support the existing 6.42-ha (15.86-ac) sub-basin drainage area of the KSC Visitor Center.

1.2 NEED FOR ACTION

As the primary launch site for Space Shuttle missions, the Kennedy Space Center and the State of Florida have the obligation to provide state-of-the-art education and entertainment facilities in support of historical and future public understanding of space exploration. The Kennedy Space Center (KSC) Visitor Complex is one of the most visible arenas for the United States citizens and worldwide public alike to participate and learn about the National Aeronautics and Space Administration (NASA) program's history, ongoing projects, and future. Approximately 1.5 million visitors currently enter the Visitor Complex each year to look, listen, and learn about NASA. This project which will be located in the "Shuttle Plaza" of the Visitor Complex is a major enhancement in telling the NASA Space Shuttle Story. If no action is taken, this valuable element will not be experienced by the visitors. This type of state-of-the-art improvement would enhance the Visitor Complex and thus the attendance of both local and international visitors.

The proposed development would also allow for an enhanced stormwater system that will provide treatment for two sub-drainage areas located within the KSC Visitor Complex that are not currently permitted. If no action is taken, the two sub-drainage basins will remain un-treated and un-permitted potentially resulting in stormwater management problems within the KSC Visitor Complex.

SECTION II

**DESCRIPTION OF PROPOSED ACTION AND
ALTERNATIVE**

SECTION II

DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.1 GENERAL

The visitor experience currently consists of the main campus and three featured bus tour destinations inside the NASA secured areas. They are as follows:

- Approximately 210.44-ha (520-ac) on the south side of the NASA Parkway around the current main campus;
- Approximately 7.28-ha (18-ac) on north Kennedy Parkway around the Apollo / Saturn V Center;
- The Launch Complex 39 (LC-39) Observation Post on the Saturn Causeway near the Shuttle Launch pads; and
- The International Space Station Center (ISSC) on E. Avenue SE Road near the KSC Headquarters Building. Currently only open to special tours.

The main campus of the Visitor Complex consists of a cluster of buildings with parking to the south, with the NASA Causeway to the north, and undeveloped woodlands and orange groves to the west and east, respectively. The proposed action would enhance the visitor opportunities at the main campus. The Shuttle Launch Simulation Facility (SLSF) would ultimately provide a high-action entertainment experience for the guests and residences within the main campus area. The SLSF would consist of two facilities - a 4087.6-m² (44,000-ft²) simulator facility and an outdoor mechanical chiller yard. The project would also enhance the bus drop-off area, sidewalks and the entrance roadway into the Delaware North Administration employee parking facility. The SLSF would house approximately 18 new employees of the Kennedy Space Center (KSC).

The Proposed Action site location for the SLSF is shown in Figure 1. The Proposed Action would be to construct the SLSF at KSC, Florida, on approximately 9.10-ha (22.50-ac) south of NASA Parkway West within the KSC Visitor Complex and to the east of the main entrance. This site uses an existing stormwater retention pond as the location of the SLSF, existing infrastructure for redevelopment, and abandoned citrus grove as a new stormwater system and new mechanical chiller enclosure facility (Figure 2).

The SLSF would provide the capability to enhance tourism on KSC and within the surrounding areas. Visitation to KSC is approximately 1.4 million people annually (DNCP&R 2001) with an

anticipated increase of 5% by the end of 2007. To encourage use of the entire KSC Visitor Complex, the location for the SLSF would be within the KSC Visitor Complex main campus (Figure 2). The KSC Visitor Complex has approximately 15 buildings that feature museums, theatres, memorials, gardens and conference center facilities integrated into a multi-media learning experience about historical and future space flight experiences. This includes two IMAX theatres that feature dynamic space films that have included The Blue Planet, Mission to Mars, Space Station 3D and The Dream is Alive.

The design and construction of the SLSF is aimed to improve occupant well-being, environmental performance and economic returns being consistent with NASA high standards for visitor comfort that exceed industry standards for similar uses such as theme parks. This would be accomplished through the design and use of innovative practices, standards, and technologies and based on maintaining and improving the excellence of service and visitor comfort at KSC.

2.2 PROPOSED ACTION: CONSTRUCT THE SHUTTLE LAUNCH SIMULATION FACILITY AT THE KSC VISITOR COMPLEX

The Proposed Action is to construct the SLSF on a 9.10-ha (22.50-ac) site located south of NASA Parkway West within the KSC Visitor Complex main campus and to the east of the main entrance (Figure 3). The new three-sided, multi-story facility consists of a 4087.6- m² (44,000-ft²) metal building with both show and retail spaces contained within. The building is designed to provide Guests with a realistic experience of entering a NASA type facility with the look and feel of Shuttle related facilities and elements such as the VAB and the gantry on the launch pads. The primary entrance into the building will be through a gantry to the second floor. The show elements will direct guests through the various show elements within the second and first floors of the building and exit all guests through the retail store located on the first floor. Guests exit the store on the front of the building leading to Shuttle Plaza area outside.

Construction on this site would not require the relocation of any existing buildings. Since the facility is proposed within an existing stormwater treatment system, the stormwater system will be enhanced and relocated to the east side of the main entrance to the Visitor Complex, within an existing abandoned citrus grove.

2.3 NO ACTION ALTERNATIVE

The No Action Alternative would involve not constructing the SLSF. This attraction seeks to provide entertainment and educational outreach to the public regarding the KSC manned space flight program and the overall NASA mission. Lack of action would reduce tourist opportunities

and decrease the available opportunity benefits to provide manned space flight education outreach to the general public.

SECTION III
AFFECTED ENVIRONMENT

SECTION III

AFFECTED ENVIRONMENT

3.1 GENERAL

The Kennedy Space Center (KSC) encompasses nearly 56,000-ha (140,000-ac) on the east coast of central Florida and is bordered on the west by the Indian River Lagoon, on the southeast by the Banana River Lagoon, and on the north by the Mosquito Lagoon. KSC is the primary launch and landing site for NASA's Space Shuttles with two active launch pads and is the primary eastern U.S. landing site for Space Shuttle flights. In addition to supporting the Nation's space mission operations, KSC contains within its boundaries the Merritt Island National Wildlife Refuge (MINWR) and the Canaveral National Seashore (CNS), which are managed by the U.S. Fish and Wildlife Service (USFWS) and National Park Service (NPS), respectively. This unique relationship between space flight and preservation of the environment is carefully managed to ensure that both objectives are pursued with minimal conflict with one another. The existing environment at the Proposed Action Alternative Action site is described in detail in the following sections.

3.2 FACILITIES AND INFRASTRUCTURE

3.2.1 TRANSPORTATION. KSC is served by more than 340 km (211 miles) of roadways with more than 263 km (163 miles) of paved roads and 77 km (48 miles) of unpaved roads. Of the four access roads onto KSC, NASA Parkway West serves as the primary access road for cargo, tourists, and personnel entering and leaving. This four-lane road originates in Titusville as State Road 405 and crosses the Indian River Lagoon, onto KSC. This road passes north of the Proposed Action site and continues east toward the KSC Industrial Area, where it is reduced to two lanes, crosses over the Banana River, and enters the Cape Canaveral Air Force Station (CCAFS). The second point of entry onto KSC is from the south via Kennedy Parkway South, which originates on north Merritt Island as State Road 3. This road is the major north-south artery for KSC. The third entry point is accessible from Titusville along Beach Road, which originates in Titusville as State Road 402. Beach Road intersects Kennedy Parkway North within KSC. The fourth entry point is south of Oak Hill at the intersection of U.S.1 and Kennedy Parkway North in Volusia County. The Proposed Action site can be accessed by NASA Parkway West to the main entrance of the KSC Visitor Complex (Figure 1).

3.2.2 UTILITIES. Potable water, wastewater, electrical, communications, and other various utilities, are provided to facilities across KSC.

3.2.2.1 Potable Water. KSC's potable water is supplied by the City of Cocoa, which obtains its water from artesian wells located west of the St. Johns River in Orange County and from the St. Johns River. Water enters KSC along State Road 3 from a 600-mm (24-in) water main and extends north along Kennedy Parkway South to the Launch Complex (LC)-39 Industrial Area. The average daily demand for water is 4.92 mLD (1.3 mgd) for both KSC and the CCAFS; KSC alone has an average daily demand of 3.75 mLD (0.99 mgd). Total storage capacity at KSC is approximately 15 million liters (4 million gallons) in 10 aboveground storage tanks (ASTs). The LC-39 Industrial Area has a 4-million-liter (1-million-gallon) AST and a 950,000-liter (250,000-gallon) elevated storage tank. An identical water tower is also found in the KSC Industrial Area. Fire suppression system booster pump stations and a potable water system emergency pump are located within a utility annex, which receives its supply from the LC-39 Industrial Area aboveground storage tank. The total usage of potable water for the Visitor Complex for the Fiscal Year 2003 (October 2003 thru September 2004) was 66.43 ml (17.55 mg).

3.2.2.2 Wastewater. The sanitary sewer system at KSC is composed of many lift stations that pump sanitary sewerage to the CCAFS wastewater treatment plant. Until 1997, the KSC Visitor Complex main campus had its own wastewater treatment plant with effluent ponds on-site. In 1997, the treatment plant was removed and a lift station was installed in its place. A six (6) inch diameter force main runs east through the parking area, turns north to the bank, along the south side of the canal, adjacent to the NASA Causeway. The force main then runs easterly with an eventual discharge into the 3.04 mld (800,000 gpd) Cape Canaveral Air Force Station (CCAFS) regional wastewater treatment plant (DNPSS 2001). The CCAFS treatment plant is running at 70-75% capacity (JEA 2004), allowing for additional treatment capacity at the CCAFS facility.

3.2.2.3 Communications. The KSC Communications System provides a variety of services at KSC including the following: (1) conventional telephone service; (2) transmission of large volumes of test data to central collection or reduction stations; (3) transmission of timing information from operation centers to data gathering instrumentation at widely scattered locations; (4) transmission of weather and range safety data; and (5) communication with satellites, Space Shuttles, and other hardware in space. The major segments are three distribution and switching stations located in the KSC Industrial Area (First Switch) and LC-39 Industrial Area (Second and Third Switches). These three stations provide service for over 18,500 telephones on KSC. Communications cabling for the main campus of the KSC Visitor Complex originates at the KSC industrial area and is routed underground along NASA Causeway into the Campus Main (DNPSS 2001).

3.2.2.4 Electricity. The power and lighting distribution systems for KSC has a total capacity of 137,000 kilovolt/amps (kVA) and is provided by Florida Power and Light (FPL). The power entering KSC is distributed from two main substations: C-5 Substation, servicing the LC-39 Area, and the Orsino Substation, servicing the KSC Industrial Area. The high voltage power is

distributed from the substations by over 434 km (270 miles) of overhead and underground power lines to transformers and substations at various facilities. The Visitor Complex main campus receives electricity from the 13.2KV Orsino substation, located in the KSC industrial area via load break switches and vacuum fault interrupter switches located along the south side of NASA causeway in front of the main campus (DNPSS 2001). KSC offers limited backup power to facilities that are critical launch supporting facilities. Backup power is provided by diesel generators located at both C-5 and Orsino Substations.

3.2.2.5 Chilled and High Temperature Water. The KSCVC shall provide a new Chiller Plant and electric heating Plan to provide local facilities with heating and cooling. The new Chiller Plant will provide chilled water for the SLSF and has the capability of operating two independent variable load chillers to accommodate various load conditions up to 500 tons (1,000,000 lbs).

3.2.3 LINE-OF-SIGHT. KSC contains many transmitters, radio tracking systems, communications antenna, camera pads, and visual observation points that require an unobstructed line-of-sight between the facilities and the transmitters. Line-of-sight emanate from various locations such as C-Band Station near the Shuttle Landing Facility (SLF), Central Telemetry Station, the Radar Station, Spaceflight Tracking and Data Network (STDN), the Launch Complexes, and facilities within the Vehicle Assembly Building (VAB) Area, the Industrial Area, and the CCAFS Industrial Area.

3.2.4 EXISTING FACILITIES. Facilities within KSC are grouped by function area; these areas are the Industrial Area, VAB Area, Contractors Road, Fluid Servicing Area, LC-39A Area, LC-39B Area, SLF, Visitor Complex, STDN, and CCAFS. Buildings are grouped in function areas by their location and function. Types of existing facilities at KSC are classified as permanent, semi-permanent, and temporary. The Proposed Action sites are located within the Visitor Complex main campus. Permanent facilities within this area include but are not limited to the Astronaut Memorial Foundation (AMF) Education Building, Early Space Exploration Building, Exhibits and Concessions buildings, Shuttle Plaza, Rocket Garden, ESE Building, AMF Memorial, and DNPSS Offices.

3.3 AIR QUALITY

The ambient air quality at KSC is predominantly influenced by daily operations, such as vehicle traffic, utilities fuel combustion, and standard refurbishment and maintenance operations. Air quality is also influenced to some extent by emission sources outside of KSC, primarily two regional power plants located within an 18.5-km (10-mile) radius of KSC. In addition to these sources, other operations occurring on an infrequent basis throughout the year also play a role in the quality of air at KSC. These include space launches and prescribed fire management practices.

A Permanent Air Monitoring System (PAMS) station monitors ambient air quality. The PAMS station continuously monitors concentrations of sulfur dioxide (SO₂), nitrogen dioxide (NO₂), carbon monoxide (CO), ozone (O₃), and total inhalable (10-micron) particulates, as well as meteorological data. Currently, KSC is located within an area which is classified as “attainment” with respect to the National Ambient Air Quality Standards (NAAQS) established by the Environmental Protection Agency (EPA) for all criteria pollutants (KSC 2003-D).

3.4 BIOLOGICAL RESOURCES.

On May 25 and September 30, 2004, BKI, Consulting Ecologists performed field assessments of the proposed site. During the field assessment vegetation, open waters, wetlands, and wildlife were documented and observed (Figure 2).

3.4.1 VEGETATION. Vegetation on KSC can generally be categorized into upland, wetland, and open water communities. Several plant species found on KSC are listed as species of special concern, threatened, or endangered by state and federal agencies. These species have been identified by agencies as being rare or restricted to sensitive habitats; however, there are no regulatory implications for the occurrences of listed plant species on the project site. The on-site vegetative assemblages are categorized according to the Florida Land Use, Cover and Forms Classification System (FLUCFCS) developed by the Florida Department of Transportation (Version 2 1999).

The SLSF is proposed for a single possible site location—The Proposed Action site (Figure 1). Vegetation within the SLSF project area consists of urban and past agricultural land, which includes cultivated grass and landscaping vegetation, shallow swale or ditch vegetative community types, and abandoned citrus groves community types, and one open water community. Two wetlands, one shrub and one shrub-hardwood, were identified within the existing citrus grove; however these wetlands will not be impacted by the proposed action. Table 3.1.1 summarizes the community types within the sub-basin drainage area of the Proposed Action. Table 3.1.2 summarizes the community types that will be impacted by the Proposed Action. Table 3.2 summarizes the vegetation present at the Proposed Action site.

Table 3.1.1 Community types within the sub-basin drainage area of the Proposed Action Site.

Land Cover Description	FLUCFCS	Existing Area	
		Acres	Hectares
Brazilian Pepper	4220	0.10	0.04
Abandon Citrus Grove	2240	5.89	2.38
Ditches	5120	0.22	0.09
Government, Institutional	1700	15.11	6.11
Reservoirs (< 10 ac)	5340	0.52	0.21
Roadway, Improved Surface	8140	0.66	0.26
TOTAL		22.50	9.10

Table 3.1.2 Community types that will be impacted by the Proposed Action.

Proposed Land Use	Existing Land Use		Approximate Area	
	Description	FLUCFCS	acres	hectares
launch simulator, bus drop-off, sidewalks, and entrance roadway to parking	Reservoir (> 10 ac)	5340	0.52	0.21
	Governmental, Institutional	1700	15.11	6.12
	Roadways, Improved Surface	8140	0.23	0.09
	<i>SUBTOTAL</i>		<i>15.86</i>	<i>6.42</i>
Mechanical chiller enclosure	Abandon Citrus Groves	2240	0.50	0.20
	Ditches	5120	0.04	0.02
	<i>SUBTOTAL</i>		<i>0.54</i>	<i>0.22</i>
Stormwater management system	Abandon Citrus Groves	2240	5.39	2.18
	Ditches	5120	0.18	0.07
	Brazilian Pepper	4220	0.10	0.04
	<i>SUBTOTAL</i>		<i>5.67</i>	<i>2.29</i>
Roadways, Improved Surface	Roadways, Improved Surface	8140	0.43	0.17
	<i>SUBTOTAL</i>		<i>0.43</i>	<i>0.17</i>
TOTAL			22.50	9.10

Scientific Name	Common Name	Scientific Name	Common Name	Scientific Name	Common Name
<i>Acer rubrum</i>	red maple	<i>Ludwigia</i> sp.	primrose willow	<i>Sambucus nigra</i> subsp. <i>canadensis</i>	elderberry
<i>Ampelopsis arborea</i>	pepper vine	<i>Melia azedarach</i>	chinaberry tree	<i>Sereona repens</i>	saw palmetto
<i>Andropogon</i> sp.	andropogon	<i>Panicum hemitomom</i>	maidencane	<i>Smilax</i> sp.	smilax
<i>Blechnum serrulatum</i>	swamp fern	<i>Parthenocissus quinquefolia</i>	Virginia creeper	<i>Toxicodendron radicans</i>	eastern poison ivy
<i>Casuarina equisetifolia</i>	Australian-pine	<i>Psychotria nervosa</i>	coffee	<i>Ulmus americana</i>	American elm
<i>Celtis occidentalis</i>	hackberry	<i>Quercus laurifolia</i>	laurel oak	<i>Urena lobata</i>	caesarweed
<i>Chamaecrista fasciculata</i>	partridge pea	<i>Quercus virginiana</i>	live oak	<i>Vitis rotundifolia</i>	muscadine
<i>Citrus x aurantium</i>	citrus grapefruit	<i>Rubrus</i> sp.	blackberry		
<i>Dactylis glomerata</i>	orchard grass	<i>Sabal palmetto</i>	cabbage palm		
<i>Dryopteris ludoviciana</i>	southern wood fern	<i>Salix caroliniana</i>	Carolina willow		

The Proposed Action site has a project area of approximately 9.10-ha (22.50-ac), of which approximately 8.81-ha (21.76-ac) are uplands. The upland community type, Abandon Citrus Grove (FLUCFCS 2240), dominates the project area east of the main entrance of the KSC Visitor Complex (Figure 2). A small area of Brazilian Pepper (FLUCFCS 4220) can also be found adjacent to an existing canal within the Abandoned Citrus Grove (Table 3.1.2).

3.4.2 WETLANDS AND FLOODPLAINS. There are approximately 15,300-ha (38,000-ac) of wetlands on KSC that can be characterized as freshwater herbaceous marsh, forested hammock systems, brackish water lagoons, open ocean, and managed fresh and brackish water impoundments. KSC is bordered on the western edge by the Indian River Lagoon (IRL). The IRL has been nationally recognized for its quality and species diversity. The IRL is designated as a Florida Outstanding Waterway, an Estuary of National Significance, and has been nominated as an Estuary for National Research. Shallow flats of dense submerged aquatic

vegetation including the sea grasses (*Halodule wrightii*, *Syringodium filiforme*, and *Ruppia maritima*) and the macroalga (*Caulerpa prolifera* and *Gracilaria* spp.) dominate the IRL system throughout KSC. Mixed salt-tolerant grasses dominate the edge of the IRL. Impounded salt marsh waters are found throughout KSC and are managed by the USFWS, located on the MINWR. Aquatic inland habitats on KSC include willow swamps, freshwater gramminoid marshes, and cattail marshes. The wetlands and surrounding waters of KSC support large wintering populations of waterfowl, as well as transient and resident wading bird populations.

Approximately 0.30-ha (0.74-ac) are surface waters in the form of Reservoirs (FLUCFCS 5340) or agricultural Ditches (FLUCFCS 5120) that do not require mitigation for their impact. The open water community type, Reservoirs (< 4.049-ha) (< 10-ac) (FLUCFCS 5340), is found along the eastern side of the KSC Visitor Complex within the Proposed Action site of the launch simulator facility (Figure 2). The reservoir is surrounded by cultivated, maintained grass. Several small ditches, historically used for irrigation of the citrus grove and stormwater drainage comprise the remaining wetlands. Two shrub wetlands, dominated by Brazilian Pepper, were delineated within the abandoned citrus grove; however, these two wetland systems will not be impacted by the proposed stormwater management system. The quality of the wetlands, located in the citrus groves, is very low due to their dominance by Brazilian pepper (an exotic species). Thus potential secondary impacts related to the hydrology of these wetlands are minimal.

Extensive constructed ditches and canals convey water throughout the land of KSC. All wetland canals that convey water to KSC's extensive surface water drainage system will be avoided, making the proposed stormwater management system independent of existing drainage. These ditch communities are dominated by herbaceous species such as cattail (*Typha* sp.), pennywort (*Hydrocotyle* sp.), swamp smartweed (*Polygonum hydropiperoides*), primrosewillow (*Ludwigia* sp.), Carolina willow, Brazilian pepper, and muscadine (*Vitis* sp.).

The Proposed Action is located in the 100-year floodplain (Figure 4). The design of the stormwater management system accounts for the increased storage of stormwater associated with the 100-year floodplain.

3.4.3 WILDLIFE

3.4.3.1 Birds. KSC and the surrounding coastal areas provide habitat for more than 300 bird species. Approximately 90 of these species are breeding residents, more than 100 species have been documented to winter on KSC, and the remaining species are transients that regularly use KSC terrestrial and aquatic habitats for brief periods of time. Twelve species are listed as endangered, threatened, or species of special concern by the Florida Fish and Wildlife Conservation Commission (FWCC). Of these 12 species, 5 are listed by the U.S. Fish and Wildlife Service (USFWS) as threatened or endangered and thus activities relating to these

species fall under jurisdiction of the Endangered Species Act (ESA). The most common of the federally listed species are the Florida scrub-jay (*Aphelocoma coerulescens coerulescens*), wood stork (*Mycteria Americana*), and bald eagle (*Haliaeetus leucocephalus leucocephalus*).

Wading birds are known to use the roadside canals and drainage ditches, even though none were observed during the field investigations. No listed species were documented within the Proposed Action site. Non-listed species documented in the Proposed Action site include fish crow and morning dove (*Zenaida macroura*).

3.4.3.2 Mammals More than 31 species of mammals inhabit KSC lands and waters. Evidence of raccoon and opossum, based on tracks and burrows, were also noted. Other small mammal species such as the eastern spotted skunk (*Spilogale putorius*), old field mouse (*Peromyscus* sp.), cotton rat (*Sigmodon hispidus*) and eastern woodrat (*Neotoma floridana*) may use the undeveloped portion of the Proposed Action site.

3.4.3.3 Herpetofauna The gopher tortoise (*Gopherus polyphemus*), a State-listed species of concern, is a keystone species that is best suited for Longleaf Pine-Xeric Oak (FLUCFCS 412), Xeric Oak (FLUCFCS 421), occasionally Pine Flatwoods (FLUCFCS 411), and Pine-Mesic Oak (FLUCFCS 414) communities. This species will occasionally burrow in open grass areas and have been reported within abandoned citrus groves that are located on well-drained soils.

No gopher tortoises or associated borrows were observed in the abandoned citrus grove at the Proposed Action site. Herpetofauna species that may use the Proposed Action site include the American alligator (*Alligator mississippiensis*), eastern diamondback rattlesnake (*Crotalus adamanteus*), eastern indigo snake (*Drymarchon corais*), and mole snake (*Lampropeltis calligaster*). No herpetofauna species were documented at the Proposed Action site during the field assessment.

3.4 THREATENED AND ENDANGERED SPECIES.

Thirty-seven state or federally listed wildlife species regularly use the lands or waters of KSC. Of these, seven (7) state or federally listed wildlife species could potentially use the land or waters of the Proposed Action site (Table 3.3). No listed species were observed; however, existing drainage ditches are known to support the listed wading bird species and the American alligator. The Eastern indigo snake has also been reported using similar abandon citrus habitat on Kennedy Space Center as a part of its range. No other listed species or their tracks were observed during the field assessment. Habitat quality is poor at the Proposed Action site which consists of urban area, abandoned citrus grove, drainage ditches, and a shallow reservoir used for stormwater management. Thus these sites are unlikely to provide suitable and sustainable habitat for listed species.

3.5 CULTURAL RESOURCES

Sites containing potential archeological and/or historical resources on KSC are protected under the National Historical Preservation Act, which requires that every federal agency “take into account” how each undertaking could affect historic sites. NASA has mapped various areas to indicate their potential for containing historical artifacts (AC 1992). Areas that have low potential for historical artifacts generally do not require additional Phase I or II archaeological surveys. Based on the results of the KSC-wide archeological survey, the Proposed Action site are both in low potential areas of archaeological significance. In addition, no known historic or archaeological sites are within these sites.

3.6 GEOLOGY AND SOILS

KSC is located on the eastern region of peninsular Florida, which gradually rose above a much larger feature called the Florida Plateau. Four distinct geological units lie beneath KSC and are characteristic of the coastal area of east central Florida. In descending order, these are Pleistocene and Recent Age sands with inter-bedded shell layers; Upper Miocene and Pliocene silt or clayey sands; Central and Lower Miocene compacted clays and silts; and Eocene limestones.

Table 3.3. Legally protected and proposed candidate animal species reported to occur on John F. Kennedy Space Center and their potential for occurrence within the Proposed Action site. Source: BKI, Inc. November 2004.

Scientific name	Common name	Listing Status		Habitat Preferences	Potential Occurrence
		FWC	FWS		
Mammals					
<i>Felis concolor coryi</i>	Florida panther	E	E	utilizes a wide variety of habitat types and prey covering large territories; FWS has designated critical habitat for this species	Unlikely
<i>Mustela frenata peninsula</i>	Florida weasel	S3		may be observed in any habitat depending upon availability of food	Unlikely
<i>Neofiber alleni</i>	Roundtailed muskrat	S3		shallow marshes with emergent vegetation preferring dense stands of maidencane and pickerelweed	Unlikely
Birds					
<i>Dendroica kirtlandii</i>	Kirtland's warbler	E	E	transient population with no known breeding sites within state	Unlikely
<i>Egretta caerulea</i>	Little blue heron	SSC		freshwater, brackish and estuarine wetlands	Not observed
<i>Egretta rufescens</i>	Reddish egret	SSC		nesting exclusively on coastal islands and foraging nearby	Not observed
<i>Egretta thula</i>	Snowy egret	SSC		freshwater, brackish and estuarine wetlands	Not observed
<i>Egretta tricolor</i>	Tricolored heron, Louisiana heron	SSC		freshwater, brackish and estuarine wetlands	Not observed
<i>Eudocimus albus</i>	White ibis	SSC		typically found in marshy sloughs, mud flats, lagoons, wet pastures and forested wetlands	Not observed
<i>Falco peregrinus</i> sspp.	Peregrine falcon	E	E	mainly open country from mountains to coasts; formerly even cities	Unlikely
<i>Falco sparverius paulus</i>	Southeastern American kestrel	T		mainly open country from mountains to coasts; formerly even cities	Occasional
<i>Grus canadensis pratensis</i>	Florida sandhill crane	T		shallow marshes and open pastures	Unlikely
<i>Haliaeetus leucocephalus</i>	Bald eagle	T	T	nests in mature pine or cypress near permanent water bodies	Occasional, nest not reported within 1500' of site

Table 3.3. Legally protected and proposed candidate animal species reported to occur in Brevard County, Florida and their potential occurrence within the Proposed Action site. Source: BKI, Inc. November 2004.

Scientific name	Common name	Listing Status		Habitat Preferences	Potential Occurrence
		FWC	FWS		
<i>Mycteria Americana</i>	Wood stork	E	E	freshwater and brackish wetlands	Not observed
<i>Pandion haliaetus</i>	Osprey	SSC		open bodies of water, nesting nearby	Occasional
Reptiles and Amphibians					
<i>Alligator mississippiensis</i>	American alligator	SSC	T(S/A)	animals as food and water; listed as threatened due to similarity of appearance with the American crocodile	Occasional
<i>Drymarchon corais couperi</i>	Eastern indigo snake	T	T	wide ranging utilizing seasonal habitats; frequently observed in gopher tortoise burrows	Not observed
<i>Gopherus polyphemus</i>	Gopher tortoise	SSC		well-drained, loose soil; low growing forbs and open sunlit sites	Unlikely

Listing agency

FWS: United States Fish and Wildlife Service

FWC: Florida Fish and Wildlife Conservation Commission

Legal Status

E: Endangered

SSC: Species of Species Concern

S3: Either very rare and local throughout its range or found locally in a restricted range or vulnerable to extinction from other factors.

T: Threatened

T(S/A): Threatened due to similarity of appearance

Potential Occurrence Classification

confirmed: species observed on site

not observed: habitat available but species or indicators not observed

occasional: potential to occasionally traverse or use habitat

unlikely: site marginally suitable for species utilization or outside reported range

Three soil series were mapped by the Soil Conservation Service within the Proposed Action site: Anclote, Bradenton, and Wabasso are shown by the Brevard County Soil Survey data (Figure 5).

Anclote sand

Taxonomically the Anclote soil series is classed as sandy, siliceous, hyperthermic Typic Endoaquolls. The Anclote sand phase of this series is a nearly level, very poorly drained, sandy soil in marshy depressions in the flatwoods, in broad areas on flood plains and in poorly defined drainageways. Typically the water table is between 254 and 1016 millimeters (10 and 40 inches) below the surface, rising to within 254 millimeters (10 inches) for more than 6 months of the year. This soil is considered hydric by both state and federal agencies.

Bradenton sand

Taxonomically the Bradenton soil series is classed as coarse-loamy, siliceous, superactive, hyperthermic Typic Endoaqualfs. This soil phase is nearly level, poorly drained, sandy soils on low marine terraces. In most years the water table is within a depth of 254 millimeter (10 inches) for 2 to 6 months and between depths of 254 and 762 millimeter (10 and 30 inches) for 6 months or more each year. Most areas are drained through ditches and are planted with citrus.

Wabasso fine sand

This soil phase is nearly level and poorly drained. It is associated with broad areas within pine flatwoods and on low ridges within flood plains. The water table is within 254 millimeters (10 inches) of the surface for 1 to 2 months of the year and within 762 millimeters (30 inches) during the rest of the year. The vegetation associated with this soil phase is typified by second-growth longleaf or slash pines and an understory of saw palmetto, and runner oak. Included within this soil are small areas of Boca, EauGallie, Oldsmar, Riviera and Winder soils. Taxonomically the Wabasso soil series is classed as sandy over loamy, siliceous, active, hyperthermic, Alflic Alaquods. Wabasso fine sand is classed as hydric by federal agencies.

3.7 NOISE

Noise generated at KSC originates from six primary sources: (1) orbiter reentry sonic booms, (2) launches, (3) aircraft movements, (4) industrial operations, (5) construction, and (6) traffic. Noise generated above ambient levels by these sources has the potential to adversely affect both wildlife and humans. Some typical values for noise levels are shown on Tables 3.4 and 3.5, for activities occurring at construction sites and for activities conducted routinely at KSC. The effects of noise on wildlife have been studied at KSC during the launch of spacecraft (KSC 1981; Breininger 1990). These studies have shown that besides an initial startle response to launches, birds and other wildlife return to their normal activities soon afterward and appear to show no adverse affects. Other studies conducted on wading bird colonies subjected to military

overflights (152 m [500 feet] of altitude) with noise levels up to 100 decibels (dBA) observed no productivity limiting responses and only a short-term interruption of their daily routine (Dynamac 2000). The Occupational Safety and Health Administration (OSHA) has established permissible noise exposure limits for humans.

Source	Noise Level (Peak)	Distance From Source [a]			
		15.24 m (50 ft)	30.48 m (100 ft)	60.96 m (200 ft)	121.92 m (400 ft)
Construction					
Heavy Trucks	95	84-89	78-83	72-77	66-71
Pickup Trucks	92	72	66	60	54
Dump Trucks	108	88	82	76	70
Concrete Mixer	105	85	79	73	67
Jackhammer	108	88	82	76	70
Scraper	93	80-89	74-82	68-77	60-71
Dozer	107	87-102	81-96	75-90	69-84
Paver	109	80-89	74-83	68-77	60-71
Generator	96	76	70	64	58
Shovel	111	91	85	79	73
Crane	104	75-88	69-82	63-76	55-70
Loader	104	73-86	67-80	61-74	55-68
Grader	108	88-91	82-85	76-79	70-73
Caterpillar	103	88	82	76	70
Dragline	105	85	79	73	67
Shovel	110	91-107	85-101	79-95	73-95
Dredging	89	79	73	66	77
Pile Driver	105	95	89	83	77
Ditcher	104	99	93	87	81
Fork Lift	100	95	89	83	77
Vehicles					
Diesel Train	98	80-88	74-82	68-76	62-70
Mack Truck	91	84	78	72	66
Bus	97	82	76	70	54
Compact Auto	90	75-80	69-74	63-68	57-62
Passenger Auto	85	69-76	63-70	57-64	51-68
Motorcycle	110	82	76	70	64
[a] Assume 6 dBA decrease for every doubling of distance.					

Source: Golden 1980.

Table 3.5 Measured noise on KSC		
Source	Peak	Remarks
Re-Entry Sonic Boom [1]		
Orbiter		101 N/m ² max. (2.1 psf)
SRB casing		96 to 144 N/m ² (2 to 3 psf)
External tank		96 to 192 N/m ² (2 to 4 psf)
Launch Noise		
Titan IIIC	94	21 Oct 1965 (9,388 m)
Saturn I	89	Avg- of 3 (9,034 m)
Saturn V	91	15 Apr 1969 (9,384 m)
Atlas	96	Comstar (4,816 m)
Space Shuttle [1]	90	1.4 dBA Down From Saturn V (9, 384 m)
Aircraft		
F4 Jet	107	18 km From Ground Zero
F4 Jet	158	Calculated at Ground Zero
NASA Gulfstream	109	Takeoff (Marker 14)
NASA Gulfstream	100	Landing (Marker 14)
Industrial Activities		
Complex 39A	78	Transformers
LEFT	92	Hydraulic Charger Unit
Machine Shop	112	Base Support Building M6-486
Computer Room	88	VAB – Room 2K11
Snack Bar	60	CIF - Room 154
Laboratories	58	CIF – Rooms 139 and 282
Elevator	62	Central Instrumentation Fac.
VAB High Bay	108	Welding, Cutting, etc.
VAB High Bay	116	Chipping
Hangar AE	77	Room 125 During Test
Headquarters office	75	Room 2637 and Printers
O&C Office	57	Room 2063
Mobile Launcher Platform	94	Main Pump Operating
Mobile Launcher Platform	199	2 Pumps Operating 5K Load
Industrial Area	66	15 m From Traffic Light
Undisturbed Areas		
Seashore	69	Medium Waves (Nice Day)
Riverbank	48	Light Gusts (No Traffic)
150 m Tower	64	Light Gusts of Wind
[1] Estimated		

Source: KSC 2003-D.

The 8-hour time weighted average noise level on KSC is appreciably lower than the OSHA recommended level of 85 dBA (Dynamac 2000).

3.8 SURFACE WATER QUALITY

The surface waters in and surrounding KSC are best described as shallow estuarine lagoons and include portions of IRL, Banana River, Mosquito Lagoon, and Banana Creek. The area of Mosquito Lagoon within the KSC boundary and the northernmost portion of the IRL north of the Jay Railway spur crossing are designated by the State as Class II, Shellfish Propagation and Harvesting. All other surface waters at KSC have been designated as Class III, Recreation and Fish and Wildlife Propagation. All surface waters adjacent to and within the MINWR have the distinction of being designated as an Outstanding Florida Waters as required by Florida Statutes for waters within National Wildlife Refuges. Several agencies including NASA, USFWS, and Brevard County maintain water quality monitoring stations at surface water sites within and around KSC. The data collected are used for long-term trend analysis to support land use planning and resource management. Surface water quality at KSC is generally good, with the best areas of water quality being adjacent to undeveloped areas of the lagoon, such as Mosquito Lagoon, and the northern-most portions of the IRL and Banana River.

The surface waters at the Proposed Action site primarily consist of existing stormwater retention and agricultural ditches and canals. All of these surface waters are considered Waters of the State. The majority of the surface water within the drainage system of the KSC Visitor Complex and the adjacent citrus groves flow to the north and west into the Indian River Lagoon. Flood hazards for the KSC Visitor Complex are shown in Figure 4.

3.9 GROUNDWATER QUALITY

The State of Florida, through legislation, has created four categories to rate the quality of groundwater in a particular area. The criteria for these categories are based upon the degree of protection that should be afforded to that groundwater source, with Class G-I the more stringent and Class G-IV the lesser. Groundwater at KSC is classified as Class G-II, which means that the groundwater is a potential potable water source and generally has a total dissolved solids content of less than 10,000 mg/L (0.624 lb/ft³). The subsurface of KSC is composed of the surficial aquifer, intermediate aquifer, and Floridan aquifer. Recharge to the surficial aquifer system is primarily due to infiltration of precipitation; however, the quality of water in the aquifer beneath KSC is influenced by intrusion of saline and brackish surface waters from the Atlantic Ocean and surrounding lagoon systems. This is evident by the high mineral content, principally chlorides that have been measured in groundwater samples collected during various KSC surveys. Groundwater quality for the intermediate and Floridan aquifers at KSC are shown in Table 3.6.

The surficial aquifer in the area of the proposed site is called the west plain subaquifer and is in a region considered to be fair to poor in terms of its ability to recharge the underlying aquifer systems. The waters of this aquifer system are predominately fresh; however, due to intrusion from nearby saline waters, some areas may exhibit high chloride as well as high total dissolved solids concentrations.

Parameter	Drinking Water Stds.		Intermediate Aquifer System			Floridan Aquifer System		
			Mean Conc.	Minimum Conc.	Maximum Conc.	Mean Conc.	Minimum Conc.	Maximum Conc.
Inorganics								
Chlorides	(S)	250.000	10134.000	1340.000	28400.00	1882.00	1189.00	3062.00
Manganese	(S)	0.050	<0.050	<0.050	<0.05			
Nitrate	(P)	10.000	0.020	<0.010	6.00			
Sodium	(P)	160.000	5360.000	550.000	10500.00	950.00	614.00	1531.00
Sulfate	(S)	250.000	695.000	10.000	1900	282.00	251.00	320.00
Physical Parameter								
TDS	(S)	250.000	15163.000	2870 000	2700.00	3778.00	2326.00	7823.00
pH	(S)	6.500	7.620	7.020	8.31	7.45	7.18	7.1 5
Alkalinity			189.000	170.000	200.00	810.00	133.00	381.00
Trace Metals								
Arsenic	(P)	0.050	0.060	<0.050	0.100			
Barium	(P)	1.000	<1.000	<1.000	<1.000			
Cadmium	(P)	0.010	0.020	<0.010	<0.050			
Chromium	(P)	0.050	<0.050	<0.050	<0.050			
Copper	(S)	1.000	<1.000	<1.000	<1.000			
Iron	(S)	0.300	1.720	<0.030	4.060	0.11	0.10	0.13
Lead	(P)	0.050	<0.050	<0.050	<0.050			
Mercury	(P)	0.002	<0.002	<0.002	<0.002			
Selenium	(P)	0.010	0.060	0.200	<0.010			
Silver	(P)	0.050	<0.050	<0.050	<0.050			
Zinc	(S)	5.000	0.070	<0.020	0.330			
Gross Alpha (pCi/l)	(P)	15.000	11.500	2.60.000	21.000			
Fecal Coliform (n/11)	(P)	1.000	<12.000	<10.000	20.000			

Source: Dynamac 2000.

All concentrations expressed in mg/l unless otherwise specified.

3.10 SOCIOECONOMICS

The KSC workforce is composed of approximately 13,000 personnel, including contractor, construction, tenant, and permanent civil service employees (KSC 2003). Approximately 50% of the personnel have positions directly related to the Space Shuttle and payload processing operations. The remaining work force is employed in ground and base support, unmanned launch programs, crew training, engineering, and administrative positions. Approximately 53% of the personnel at KSC are stationed in the VAB Area, while 39% are located in the Industrial Area. The remaining work force is stationed at various outlying facilities at KSC. For the Proposed Action sites, the employees will be predominately new hire at KSC.

3.11 LAND USE

KSC comprises approximately 56,000-ha (140,000-ac), of which nearly 95% is undeveloped area including uplands, wetlands, mosquito control impoundments, and open water areas. KSC is unique in that the MINWR and the CNS lie within its boundaries and are managed for NASA by the USFWS and the NPS, respectively. These agencies exercise management control over agricultural, recreational, and environmental programs within the MINWR and CNS. NASA manages nearly 1,704-ha (4,212-ac) consisting of facilities, roads, rights-of-way, safety zones, and reserved areas for future expansion. The operational areas developed within KSC are dominated by the LC-39 Industrial Area, Industrial Area, and SLF. These facilities account for more than 70% of the NASA managed developed area (KSC 2003-D).

The Proposed Action location is currently classified as Urban and Agriculture. The areas associated with each land use classification are shown in Table 3.1.1. Implementation of these actions would require improving the existing urban layout and removal of agricultural lands.

SECTION IV

**ENVIRONMENTAL CONSEQUENCES AND
MITIGATION**

SECTION IV

ENVIRONMENTAL CONSEQUENCES AND MITIGATION

4.1 SUMMARY OF RELEVANT ISSUES AND STATUS OF ISSUES

Impacts resulting from implementation of this project were identified and then classified in one of the five following categories:

- **Not Applicable (N/A)**—those activities not related to the site specific or global environment.
- **None**—those areas in which no impacts are expected.
- **Minimal**—those areas in which the impacts are not expected to be measurable or are too small to cause any discernable degradation to the environment.
- **Minor**—those impacts that would be measurable but are within the capacity of the impacted system to absorb the change, or can be compensated for, so that the impact is not substantial.
- **Major**—those environmental impacts that individually or cumulatively could be substantial (greater than 10% impact to KSC).

Impacts from construction and operation at the Proposed Action site vary from none to minor depending upon the environmental issues evaluated. Results of the analyses are summarized in Table 4.1, which shows impacts to each media for each action.

This matrix can be used to review the overall impacts of implementation of this project for the Proposed Action site and No Action. The following discussion provides details of the scope and type of impacts.

Table 4.1 Summary of Potential Impacts to the Environment from the Proposed Action and No Action Alternatives.

Media	Impact Phase	Proposed Action	No Action
Facilities and Infrastructure			
Transportation	Construction	Minimal	None
	Operation	Minimal	None
Utilities	Construction	None	None
	Operation	Minimal /Minor/ None	None
Line-of-Sight	Construction	None	None
	Operation	None	None
Existing Facilities	Construction	Minor	Minor
	Operation	Minor	None
Air Quality	Construction	Minimal	None
	Operation	Minor	None
Vegetation	Construction	Minimal	None
	Operation	None	None
Wildlife	Construction	Minimal	None
	Operation	None	None
Threatened and Endangered Species	Construction	Minimal	None
	Operation	None	None
Cultural Resources	Construction	None	None
	Operation	None	None
Geology	Construction	Minimal	None
	Operation	None	None
Noise	Construction	Minimal	None
	Operation	Minimal	None
Surface Water Quality	Construction	Minimal	None
	Operation	Minimal	None
Groundwater Quality	Construction	None	None
	Operation	None	None
Socioeconomics	Construction	Minor	None
	Operation	Minor	Minor
Land Use	Construction	Minimal	None
	Operation	None	None

Key to Categories:

None: No impacts are expected.

Minimal: The impacts are not expected to be measurable or are too small to cause any discernable degradation to the environment at KSC.

Minor: Those impacts which are measurable, but are within the capacity of the impacted system to absorb the change, or the impacts can be compensated for, so that the impact is not substantial to KSC.

4.2 PROPOSED ACTION

4.2.1 FACILITIES AND INFRASTRUCTURE

4.2.1.1 Transportation. The Proposed Action would use the existing transportation corridors found within KSC and the Visitor Complex main campus. Construction activity would have a minimal negative impact on the traffic capacity and flow along NASA Causeway due to the slight increase in construction related traffic. Planned construction would not require road closures or right-of-way impacts. There may be a slight impact to KSC bus tour drop-off during the drop-off location redevelopment. The operation of the SLSF at the Visitor Complex would have a minimal negative impact to the environment due to an increase in employee traffic and potential NASA tour buses. The redevelopment of the entrance to the DNCP&R administration building parking may have a minimal positive impact to the internal traffic patterns at the Visitor Complex. DNCP&R attributes 80% of the guest access is obtained through SR-405 and the remaining 20% through SR-3. A recent traffic analyses conducted as a part of other planned development on KSC indicate that the intersection of US Highway 1 and SR 405 in southern Titusville is equipped to handle an increase in traffic without mitigation (FSA 2004). Furthermore, the current KSC Visitor Complex guest attendance is still approximately 25% below the previous attendance levels of 2000-2001 (DNPSS 2001).

Table 4.2 Guest Vehicle Impact Projections (Daily Averages)

	Current Attendance 2004	Current Vehicle Traffic 2004 (Total KSC)	Projected Attendance 2007	Projected Attendance Change (%)	Projected Vehicle Traffic Impact 2007	Projected Vehicle Traffic Change (% of Total KSC)
West Entrance SR-405 (80% of total)	3,068	12,000	3,594	17.1%	1,331	1.312%
South Entrance SR-3 (20% of total)	767	3,000	899	17.2%	333	.328%
Total	3,835	15,000	4,493	17.15%	1,664	1.64%

Based on this data, the net projected increase in average daily attendance is 658 guests per day and a net increase in vehicle traffic of 244 vehicles per day.

4.2.1.2 Utilities. Construction activity would have no impact on the utilities of KSC or the Visitor Complex. Operation of the Proposed Action would have a minimal impact on the utilities within the main campus of the Visitor Complex. The facilities will increase the daily cumulative utility use. An increase in the number of visitors will also increase utility use during operation of the SLSF.

4.2.1.2.1 Potable Water. The SLSF plans on utilizing the KSC water distribution for potable and fire flow demands. Construction of the SLSF would have no impact on the use of potable water. The impact to the existing potable water system resulting from the operation of the SLSF would have a minor impact overall to KSC. The additional usage is estimated at 64.3 Lpd (17 gpd) per capita for the estimated increase in attendance. This equates to an estimated daily total increase of 42,332 Lpd (11,186 gpd) of potable water to be used by the new employees and visitors. This increase is calculated to be less than 1% of the existing KSC daily consumption and available supply as stated in section 3.2.2.1. The new total demand is still significantly below the infrastructure demand levels that supported the KSC workforce levels of 1968 and is not likely to result in water shortages or related potable water issues.

4.2.1.2.2 Wastewater. The SLSF plans on utilizing the KSC wastewater collection system and the CCAFS treatment system for wastewater disposal. Construction would have no impact on the wastewater at the Visitor Complex main campus. Operation of the SLSF would result in an estimated increase of approximately 26,490 Lpd (7,000 gpd) average daily wastewater flow that would be expected for the Proposed Action. The existing capacity stated in section 3.2.2.2 is not expected to be significantly impacted by the approximated >1% increase.

4.2.1.2.3 Communications. The SLSF would use the KSC communication network. SLSF communications would be routed through the Communications Distribution and Switching Center (CD&SC) facility via an existing duct bank system. The addition of the data and communication lines to support the proposed action are minimal and the existing infrastructure is adequate to support the proposed action site (DNCP&R 2001). This is expected to have minimal impact on operations at KSC. During construction, installation of on-site and off-site communications infrastructure would have minimal impact to the environment, with services being designed to minimize environmental impacts.

4.2.1.2.4 Electricity. The SLSF calculated maximum electrical load of 2700 kVa would connect to the existing KSC power network along SR-405 adjacent to the Visitor Complex main campus. This result is an estimated 1 % increase (after diversification) in total KSC electrical load as stated in section 3.2.2.4 and is considered to have a minor impact on the operations of KSC.

Construction loads are estimated to be considered temporary and is not expected impact the current electrical supply.

4.2.1.2.5 Irrigation. Native vegetative plant and grass species that are drought-tolerant and xeriscape techniques would be used at the SLSF. Irrigation would not be necessary to maintain landscaped areas desired to achieve an upscale research park setting. By not providing irrigation, there would be a no impact to operations at KSC. During construction, on-site irrigation piping would not be installed and therefore would have no impact to the environment.

4.2.1.2.6 Chilled Water. The SLSF plans on utilizing a new air cooled chiller plant for the SLSF, therefore construction and operation of the facility will have no impact on the existing cooling system.

4.2.1.2.7 Other Utilities. No other environmental impacts are assumed to affect other utilities.

4.2.1.3 Line-of-Sight. KSC contains many transmitters, radio tracking systems, communications antenna, camera pads, and visual observation points that require an unobstructed line-of-sight. The Proposed Action location is northeast of the MILA facility. Construction and operation of the SLSF is expected to have no impact on line-of-sight nearby the Visitor Complex.

4.2.1.4 Existing Facilities. Currently there are several existing facilities that make-up the Visitor Complex. Construction within the Proposed Action site may have a minor environmental impact to adjacent or near-by visitor facilities. Construction activity would be designed to minimize the amount of time a facility may need to be closed. The operation of the SLSF may have a minor impact on the existing facilities due to the potential for the new attractions to have long waiting lines and draw greater attention by the visitors. Visitors may decide to by-pass an older less interesting exhibit in order to provide them with the opportunity to visit the SLSF.

4.2.2 AIR QUALITY. Site preparation and construction of the SLSF at the Proposed Action location would produce minimal impacts to surrounding air quality. Clearing of land, demolition of facilities, and other construction activities would generate airborne particulates from earth moving, as well as hydrocarbon exhaust from heavy equipment and silica dust from concrete demolition. Such activities are expected to be small in scope and of short duration (estimated 15 months total construction). BMPs would also be employed to mitigate for pollutants due to earth movement. These BMPs include water spraying, placement of silt fencing, sediment settling basins, and other forms of dust control.

Table 4.3 Emission Rates for Passenger Cars and Light Trucks

Passenger Car

Component	Emission Rate and Fuel Consumption per mile (mi) ¹	Calculation	Total Annual Pollution Emitted and Fuel Consumed
Hydrocarbons	2.80 grams (g)	$(2.80 \text{ g/mi}) \times (12,500 \text{ mi}) \times (1 \text{ lb}/454 \text{ g})$	77.1 pounds of hydrocarbons
Carbon Monoxide	20.9 grams	$(20.9 \text{ g/mi}) \times (12,500 \text{ mi}) \times (1 \text{ lb}/454\text{g})$	575 pounds of carbon monoxide
Oxides of Nitrogen	1.39 grams	$(1.39 \text{ g/mi}) \times (12,500 \text{ mi}) \times (1 \text{ lb}/454\text{g})$	38.2 pounds of oxides of nitrogen
Carbon Dioxide ²	0.916 pound (lb)	$(0.916 \text{ lb/mi}) \times (12,500)$	11,450 pounds of carbon dioxide
Gasoline	0.0465 gallon	$(0.0465 \text{ gallon/mi}) \times (12,500 \text{ mi})$	581 gallons of gasoline

Light Truck

Component	Emission Rate and Fuel Consumption per mile (mi) ¹	Calculation	Total Annual Pollution Emitted and Fuel Consumed ³
Hydrocarbons	3.51 grams (g)	$(3.51 \text{ g/mi}) \times (14,000 \text{ mi}) \times (1 \text{ lb}/454 \text{ g})$	108 pounds of hydrocarbons
Carbon Monoxide	27.7 grams	$(27.7 \text{ g/mi}) \times (14,000 \text{ mi}) \times (1 \text{ lb}/454\text{g})$	854 pounds of carbon monoxide
Oxides of Nitrogen	1.81 grams	$(1.81 \text{ g/mi}) \times (14,000 \text{ mi}) \times (1 \text{ lb}/454\text{g})$	55.8 pounds of oxides of nitrogen
Carbon Dioxide ²	1.15 pounds (lb)	$(1.15 \text{ lb/mi}) \times (14,000 \text{ mi})$	16,035 pounds of carbon dioxide
Gasoline	0.0581 gallon	$(.0581 \text{ gallon/mi}) \times (14,000 \text{ mi})$	813 gallons of gasoline

Source: EPA420-F-00-013
April 2000

Operation of the SLSF at the Proposed Action location is expected to have minor impacts to surrounding air quality due to an increase in automobiles from employees, visitors and NASA tour buses. The majority of vehicles expected to arrive at the proposed action site are projected to be passenger vehicles and mini vans. The net daily increase of vehicle traffic related emissions is calculated to increase relative to the vehicle impacts in Table 4.2.

Table 4.4 Projected 2007 Air Emission Impacts (Daily)

Component	Emitted Pollution (per vehicle)	Current KSC Vehicle Totals	Projected Total Vehicle Impacts	Projected Total KSC Impact (%)
Hydrocarbons	.0957 kg (.211 lbs)	1,436 kg (3,166 lbs)	159.25 (351.1 lbs)	0.111
Carbon Monoxide	.714 kg (1.575 lbs)	10,710 kg (23,611 lbs)	1,188.79 kg (2,620.8 lbs)	0.111
Oxides of Nitrogen	.0471kg (.104 lbs)	707 kg (1,559 lbs)	78.47 kg (173 lbs)	0.111
Carbon Dioxide	14.22 kg (31.369 lbs)	213,300 kg (470,241 lbs)	23,877 kg (52,198 lbs)	0.112

4.2.3 BIOLOGICAL RESOURCES. Table 3.1.2 lists the quantitative impacts to the different habitat communities that may be impacted in the Proposed Action.

4.2.3.1 Vegetation. Construction activities at the 9.10-ha (22.50-ac) Proposed Action would result in the modification of 9.10-ha (22.50-ac) of urban and historically agricultural lands. Abandoned citrus groves will be the vegetation type most impacted by the Proposed Action (approximately 2.38-ha (5.89 ac) will be removed). Approximately 1088-ha (2688-ac) of citrus groves occurred on KSC, therefore these impact represent less than 0.002% of the citrus agricultural lands. These impacts related to construction are anticipated to be minimal.

A total of 0.29-ha (0.74-ac) of wetland vegetation in the form of surface water and agricultural ditches would be impacted, but require no mitigation, due to construction of the SLSF and improvements to entrance ways at the Proposed Action location. Currently, primrose willow, Carolina willow, Brazilian pepper, and grape vine dominate the ditches to be impacted and represent a non-native invasive community structure that is 70% of that type of vegetation as it compares to the overall acreage of this community found on KSC. Construction at the Proposed Action location is expected to have minimal impacts to this community type.

No impacts to vegetation are expected from operation of the Proposed Action. An exception to this may be if a different community of vegetation becomes established, but since non-native plants currently dominate the ditch, no further impacts are expected.

4.3.3.2 Wetlands and Floodplains. There would be no expected impacts to wetlands or floodplains for the Proposed Action (Figure 4).

4.2.3.3 Wildlife. Potential impacts to wildlife by the SLSF Proposed Action construction and operation are based on habitats removed by typical construction activities for clearing, land development and building, and the expected long-term operations of the facility. Effects from the construction phase of the project would undoubtedly occur and are expected to be temporary except for those caused by habitat removal and alteration. However, on-site habitats are largely composed of existing facilities that provide no habitat as compared to natural areas of MINWR, surrounding the project area.

Potential impacts to wildlife from construction of the Proposed Action are expected to be minimal. A majority of the proposed impacted zone contains buildings and parking lots, which provide no habitat value. Removal and alterations to the existing ditches within the project area may impact wading birds, reptile, and amphibian species. However, this is a temporary impact as new drainage ditches would be constructed. Some impacts from construction noise may occur due to active work zones. Species that are more sensitive to human activities would move away from disturbance created by the construction of the Proposed Action, resulting in at least a temporary shift in the population structure of these species.

Operation of the Proposed SLSF facilities is expected to have no impacts on wildlife species. Currently residing species that utilize the habitats within the Proposed Action are exposed to human activities from adjacent buildings and parking lots and therefore would not be affected by the operation of new buildings and parking lots.

4.2.3.4 Threatened and Endangered Species. Table 3.3 lists the level of protection to species that may be found within the Proposed Action site. Minimal impacts to protected species are expected during the construction phase of this project. No listed wading bird species or snakes were confirmed on-site. However, several wading bird species may potentially utilize the ditches, although on-site habitats do not support a majority of protected species found at KSC. These individuals would be expected to locate to other ditches and surface waters around KSC.

The operation of the Proposed Action for the SLSF is expected to have no impacts on threatened and endangered species. Proposed developments would likely expose no new change that would otherwise deter species from the area.

4.2.4 CULTURAL RESOURCES. The area proposed for this site has been previously mapped by NASA to indicate its potential for containing historical artifacts. As a result of this study, the site has been identified as having a low potential for impacts to cultural resources. No known historic or archaeological properties are within the site. Therefore, no impacts to historic or archaeological properties are expected during construction.

Operation of the SLSF at the Proposed Action site is expected to produce no impacts to cultural resources.

4.2.5 GEOLOGY AND SOILS. Site preparation activities are expected to present the only potential impact to the geology and soils within the project area and are considered minimal. Construction may result in impacts to the shallow subsurface flows of water from rainfall events; however, this would be mitigated for with site grading and modification of the existing stormwater management system.

Operation of the SLSF Proposed Action is expected to result in no impacts to the geological strata or soils of the project or local area. Over time, similar heavy road usage within the site could cause no new compaction of the underlying soil strata than is happening currently.

4.2.6 NOISE. Ambient noise levels are expected to increase during construction activities and daily operations as a result of the SLSF Proposed Action site construction. Noise generated by construction vehicles is expected to be below all noise thresholds and would occur only during construction for a brief period. EPA's recommended upper level noise threshold is 65 dBA, for a 24-hour timeframe (KSC 2003-D). No known sensitive noise receptors within measurable audible levels are in or around the site and are not expected to encounter any impacts due to construction of the Proposed Action site.

Minimal increased noise levels for operations are expected as result of additional vehicle traffic within the KSC Visitor Complex and the operation of the HVAC mechanical chiller equipment. This volume of vehicle traffic is expected to be relatively low (reference Table 3.4) and consistent with similar noise volumes and existing conditions as exhibited during daytime hours. The operation of the two 240 ton HVAC mechanical chillers will produce noise of approximately 93-96 dBA but its effects will be minimal as shown on Table 3.4. No known sensitive receptors are within or around the chiller equipment and therefore would be considered to be minimal or have no impact. Therefore, the overall impact of noise to surrounding biological systems is expected to be minimal.

4.2.7 SURFACE WATER QUALITY. Construction of the SLSF Proposed Action is expected to have minimal impacts to the surface water quality. These effects would be compensated for by use of the existing stormwater management system for the Visitor Complex. During construction activities, impacts to surface waters would be minimized by ensuring that BMPs are initiated and maintained for erosion and sedimentation control.

Operation of the SLSF Proposed Action is expected to have minimal to no impacts to surface water quality. The proposed stormwater management system would be capable of treating all stormwater runoff from the Proposed Action.

4.2.8 GROUNDWATER QUALITY. Construction of the SLSF Proposed Action location could temporarily increase the amount of sedimentation and pollutants that could migrate into the groundwater system. However, maintaining BMPs and construction of the stormwater management system would prevent this from occurring. Therefore, construction of the SLSF Proposed Action location should have no impacts to groundwater quality.

Operations of the SLSF Proposed Action location would generate pollutants typically created by vehicle traffic and by runoff from buildings and parking lots. The stormwater management system would prevent migration of contaminants downward into the surficial aquifer; instead it would promote their transport into the proposed Surface Water Management System for the KSC Visitor Complex Proposed Action site. No impact to groundwater quality is expected for the operation of this facility.

No SWMU sites are located within the Proposed Action site.

4.2.9 SOCIOECONOMICS. Construction at the Proposed Action would employ workers from the local workforce with an expected positive impact to the local economy. This construction is expected to have a minor impact to socioeconomic and the workforce at KSC during construction.

The programs to be located at the SLSF Proposed Action location already exist at KSC. Therefore, the number of people on KSC resulting from this action is expected to have no impact to the operation of the KSC workforce.

The development of a new tourist facility, located within the Visitor's Center, is forecasted to increase the number of tourists visiting KSC by 5% over the next 2 years. Based on this data, the net projected increase in daily attendance is 1420 guests per day. This would result in a minor positive impact to the local economy.

4.2.10 LAND USE. Only a relatively small portion of the total acreage of KSC has been developed or designated for NASA operational and industrial use. Of the 56,000-ha (140,000-ac) of total KSC area, 5.0% is designated for KSC operational area, and only 70% of this area has been developed. The existing land use for the Proposed Action is categorized as Urban and Agriculture (Table 3.1.2). No impacts to land use at KSC as a result of construction of this Proposed Action location are expected due to the development of approximately 0.34% of the impact would occur within existing urban land use. Approximately 2.29-ha (5.67-ac) of land use

would be changed from citrus to an open water reservoir and associated open land. This relatively small and subtle land use change would be considered minimal and the potential passive use by wildlife species would be retained.

KSC is within the Coastal Zone as defined by Florida Statutes (15 CFR 930.30-44). As such, a Coastal Zone Consistency Determination is required (FDER 1984). The results indicate that the Proposed Action could be implemented within existing environmental regulations and has been determined to be consistent with the Florida Coastal Zone Management Plan.

Operation of the SLSF Proposed Action location would have no impacts to land use. Existing unused parking spaces at the parking lots would be utilized for parking at the SLSF rather than constructing new parking. The Proposed Action land use would remain categorized as Governmental (FLUCFCS 175) and Reservoir (< 10 ac) (FLUCFCS 534) (Figure 2).

4.3 NO ACTION

4.3.1 FACILITIES AND INFRASTRUCTURE

4.3.1.1 Transportation. There would be no impacts to transportation for the No Action Alternative.

4.3.1.2 Utilities. There would be no impacts to utilities for the No Action Alternative.

4.3.1.3 Line-of-Sight. There would be no impacts to utilities for the No Action Alternative.

4.3.1.4 Existing Facilities. With no action taken, there would be a minimal impact to the operations at KSC.

4.3.2 AIR QUALITY. There would be no impacts to air quality for the No Action Alternative.

4.3.3 BIOLOGICAL RESOURCES

4.3.3.1 Vegetation. There would be no expected impacts to vegetation for the No Action Alternative.

4.3.3.2 Wetlands and Floodplains. There would be no expected impacts to wetlands or floodplains for the No Action Alternative.

4.3.3.3 Wildlife. There would be no expected impacts to wildlife for the No Action Alternative.

4.3.3.4 Threatened and Endangered Species. There would be no expected impacts to threatened or endangered species for the No Action Alternative.

4.3.4 CULTURAL RESOURCES. There would be no expected impacts to cultural resources for the No Action Alternative.

4.3.5 GEOLOGY AND SOILS. There would be no expected impacts to the geology or soils for the No Action Alternative.

4.3.6 NOISE. There would be no impacts to noise for the No Action Alternative. There would be no construction associated with this Alternative.

4.3.7 SURFACE WATER QUALITY. There would be no expected impacts to surface water quality for the No Action Alternative. There would be no construction associated with this Alternative. No additional stormwater would be generated that would require treatment.

4.3.8 GROUNDWATER QUALITY. There would be no expected impacts to groundwater quality for the No Action Alternative. There would be no construction and no change of increased pollutant loadings leaching into the groundwater associated with this Alternative.

4.3.9 SOCIOECONOMICS. There would be minor impacts to the social or economic elements of the region for the No Action Alternative. There would be a potential reduction in the anticipated growth of the tourist market related to KSC. Many of the related travel and tourists industries would have difficulty continuing to compete with the string of tourist markets of the central Florida.

4.3.10 LAND USE. There would be no expected impacts to land use for the No Action Alternative.

SECTION V
ENVIRONMENTAL JUSTICE

SECTION V

ENVIRONMENTAL JUSTICE

On February 11, 1994, the President of the United States signed EO 12898, entitled, “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations.” The general purposes of the EO are to (1) focus the attention of federal agencies on the human health and environmental conditions in minority communities and low-income communities with the goal of achieving environmental justice; (2) foster non-discrimination in federal programs that substantially affect human health or the environment; and (3) give minority communities and low-income communities greater opportunities for public participation in and access to, public information on matters relating to human health and the environment.

The EO directs federal agencies, including NASA, to develop environmental justice strategies. Further, EO 12898 requires NASA, to the greatest extent practicable and permitted by law, to make the achievement of environmental justice part of NASA’s mission by identifying and addressing, as appropriate, disproportionately high adverse human health or environmental effects on minority or low-income populations in the United States and its territories and possessions, the District of Columbia, the Commonwealth of Puerto Rico, and the Commonwealth of the Mariana Islands.

In accordance with EO 12898, NASA established an agency-wide strategy, which, in addition to the requirements set forth in the EO, seeks to (1) minimize administrative burdens, (2) focus on public outreach and involvement, (3) encourage implementation plans tailored to the specific situation at each center, (4) make each center responsible for developing its own Environmental Justice Plan, and (5) consider both normal operations and accidents.

In turn, KSC has developed a plan to comply with the EO and NASA’s agency-wide strategy. As part of that plan, the impacts to low-income and minority populations in the KSC area were addressed as part of this EA. This project, for all alternatives addressed, would be implemented within the boundaries of KSC. The closest residential areas are 3 km (1.8 miles) to the south on Merritt Island and 12 km (7.6 miles) to the west in Titusville. No groups of either low-income or minority populations have been identified in either location. In addition, the distances of these areas from the Proposed Action preclude any direct impacts from construction or operations. Economic impacts are not expected to adversely affect any particular group. Construction personnel would be drawn from the local workforce and provide a short-term economic benefit to the local area.

SECTION VI

PREPARERS, CONTRIBUTORS, AND CONTACTS

SECTION VI

PREPARERS, CONTRIBUTORS, AND CONTACTS

The individuals from KSC who provided detailed data or analyses and who prepared this document are listed in Table 6.1. The table provides information concerning which section(s) each person was involved in writing or assembling.

Table 6.1 List of Individuals Who Prepared This Document			
Preparers	Affiliation	Professional Title	Contribution
Broyles, George	SGS	KSC Central Heat Plant Supervisor	Interview – Heat Plant
Busacca, Mario	NASA/KSC	Lead, Planning and Special Projects	Document Review and Approval
Shaffer, John	NASA/KSC	Environmental Engineer	Document Review
Tom, David M.	BRPH	Project Engineer	Document
Lake, Leslie J.	BRPH	Project Manager	Document
Ippolito, Anthony	NASA, MILA	Director	Interview - Line-of-sight
King, Thomas	SGS		Interview – Water and Waste Utilities
Long, Stan	SGS	KSC Chiller Plant Supervisor	Interview-Chiller Plant
Kerr, William	BKI, Ecological Consultants, Inc.	President, Project Manager	Document Review
Larson, Vickie	Ecospatial Analysts, Inc. for BKI, Ecological Consultants, Inc.	President, Project Manager (sub-consultant)	Environmental, Biological, & Wildlife Analyses and Document

SECTION VII
REFERENCES

SECTION VII

REFERENCES

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FIGURES

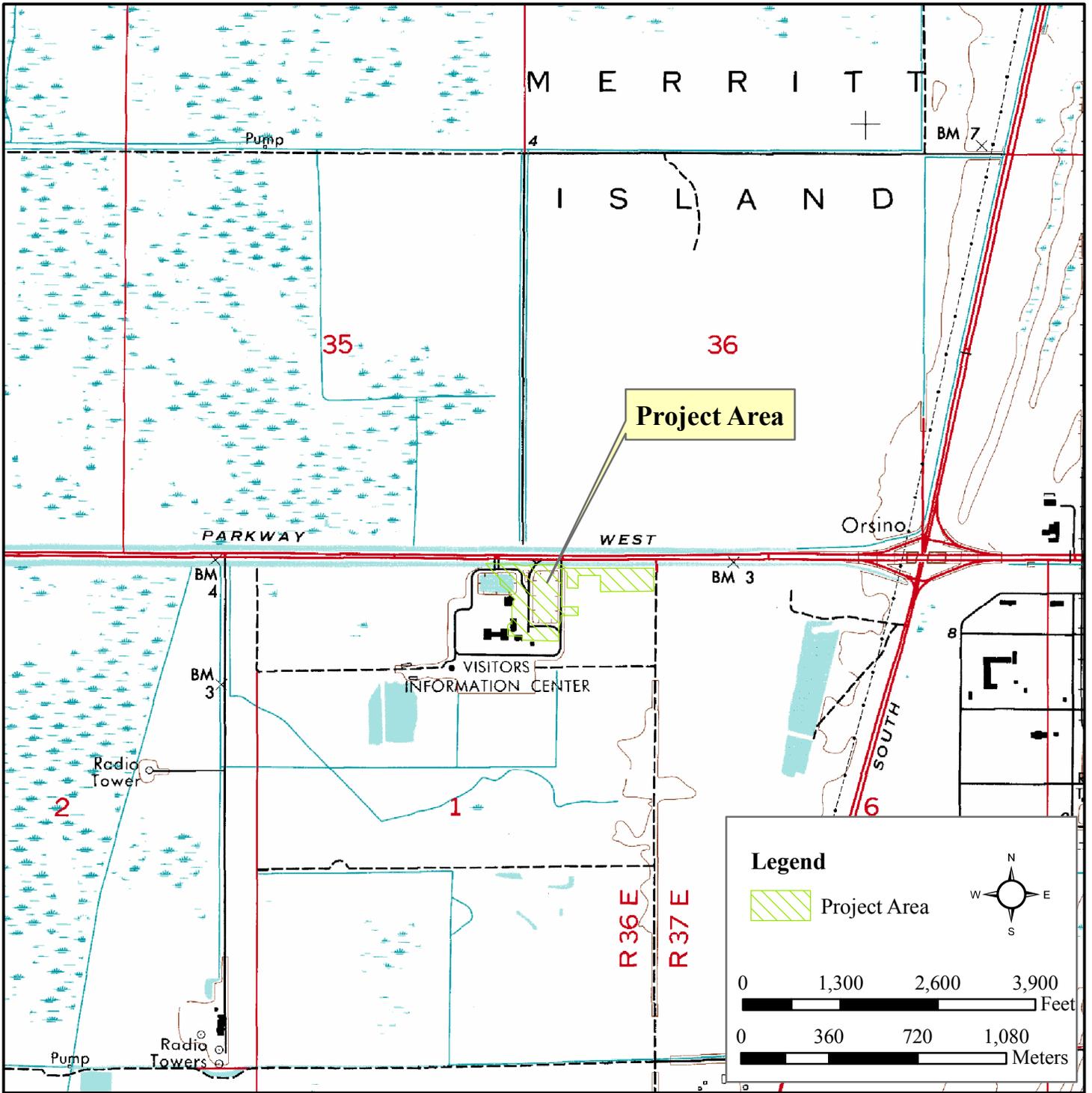


Figure 1. KSC Shuttle Launch Facility Project Area within John F. Kennedy Space Center, Florida (USGS 7.5 minute Quad Orsino).

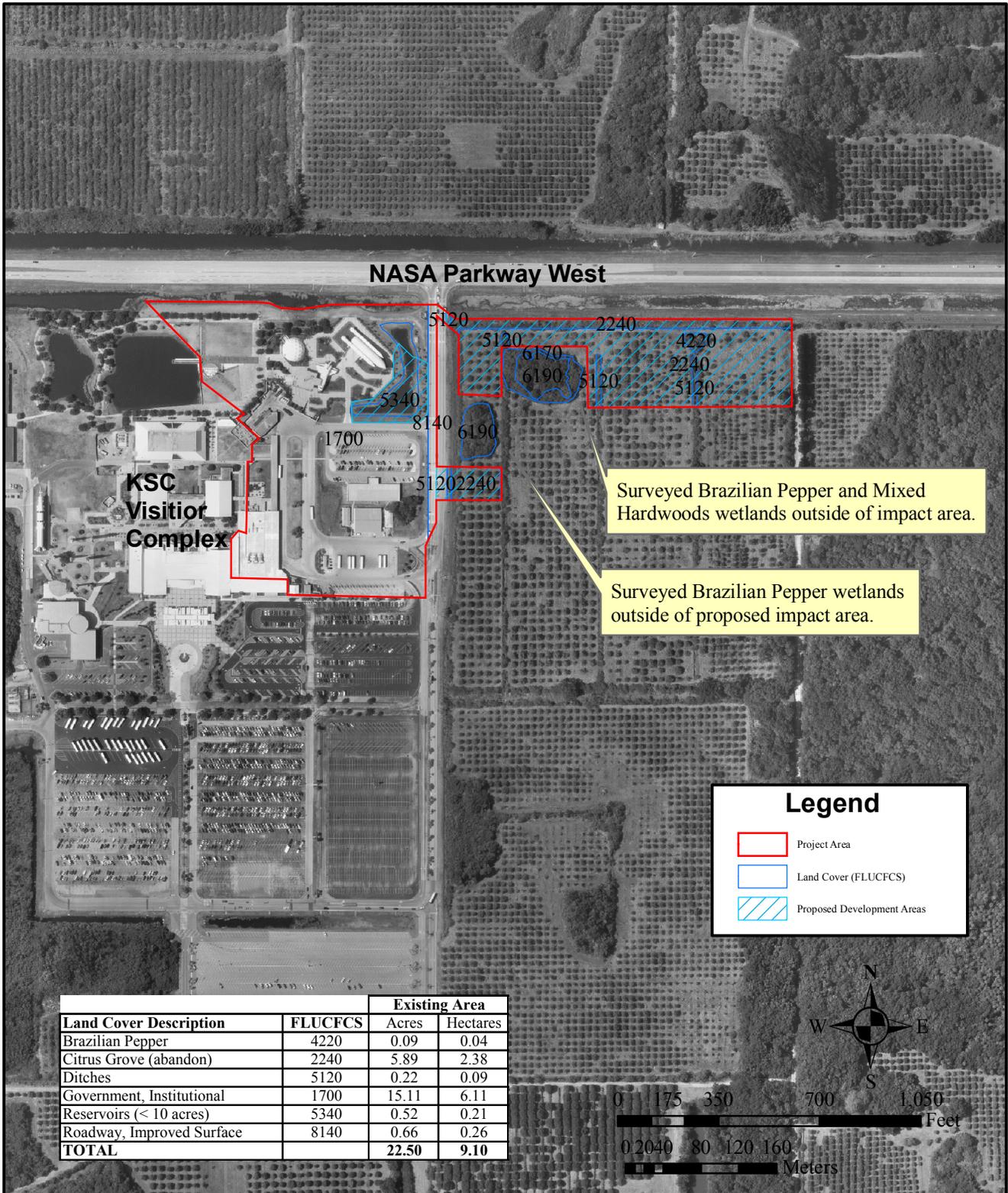


Figure 2. Existing land use (FLUCFCS) within the KSC Visitor Complex and the proposed Space Shuttle Launch Simulator (SLSF) project area.

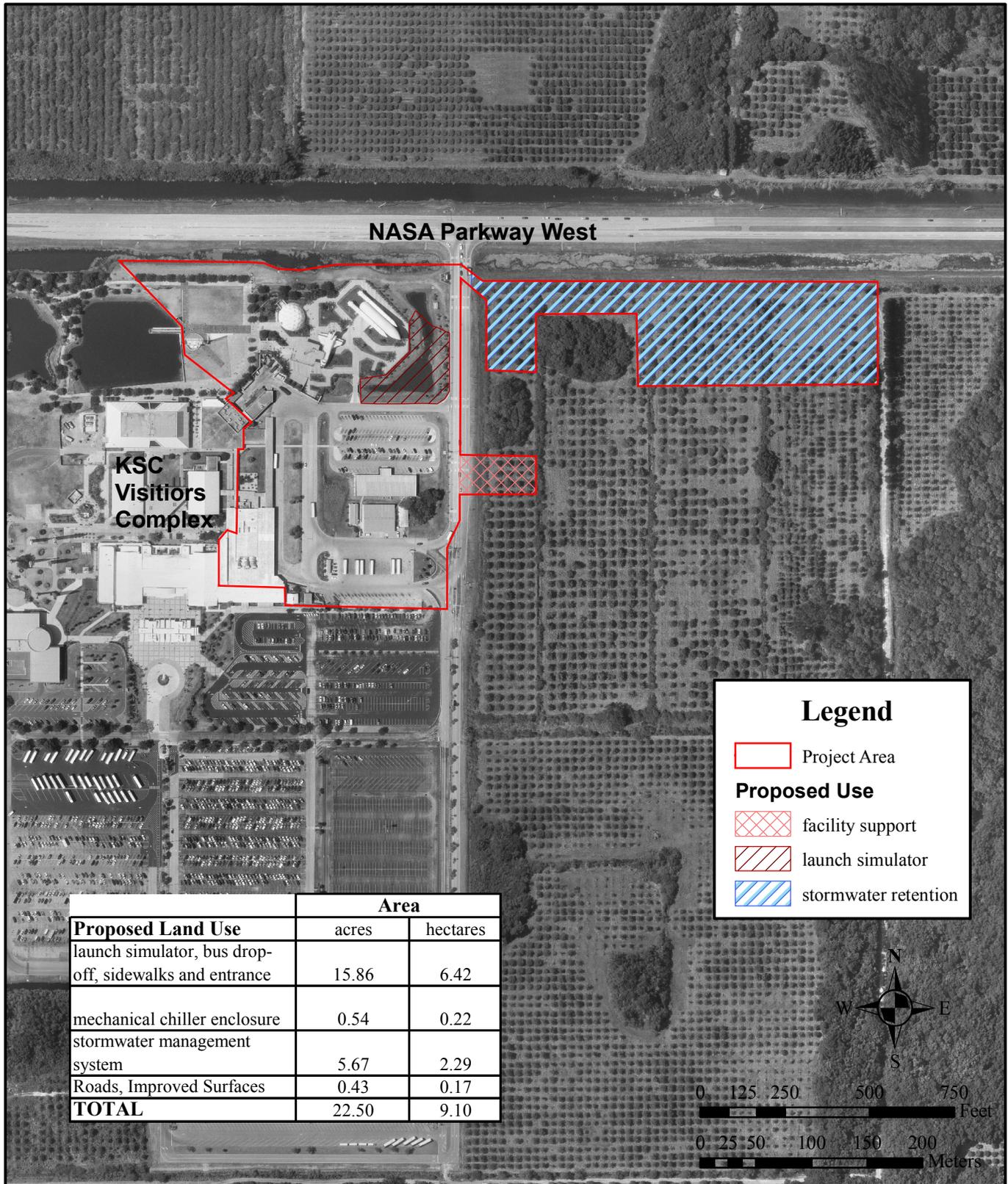


Figure 3. Proposed development area for the Shuttle Launch Simulator facility and the associated stormwater system for the KSC Visitors Complex.

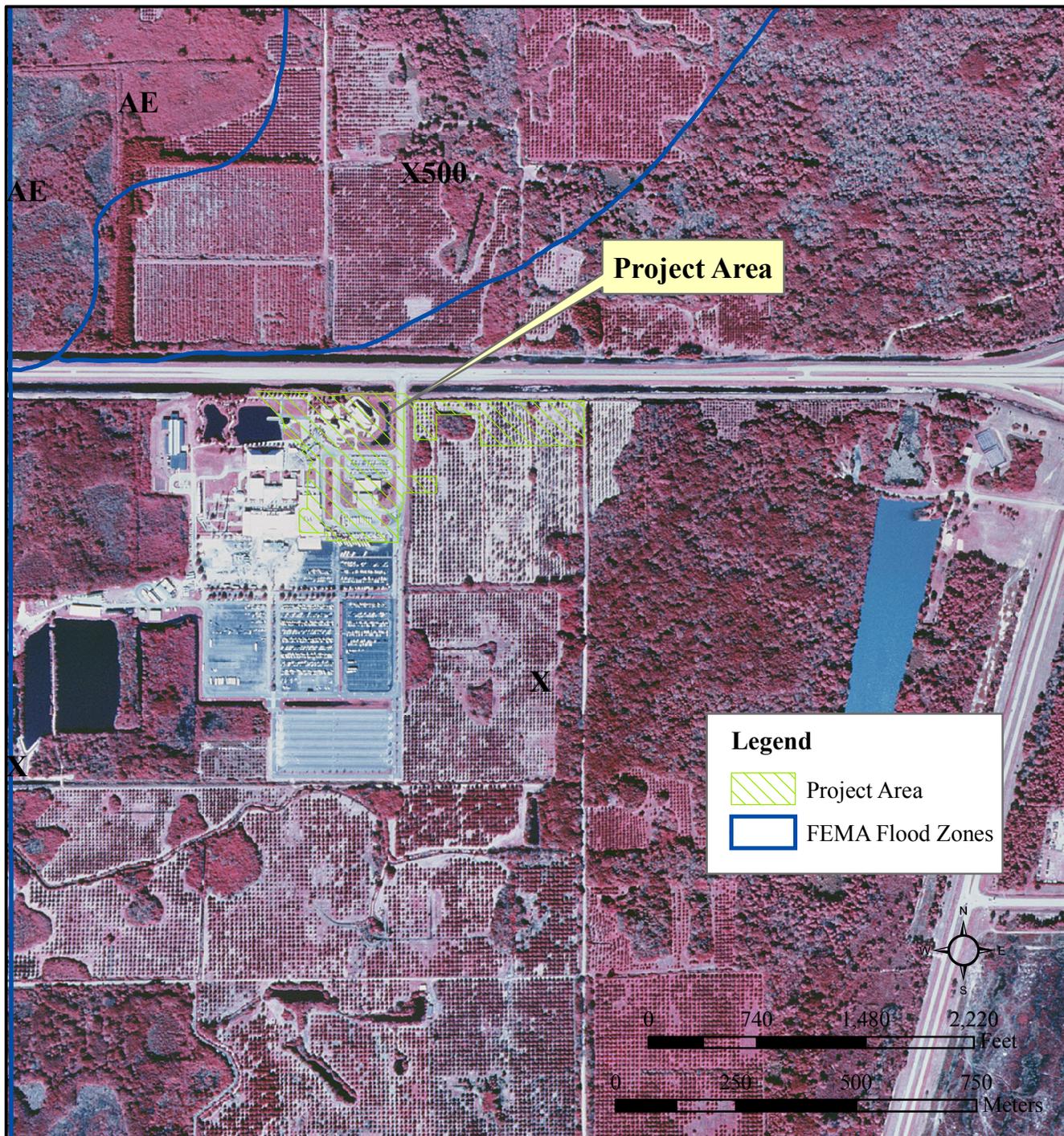


Figure 4. Federal Emergency Management Area (FEMA) flood zones within the KSC Space Shuttle Launch Simulator project area within KSC (DOQQ OrsinoSE).

x = 100-year flood zone, x500 = 500-year flood zone

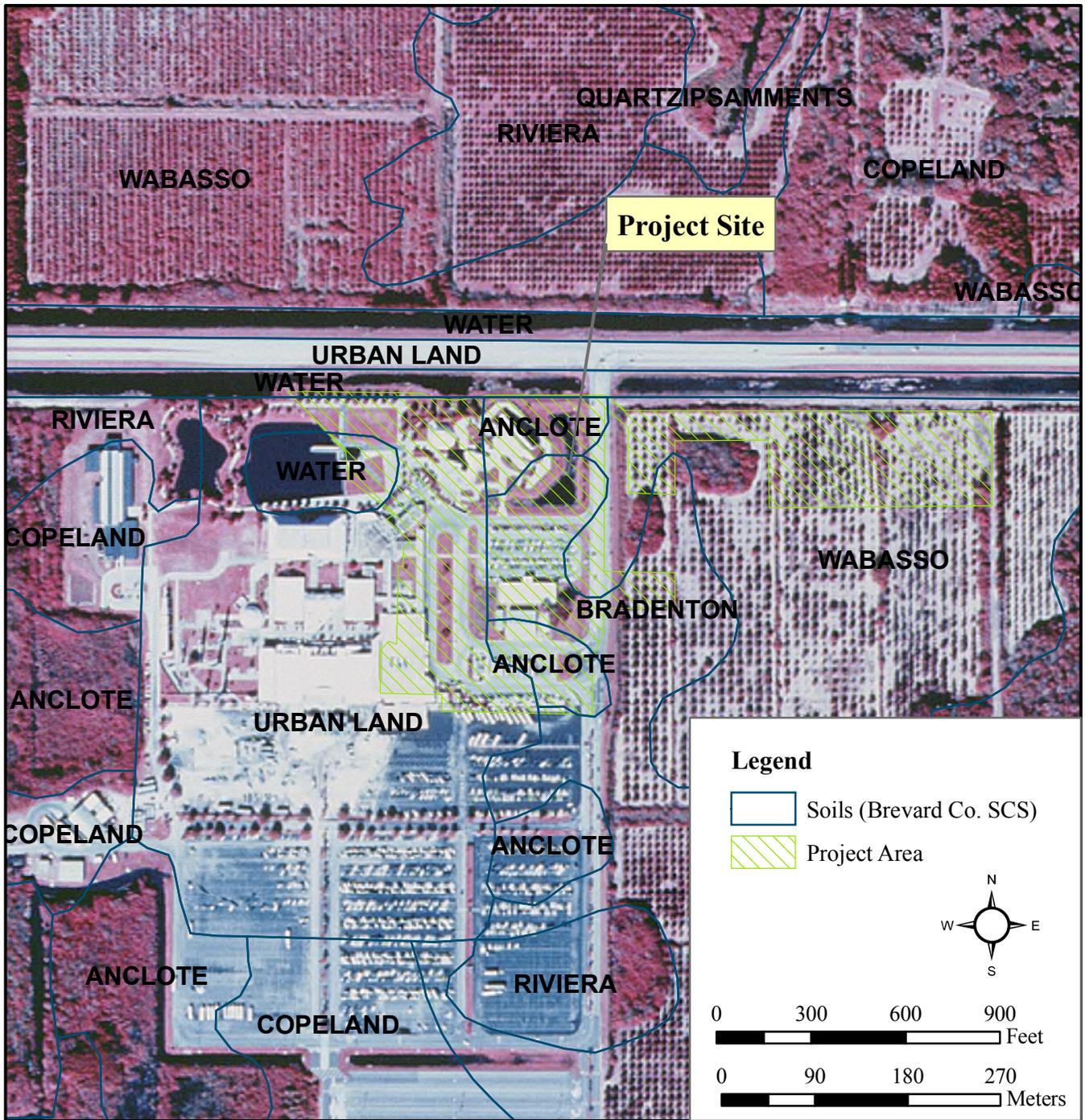


Figure 5. Brevard County soil characterizations for the KSC Space Shuttle Launch Simulator Facility (SCS 1979).