

**ENVIRONMENTAL ASSESSMENT
FOR
CENTRAL CAMPUS COMPLEX
JOHN F. KENNEDY SPACE CENTER, FLORIDA**

**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
JOHN F. KENNEDY SPACE CENTER
ENVIRONMENTAL PROGRAM OFFICE
KENNEDY SPACE CENTER, FL 32899**

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ENVIRONMENTAL ASSESSMENT FOR CENTRAL CAMPUS COMPLEX JOHN F. KENNEDY SPACE CENTER, FLORIDA

Abstract

This Environmental Assessment addresses the Proposed Action to consolidate multiple facilities in the Kennedy Space Center (KSC) Industrial Area by constructing two new buildings in the existing headquarters area between NASA Parkway, 3rd Street, C Avenue, and D Avenue. Under the Proposed Action, the historic Headquarters Building will be demolished and a new building will be constructed closer to the Operations and Checkout Building by centering it on D Avenue (Hunton Brady Architects, PA and Jones Edmunds & Associates, Inc. 2011). This option was selected from a group of 15 initial sketches as the most viable option during a Central Campus Complex Siting Study completed in February 2011. A No-Action Alternative is also presented in which no demolition or construction of new facilities would occur. Implementing the Proposed Action will have **major** impacts to cultural resources, while the remaining environmental impacts will be **minor**.

LEAD AGENCY: National Aeronautics and Space Administration
John F. Kennedy Space Center
Environmental Program Office
Kennedy Space Center, FL 32899

POINT OF CONTACT: Donald Dankert
Biological Scientist
NASA KSC Environmental Management Branch
Mail Code TA-A4C
Kennedy Space Center, FL 32899
(321) 861-1196
donald.j.dankert@nasa.gov

Table of Contents

1.0	PURPOSE AND NEED FOR ACTION.....	1
2.0	ALTERNATIVE ACTIONS	3
2.1	Proposed Action.....	3
2.2	No-Action Alternative	5
3.0	AFFECTED ENVIRONMENT	9
3.1	Facilities and Infrastructure	11
3.1.1	Transportation	11
3.1.2	Wastewater Treatment	11
3.1.3	Electricity	11
3.1.4	Communications	12
3.1.5	Potable Water	12
3.2	Air Quality	13
3.3	Biological Resources	13
3.3.1	Habitats and Vegetation	13
3.3.2	Wildlife	19
3.4	Threatened and Endangered Species	20
3.4.1	Listed Wildlife	20
3.4.2	Listed Plants.....	22
3.5	Cultural Resources	22
3.6	Geology and Soils	23
3.7	Noise	26
3.8	Surface Water Quality.....	29
3.9	Surface Water Resources and Drainage.....	29
3.10	Floodplains.....	31
3.11	Groundwater Quality	34
3.12	Socioeconomics	34
4.0	ENVIRONMENTAL CONSEQUENCES	35
4.1	Summary and Status of Impacts	35
4.2	Facilities and Infrastructures.....	35
4.2.1	Transportation	35
4.2.2	Utilities.....	37

Table of Contents

4.2.3	Air Quality	37
4.2.4	Biological Resources	38
4.2.5	Threatened and Endangered Species	40
4.2.6	Cultural Resources	41
4.2.7	Geology and Soils	41
4.2.8	Noise	42
4.2.9	Surface Water Quality.....	43
4.2.10	Floodplains.....	44
4.2.11	Groundwater Quality	44
4.2.12	Socioeconomics	45
4.3	Permits, Licenses, and Approvals.....	45
5.0	ENVIRONMENTAL JUSTICE	47
6.0	CUMULATIVE IMPACT	49
6.1	No Action Alternative.....	49
7.0	MITIGATION ACTIVITIES.....	51
8.0	PREPARERS, CONTRIBUTORS, AND CONTACTS.....	53
9.0	LITERATURE CITED	55

List of Illustrations

LIST OF FIGURES

Figure 2-1	Proposed Action All Phases – Site Plan Map	7
Figure 3-1	Aerial Location Map	10
Figure 3-2	Proposed Action Site – Land Use Map.....	15
Figure 3-3	Proposed Action Site –Wetland Map.....	18
Figure 3-4	Proposed Action Site - Soils Map	25
Figure 3-5	Stormwater Region Map	30
Figure 3-6	Topographic Map of Proposed Action Site	32
Figure 3-7	FEMA Floodplain Map.....	33

LIST OF TABLES

Table 3-1	Summary of Surface Water Impacts for the Proposed Action Site	17
Table 3-2	Threatened and Endangered Wildlife Species Documented at KSC	21
Table 3-3	Noise Levels (in Decibels, A-Weighted) Measured on KSC	27
Table 3-4	Measured Noise on KSC.....	28
Table 4-1	Summary of Potential Impacts.....	36
Table 7-1	List of Individuals Who Prepared This Document	53

List of Abbreviations and Acronyms

ACHP	Advisory Council on Historic Preservation
AST	Above-Ground Storage Tanks
BMP	Best Management Practice
CCAFS	Cape Canaveral Air Force Station
CCE	Construction Cost Estimate
CD&SC	Communications Distribution and Switching Center
CIF	Central Instrumentation Facility
CO	Carbon Monoxide
dBA	A-Weighted Decibels
EO	Executive Order
EPA	Environmental Protection Agency
ERP	Environmental Resource Permit
FDEP	Florida Department of Environmental Protection
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FL SHPO	Florida State Historic Preservation Officer
FPL	Florida Power and Light
FY	Fiscal Year
HMF	Hypergol Maintenance Facility
HQ	Headquarters
IRL	Indian River Lagoon
KSC	Kennedy Space Center
kV	Kilovolts
kVA	Kilovolt-amps
L	Liters
LBS	Load Break Switch
LC	Launch Complex
LEED	Leadership in Energy and Environmental Design

List of Abbreviations and Acronyms

LS	Lift Station
MINWR	Merritt Island National Wildlife Refuge
NASA	National Aeronautics and Space Administration
NAVD	North American Vertical Datum
NHPA	National Historic Preservation Act
NO ₂	Nitrogen Dioxide
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
O ₃	Ozone
O&C	Operations and Checkout Building
OFW	Outstanding Florida Waters
OSHA	Occupational Safety and Health Administration
PWS	Public Water System
SJRWMD	St. Johns River Water Management District
SO ₂	Sulfur Dioxide
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
V	Volts
VAB	Vehicle Assembly Building
VFI	Vacuum Fault Interrupter

EXECUTIVE SUMMARY

This Environmental Assessment addresses the Proposed Action to construct a new Central Campus Complex (Headquarters [HQ] Building). The purpose of the new facility is to consolidate National Aeronautics and Space Administration buildings and create a campus-like layout at the Kennedy Space Center (KSC), Florida. The modifications needed for the Central Campus Complex are presented in the document entitled *Central Campus Complex Siting Study Final Report, KSC-TA-11384* (Hunton Brady Architects, PA and Jones Edmunds & Associates, Inc., 2011). The *Siting Study* developed 12 master planning concepts (Options A through L) that were narrowed to six initial phasing sketches (Options C, F, G, I, J, and L). These options were then analyzed through a “Design Charrette” process with interactive and inclusive “hands-on” involvement by all stakeholders. The design information from initial planning sessions was compiled, and NASA stakeholders were invited from the Directorates that will be using the facilities. As a result of this Design Charrette, four additional options (Options M, N, O, and P) were developed that incorporated all stakeholder concerns associated with the various options. Three options (I, N, and P) were selected as the most viable options and investigated further. During this process Option N was determined to be the most viable option and is therefore the Proposed Action in this report.

The Proposed Action and the No-Action Alternative were evaluated to determine the extent of impacts on the environment at KSC. The Proposed Action, Option N, involves demolishing the existing HQ

Building and constructing a new building centered on D Avenue, thus permanently closing a section of D Avenue. The new HQ Building will be closer to the Operations and Checkout Building (O&C). To be central to the HQ Building, O&C, and Space Station Processing Facility, the Shared Services Building will be attached to the HQ Building on the side facing the Lab Consolidation Building, which will maximize use and convenience. The No-Action Alternative would involve no demolition or construction of new facilities.

The Proposed Action will require permits from the St. Johns River Water Management District, the U.S. Army Corps of Engineers, and the Florida Department of Environmental Protection.

This document describes the portions of the KSC environment that relate to the Proposed Action site. Potential environmental impacts evaluated include transportation, utilities, air quality, biological resources including land use, threatened and endangered wildlife species, biodiversity, vegetation, cultural resources, geology and soils, noise, surface water quality, groundwater quality, and socioeconomics. This document includes references to the Jacobs Engineering (2009) *Environmental Assessment* report where applicable.

Potential impacts resulting from implementing the Proposed Action were identified and then classified into one of the following pre-determined categories: None, Minimal, Minor, or Major.

Impacts from construction and operation at the Proposed Action Site vary from none to major impacts depending on the potential severity of the environmental issues

Executive Summary

evaluated. Results of the analyses are summarized in Table 4-1 of this document.

The results of the assessment of environmental issues from construction at the Proposed Action site indicate that there will be a **major impact** to cultural resources because the HQ Building is listed in the National Register of Historic Places. Coordination with the Florida State Historical Preservation Office and the Advisory Council on Historic Preservation, along with interested parties, will be required to initiate a Section 106 review under the National Historic Preservation Act, 36 CFR Part 800: Protection of Historic Properties, and KCA-4185, Management of Historic Properties at KSC. Section 106 is a public review process that seeks ways to avoid, reduce, or mitigate adverse effects to historic properties.

Based on currently available information, there will be **no to minor impacts** on transportation, utilities, air quality, biological resources, threatened and endangered species, geology, soils, noise, surface water or groundwater quality, or socioeconomics resulting from the Proposed Action. Therefore, no monitoring strategies for these resources are provided or recommended at this time.

The No-Action Alternative and Proposed Action are not expected to produce any consequences related to Environmental Justice because all activities are located away from population centers.

1.0 Purpose and Need for Action

Many of the existing National Aeronautics and Space Administration (NASA) facilities were built in the 1960s and are in poor to fair condition, are extremely energy-inefficient, and cannot be renovated cost-effectively. As a result, NASA needs new suitable facilities to continue to support the evolving needs of the space program in the 21st century.

Kennedy Space Center (KSC) will continue to process and launch the next-generation vehicles and spacecraft designed to achieve NASA's goals for space exploration. To achieve this transformation, program personnel are developing the necessary ground systems while refurbishing and upgrading infrastructure and facilities to meet tomorrow's demands. This modernization effort keeps flexibility in mind to accommodate a multitude of government, commercial, and other customers.

Typically, when new facilities are required, funding is requested and buildings are built and remodeled on as needed. KSC is at a pivotal point in time in which the Center must move toward a more consolidated approach to streamline maintenance and operational costs. Currently, the building program standards are not applied universally and the site plan of the existing facilities does not incorporate an environment that promotes pedestrian interaction (Jacobs Engineering, 2009).

The purpose of the Proposed Action is to construct new facilities for the space

program to create a pedestrian-friendly, campus-like layout; to plan for facilities that are suitable to support the new mission; to improve the adjacencies of common buildings; to create public greenspace(s); and to improve connection between existing and new buildings. More importantly, this design will reduce facility life-cycle costs (e.g., reduced maintenance costs, increased energy efficiency). It currently costs approximately \$3.7 million to operate the HQ Building. The projected cost of operating the new facility will be approximately \$1.1 million. This is an annual cost savings of \$2.6 million, which will result in significant savings throughout the lifespan of the new facilities.

The design goals of a consolidated Headquarters (HQ) Building are as follows:

- Minimize life-cycle costs.
- Reduce resource consumption.
- Reduce resource waste.
- Increase employee productivity.
- Increase equipment and system efficiency.
- Emphasize source and waste reduction.
- Create a healthy and safe environment.

In addition, the U.S. Green Building Council's® Leadership in Energy and Environmental Design (also known as LEED®) practices will be explored and

Chapter 1 Purpose and Need for Action

implemented when appropriate to build a sustainable facility in accordance with Executive Order (EO) 13423, *Strengthening Federal Environmental, Energy, and Transportation Management* and EO 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*. After the facility is completed, NASA will apply to have the project become LEED Silver certified or higher.

The following buildings are within the KSC Industrial Area and are included in the Proposed Action alternative: M6-0399 (HQ Building), M7-0351 (Auditorium and Training Building), and M6-0570 (Kennedy Learning Institute). Immediately to the east are M7-0355 (Operations and Checkout [O&C] Building) and M7-0453 (Payload Maintenance Facility).

2.0 Alternative Actions

Alternative Actions were selected from the study, which evaluated eight alternatives that met facility requirements. Of these eight alternatives, Option N was selected as the most viable. Option N proposes new construction on the Central Campus and is the preferred alternative because of its proximity to the O&C Building. This option has fewer constraints and lower costs than the other alternatives, and infrastructure already exists in the vicinity. Moreover, the line-of-sight analysis – which studied the invisible lines that observe, monitor, or communicate with a near or distant object – concluded that Option N is suitable for new construction or addition. The potential buildable sites at KSC contain approximately ten lines of sight. The lines originate from a single point and transmit a frequency aimed toward NASA launch sites and Cape Canaveral Air Force Station (CCAFS) sites. The heights of the lines range from approximately 8 feet mean sea level to 72 feet mean sea level and are contained within an invisible cone. Lines-of-sight heights will aid in predicting the heights and placement of future facilities in the Industrial Area (Data are being collected to further define the line-of-sight impacts on all sites – Jacobs Engineering [2009]).

Based on a regulatory agency permitting review, the Proposed Action will require the following permits and consultations:

- An Environmental Resource Permit (ERP) from the St. Johns River Water Management District (SJRWMD) for construction of a new stormwater treatment system and impacts to existing surface water

systems (i.e., stormwater treatment swales).

- A Federal Dredge and Fill permit from the U.S. Army Corps of Engineers (USACE) for filling jurisdictional surface waters.
- A National Pollutant Discharge Elimination System (NPDES) Permit from the Florida Department of Environmental Protection (FDEP) for construction activities.
- A Notice of Intent to Use the General Permit for Construction of Water Main Extensions for Public Water Systems (PWSs) through FDEP, DEP Form 62-555.900(7).
- A Notification/Application For Constructing a Domestic Wastewater Collection/Transmission System through FDEP, DEP Form 62-604.300(8)(a).
- Section 106 Review with the Florida State Historic Preservation Officer (FL SHPO), Advisory Council on Historic Preservation (ACHP), and interested parties.

2.1 Proposed Action

The Central Campus Complex will consolidate multiple facilities in the KSC Industrial Area into two new buildings to be constructed on the existing headquarters site between NASA Parkway, 3rd Street, C Avenue, and D Avenue. The Proposed Action (Option N of the Siting Study) involves demolishing the existing HQ Building and constructing a new building centered on D Avenue that will permanently

Chapter 2 Alternative Actions

close a section of D Avenue and result in the HQ Building being closer to the O&C Building (Figure 2-1). The Shared Services Building will be attached to the south side of the HQ Building, which will face the Lab Consolidation Building, maximizing use and convenience.

The program for the Central Campus Complex includes consolidating nine existing buildings, totaling approximately 675,000 sf. The buildings to be consolidated are:

- Headquarters Building (M6-0399)
- Central Instrumentation Facility (CIF) (M6-0342)
- Base Operations Building (M6-0339)
- Electromagnetic Lab (M6-0336)
- Industrial Area Support Building (M6-0493)
- Occupational Health Facility (M6-0495)
- Auditorium and Training Building (M6-0351)
- Environmental Health Facility (L7-1557)
- NASA Technical Records Center (M6-0489)

The functions of these buildings will be consolidated into fewer buildings with a targeted minimum 21% reduction in square footage due to spatial efficiencies. The final targeted square footage is 500,000 sf, which is a 26% reduction. In addition, a new Lab

Consolidation Building (reference study KSC-TA-6715 *Engineering Technology Development Complex — ETDC*) totaling 185,000 sf will be incorporated into the Central Campus Complex in addition to the 500,000 sf. After in-depth study, the Design Team determined that the Shared Services Building will be consolidated into the first phase of the project within the new HQ Building or directly adjacent to it with a covered pedestrian connection. The best location for the Lab Consolidation Building was determined to be close to both the new HQ Building and the O&C Building.

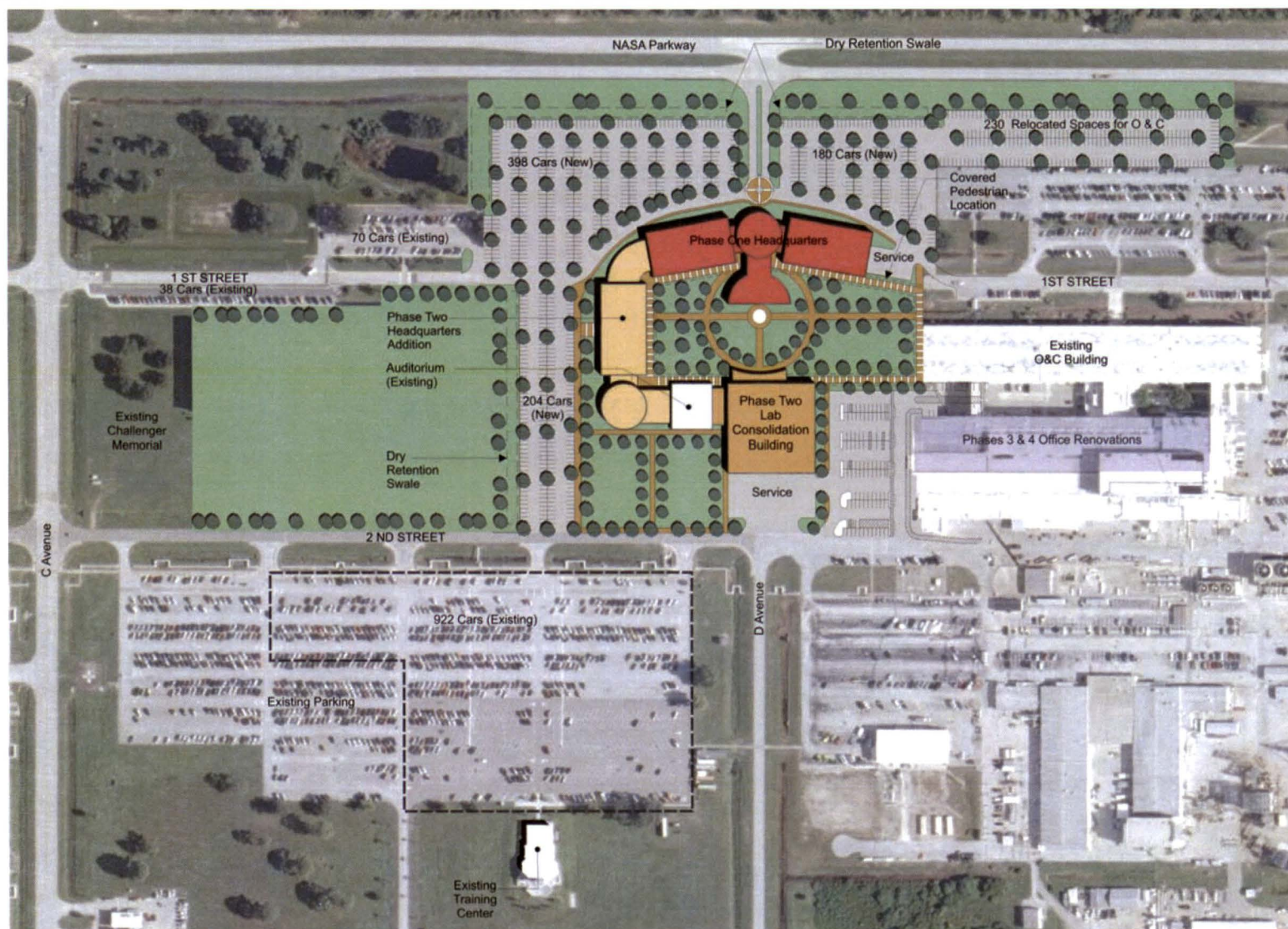
The building areas of each phase of the project depend on the project budgets for each fiscal year. The Phase One project will be the construction of the new HQ Building (Figure 2-2). The existing HQ building will remain through the completion of Phase 1. The Phase 2 project will be the Lab Consolidation Building as well as additional HQ Building space. Phase 2 will depend on future funding. Demolition of the existing HQ Building will be part of the Phase 2 funding. If funding is not available for Phase 2, alternate funding for demolishing the HQ Building will be obtained. Phases 3 and 4, which are not detailed in this study, are expected to be the renovation of approximately 100,000 sf of lab space into office space within the existing O&C Building, which will decrease the required total area of new construction in the consolidation to 400,000 sf. The Phase One Budget of \$87,000,000 (CCE) is expected to generate a Phase One HQ Building between 240,000 sf and 290,000 sf based on parametric cost analysis that estimates construction costs for the project to be between \$250 and \$300 per square foot. Later, a more detailed cost analysis revealed that the total Phase One HQ Building will be

slightly larger at between 291,000 sf and 300,000 sf.

The Phase Two budget is also \$87,000,000 (CCE), which was determined to be able to support the 185,000 sf Lab Consolidation Building as well as a 67,000 to 69,000 sf addition to the HQ Building. These projects total between 360,000 sf and 367,000 sf, which leaves a shortfall of 33,000 sf to 40,000 sf compared to the target area of 400,000 sf. Therefore, this shortfall in building area is noted as a future phase and is assumed to be funded as a separate project.

2.2 No-Action Alternative

Under the No-Action Alternative, no renovation of the existing facilities, demolition, or construction of new facilities would occur. This alternative does not meet the purpose of and need for the Proposed Action. In addition, costs associated with maintaining the existing substandard historic buildings would continue to increase and significantly exceed the costs associated with a new facility. It currently costs approximately \$3.7 million to operate the HQ Building. The projected cost of operating the new facility will be approximately \$1.1 million. This is an annual cost savings of \$2.6 million, which will result in significant savings throughout the lifespan of the new facilities.



Environmental Assessment for Central Campus Complex Modifications
March 2013 Figure 2-1 Proposed Action All Phases – Site Plan Map

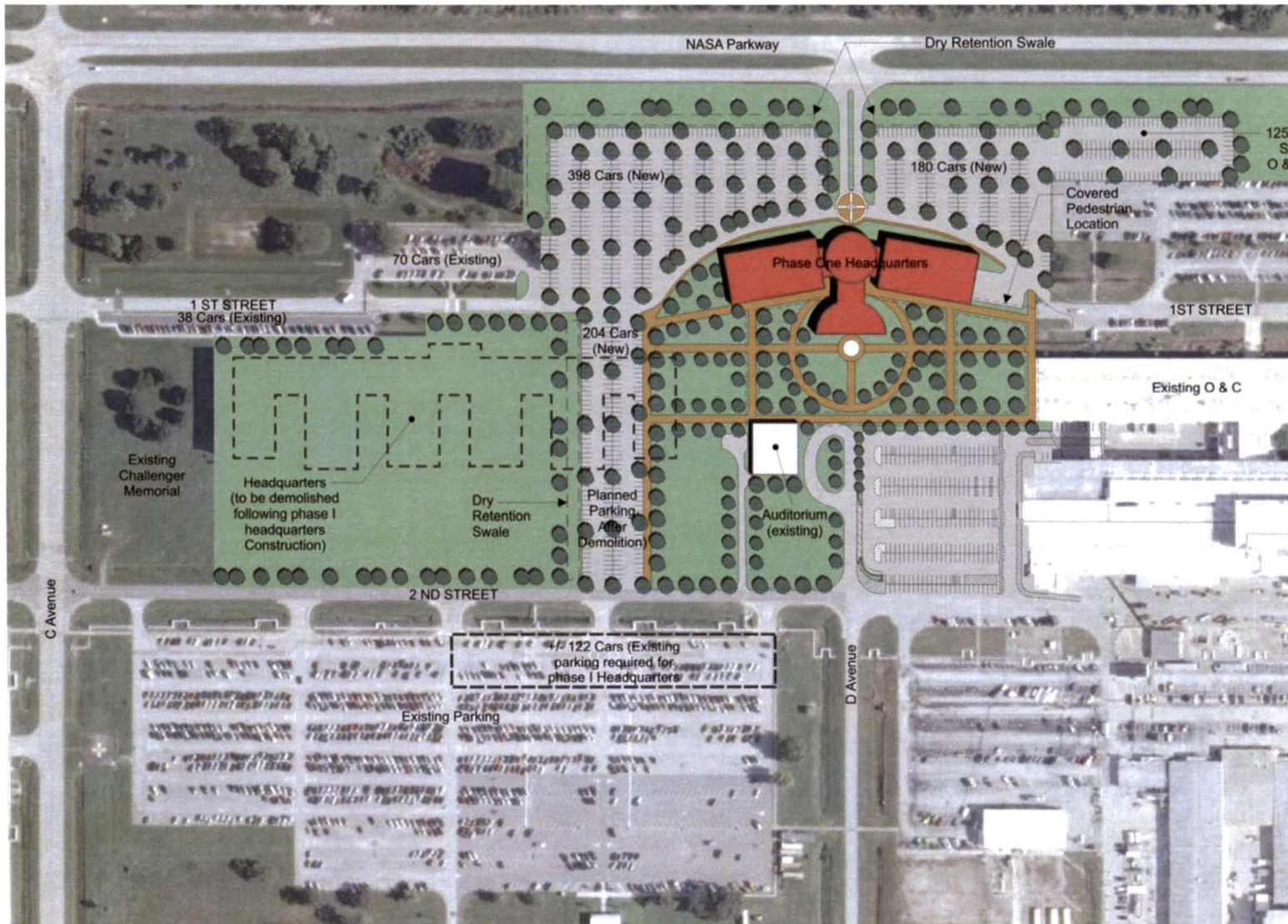


Figure 2-2 Proposed Action Phase I – Site Plan Map

3.0 Affected Environment

KSC encompasses nearly 57,400 hectares (142,000 acres) on the east coast of Central Florida and is bordered on the west by the Indian River Lagoon (IRL), on the south and east by the Banana River Lagoon, on the north by the Mosquito Lagoon, and on the east by the Atlantic Ocean. 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, which are managed by the U.S. Fish and Wildlife Service (USFWS) and National Park Service, respectively (Figure 3-1). This unique relationship between spaceflight and preservation of the environment is carefully managed to ensure that both objectives are pursued with minimal conflict with one another. The environment at the Proposed Action site is described in detail in the following sections.



Figure 3-1 Aerial Location Map

3.1 Facilities and Infrastructure

3.1.1 Transportation

KSC is served by over 340 kilometers (211 miles) of roadways with over 263 kilometers (163 miles) of paved roads and 77 kilometers (48 miles) of unpaved roads. KSC also has approximately 160 kilometers (100 miles) of railroad. 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 IRL into KSC. At the KSC Industrial Area, the road is reduced to two lanes, crosses over the Banana River, and enters CCAFS. The second point of entry into KSC is from the south via Kennedy Parkway South, which originates on north Merritt Island as State Road 3 (Kennedy Parkway). This road is the major north-south artery for KSC. The third entry point is accessible from Titusville along Beach Road, which intersects Kennedy Parkway North. The fourth entry point is through CCAFS on NASA Parkway East (*KSC-DF-3080 Environmental Resource Document, Division D*).

The Proposed Action site is within the KSC Industrial Area, which contains a grid-system of east-west streets and north-south avenues. These roadways have multiple connections to major roadways such as NASA Parkway and Kennedy Parkway.

3.1.2 Wastewater Treatment

Approximately 80% of the sanitary sewer service at KSC is provided by two collection/transmission systems, one in the

Industrial Area and one in the Vehicle Assembly Building (VAB) area. These systems collect and transport raw wastewater to the Regional Plant in CCAFS. A number of septic tank systems throughout KSC typically support small offices or temporary buildings (*2007-KSC-01 and KSC-DF-3080 Environmental Resource Document, Division D*). Wastewater from the HQ Building and other facilities in the Central Campus area is currently collected by a network of gravity-sewer laterals, mains, and manholes that discharge to Lift Station LS-1C. LS-1C is southwest of the intersection of D Avenue and 2nd Street and discharges south through a 6-inch force main with an ultimate discharge point at Master Lift Station LS-1AA.

3.1.3 Electricity

The electric power distribution system at KSC is provided by Florida Power and Light (FPL), which transmits 115 kilovolts (kV) to KSC that are distributed to two major substations: (1) the C-5 substation, which serves the LC-39 Area and provides 13.8 kV, and (2) the Orsino substation, which serves the Industrial Area and provides 13.2 kV. From 2001 through 2006, electricity use on KSC ranged between 270,000 and 293,000 megawatt-hours; electricity consistently provides 71% of KSC's total energy (*NASA 2007 and KSC-DF-3080 Environmental Resource Document, Division D*). The high-voltage power is distributed from the substations by over 434 kilometers (270 miles) of overhead and underground power lines to transformers and substations at various facilities. The HQ Building is fed power from the Orsino substation to two double-ended substations at the HQ Building for redundant power using 13.2 kV Feeders

202/203 and 204/205. Feeders 202/203 serve the HQ Building through load-break switch (LBS) 13. Feeders 204/205 serve HQ through LBS 14. Each feeder voltage is transformed down to 480/277 volts (V) with a 1,500 kilovolt-amps (kVA) and a 750-kVA transformer. Based on Fiscal Year (FY) 2010 energy reports, Feeders 202/203 have at least 9,300 kVA of spare capacity and Feeders 204/205 have at least 10,100 kVA spare of capacity. For FY 2010, the HQ Building's peak monthly demand was approximately 1,700 kVA.

As part of the [KSC's Sustainability Initiatives](#), in June 2008 KSC leased land to FPL to build a 10-megawatt photovoltaic system for FPL's electricity generation purposes. As in-kind consideration for use of the land, FPL provided KSC with a separate 1-megawatt photovoltaic system valued at \$6.4 million. This innovative partnership helped the federal government and FPL electricity consumers achieve the environmental benefits of using electricity generated from renewable sources and also helped NASA reduce energy costs that consume mission resources. KSC's 1-megawatt facility will produce almost 1,800 megawatt-hours annually, saving NASA \$162,221 in FY 2010 while avoiding 1,055 tons of carbon dioxide emissions annually. FPL's 10-megawatt facility will produce almost 19,000 megawatt-hours and avoid 10,306 tons of carbon dioxide emissions annually. Between the two systems, more than 560,000 megawatt-hours of electricity will be produced, saving KSC about \$10.7 million while avoiding 360,000 tons of carbon dioxide emissions during its expected 30-year life.

3.1.4 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 and other hardware in space. The major segments are the three distribution and switching stations in the Industrial Area (First Switch) and VAB Area (Second and Third Switches). These three stations provide service for over 18,500 telephones on KSC (*NASA 2007 and KSC-DF-3080 Environmental Resource Document, Division D*). The underground communication cabling distribution includes fiber optic and copper cabling within concrete ductbank originating from the Communications Distribution and Switching Center (CD&SC) facility (M6-0138). The primary routing of cables is east-west through the Industrial Area along NASA Parkway, 1st Street, 2nd Street, and 3rd Street. Due to a collapsed ductbank under the railroad tracks near the corner of 1st Street and B Avenue, additional cables cannot be pulled through the ductbank along 1st Street heading east.

3.1.5 Potable Water

KSC's potable water is supplied by the City of Cocoa, which obtains its water from artesian wells west of the St. Johns River in Orange County. Water enters the Center along State Road 3 from a 60-centimeter (24-inch) water main and extends north along Kennedy Parkway. The average daily

demand for water is 3.8 million liters (L) per day (1 million gallons per day). Total storage capacity at KSC is approximately 15 million L (4 million gallons) in 10 above-ground storage tanks (AST) (*NASA 2007 and KSC-DF-3080 Environmental Resource Document, Division D*). LC-39 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 within the utility annex, which receives its supply from the VAB Area AST. The potable water and fire-protection water for the Central Campus area are currently supplied by a network of 6-inch, 8-inch, and 12-inch asbestos cement water mains. The current capacity of the water system serving the Central Campus area is 7,836 liters per minute (2,070 gallons per minute). The capacity of the water system is proposed to be increased to 24,429 liters per minute (6,450 gallons per minute) as part of the FY 2011 Water and Wastewater System Improvement Project. The asbestos-containing cement mains that serve the site are proposed to be replaced with ductile iron water mains as part of the FY 2012 Water and Wastewater Systems Improvement Project.

3.2 Air Quality

The Environmental Protection Agency (EPA) has set the National Ambient Air Quality Standards for six principal pollutants (carbon monoxide [CO], nitrogen dioxide [NO₂], ozone [O₃], particulate pollution, lead, and sulfur dioxide [SO₂]), which are called “criteria” pollutants. EPA criteria air pollutants at KSC have been monitored since January 1983 as part of the

Long-term Environmental Monitoring Program for the KSC Biomedical Operations and Research Office.

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 within an 18.5-kilometer (10-mile) radius of the Center. In addition to these sources, other operations occurring infrequently throughout the year also play a role in the air quality at KSC. These include space launches and prescribed fire management practices that influence air quality as episodic events.

Currently, KSC is within an area classified as “attainment” with respect to the National Ambient Air-Quality Standards established by the EPA for the six criteria pollutants (*KSC-DF-3080, Environmental Resource Document, Division D*). The attainment classification is defined as any area that meets the national primary (provides public health protection) or secondary (provides public welfare protection) ambient air quality standard for a given pollutant.

3.3 Biological Resources

3.3.1 Habitats and Vegetation

Vegetation on KSC can generally be categorized into upland and wetland communities. A “ridge and swale” topography that includes bands of uplands and wetlands oriented northeast-southwest is found on KSC. Scrub and pine flatwoods are the common upland communities with freshwater marshes between upland bands.

Large areas of mangroves and salt marsh are adjacent to the estuaries on KSC and are an integral part of their makeup.

On November 15, 2011, an environmental investigation of the Proposed Action site was conducted to locate the approximate limits of jurisdictional wetlands or surface waters as regulated by SJRWMD and USACE and to note the presence of threatened or endangered wildlife species or habitat that could support such species.

The onsite vegetative assemblages documented during the investigation at the Proposed Action site location were categorized according to the NASA 2003 Land Cover dataset. These datasets were obtained from the KSC Environmental Management Branch. Vegetation within the approximately 21.2-hectare (52.4-acre) Proposed Action site consists of one distinct 19.3-hectare (47.8-acre) upland vegetative community type and two distinct open-water communities totaling 1.9 hectares (4.6 acres). A description of each community type is presented below.

3.3.1.1 Uplands

Approximately 36,206 hectares (89,467 acres) of uplands are on KSC; these uplands are comprised of several vegetation communities. Upland communities on KSC are found on well-drained, acidic, sandy soils that experience brief periods of standing water. Scrub and pine flat woods are the most common upland communities and rely on periodic fire for maintenance of habitat structure and vegetation composition. These upland communities support numerous upland-dependent listed wildlife species such as the Florida scrub jay and gopher tortoise.

The Proposed Action site consists of approximately 21.2 hectares (52.4 acres), of which the uplands are classified as Infrastructure-Primary (7.1 hectares; 17.6 acres) and Ruderal-Herbaceous (12.2 hectares; 30.2 acres) (Figure 3-2).

The Infrastructure-Primary classification consists of buildings, parking lots, and roads. The remaining Ruderal-Herbaceous areas are landscaped or maintained turf grass areas dominated by bahia grass (*Paspalum notatum*) and other weedy species such as common ragweed (*Ambrosia artemisiifolia*), frogfruit (*Phyla nodiflora*), and beggarticks (*Bidens alba*). Scattered longleaf pine (*Pinus palustris*), live oak (*Quercus virginiana*), and saw palmetto (*Serenoa repens*) are throughout the area.

3.3.1.2 Wetlands/Surface Waters

Approximately 4,149 hectares (10,244 acres) of wetlands are on KSC; these are characterized as freshwater or saltwater marsh, mangrove, wetland scrub, or forested wetlands (NASA, 2007). KSC is bordered on the west edge by the IRL. The IRL has been nationally recognized for its quality and species diversity. The IRL is designated as an Outstanding Florida Water (OFW) and an Estuary of National Significance and has been nominated as an Estuary for National Research. Impounded salt marsh waters are found throughout KSC and are managed by USFWS on MINWR. Aquatic inland habitats on KSC include shrub swamps, freshwater 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.

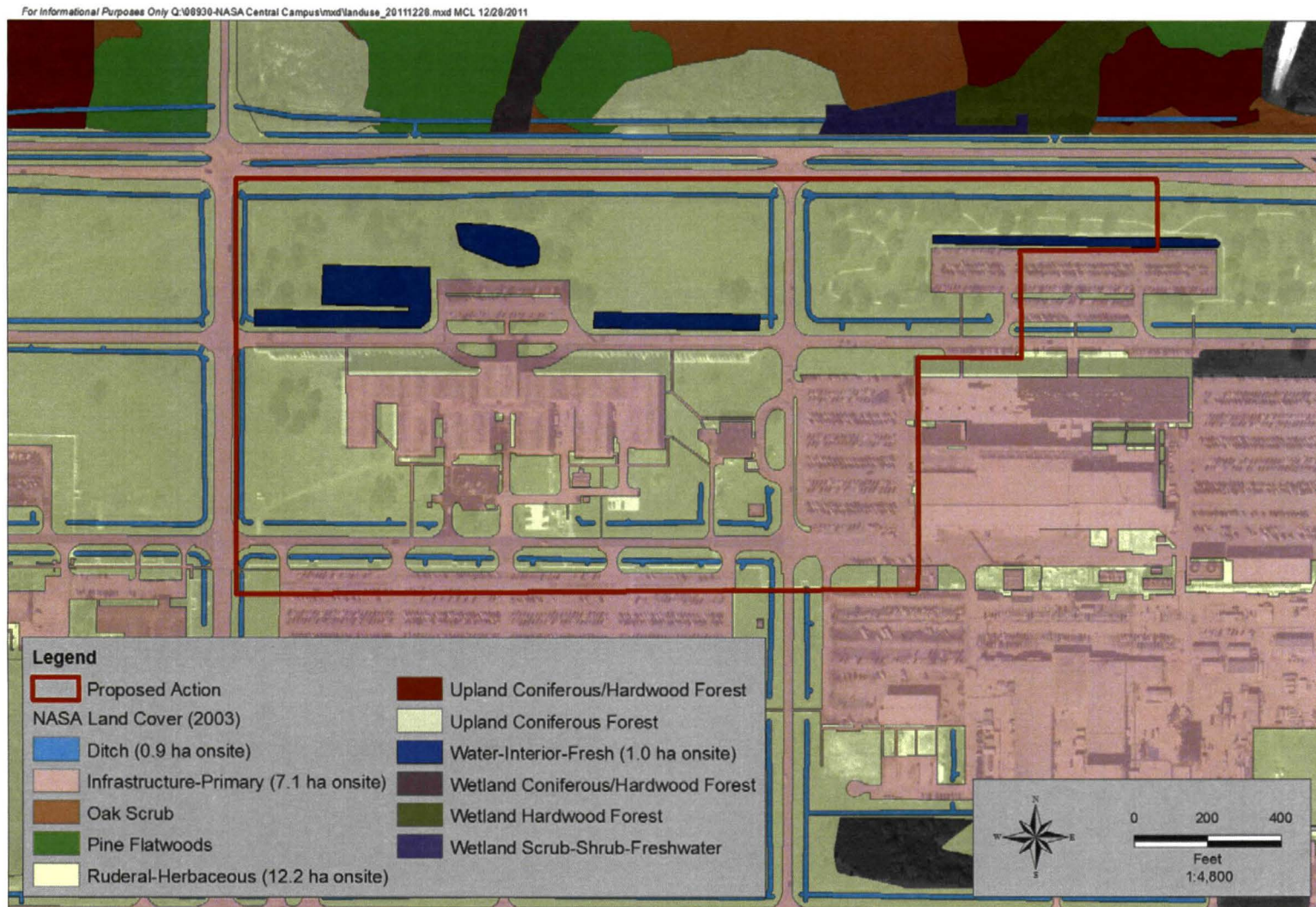


Figure 3-2 Proposed Action Site – Land Use Map

The Proposed Action site does not contain any jurisdictional wetlands but does contain approximately 1.9 hectares (4.5 acres) of low-quality jurisdictional and non-jurisdictional surface waters (Figure 3-3 and Table 3-1). The two distinct surface-water communities—Ditch and Water-Interior-Fresh (stormwater ponds)—are found in the Proposed Action site (Figure 3-3). All of these surface waters are maintained by regular mowing of the side slopes and basins when dry and were excavated in uplands.

The first surface water community, Ditch, is a man-made community located throughout the Proposed Action site (Figure 3-3 and Table 3-1) and comprises 0.9 hectare (2.2 acres). These communities are connected via culverts and serve as stormwater treatment areas. Water levels in these ditches range from several inches to greater than 0.0348 meters (1 foot) and are controlled by structures. This community is dominated by Mexican primrose willow (*Ludwigia octovalvis*), beggarticks (*Bidens alba*), camphor weed (*Pluchea sp.*), water lily (*Nymphaea sp.*), torpedo grass (*Panicum repens*), foxtail (*Setaria sp.*), frogfruit (*Phyla nodiflora*), falsefennel (*Eupatorium leptophyllum*), common ragweed (*Ambrosia artemisiifolia*), flatsedge (*Cyperus sp.*), common dayflower (*Commelina diffusa*), cattails (*Typha sp.*), spikerush (*Eleocharis sp.*), and marsh pennywort (*Hydrocotyle umbellata*).

The second surface water community, Water-Interior-Fresh, is denoted as A, B, C, and D (Figure 3-3 and Table 3-1). Surface Water A is in the northwest corner of the site and is approximately 0.2 hectare (0.4 acre) of open water. Surface Water A appears to have been an upland-cut stormwater pond (based on historical aerial

photographs) that receives and treat stormwater inflows from adjacent buildings and parking areas. A very short littoral shelf is dominated by marsh pennywort (*Hydrocotyle umbellata*), bahia grass (*Paspalum notatum*), bluestem (*Andropogon glomeratus*), cattail (*Typha sp.*), beggarticks (*Bidens alba*), and frogfruit (*Phyla nodiflora*), which transitions abruptly to the upland areas. A pocket of saw palmetto (*Serenoa repens*), Brazilian pepper (*Schinus terebinthifolia*), and cabbage palm (*Sabal palmetto*) is on the north side of the pond.

Surface Waters B, C, and D are permitted stormwater treatment areas. By State rule, permitted stormwater systems (any surface waters or wetlands therein) are considered non-jurisdictional. Surface Water B comprises 0.1 hectare (0.3 acre) and is in the northeast corner of the Proposed Action site. The majority of the pond is dominated by bahia grass (*Paspalum notatum*) and carpetgrass (*Axonopus fissifolius*). However, this vegetation provides little cover due to regular mowing.

Surface Waters C and D, comprising 0.5 hectare (1.2 acres) and 0.2 hectare (0.4 acre), respectively, are in the west and central sides of the site (Figure 3-3 and Table 3-1). These surface waters are dominated by beaksedge (*Rhynchospora sp.*), soft rush (*Juncus effusus*), bahia grass (*Paspalum notatum*), waterhyssop (*Bacopa sp.*), Mexican primrose willow (*Ludwigia octovalvis*), and cattail (*Typha sp.*). As with Surface Water B, this vegetation provides little cover due to regular mowing. Both ponds accept roadway drainage and outfall via control structures to a downstream ditch network.

Table 3-1 Summary of Surface Water Impacts for the Proposed Action Site

Site	Surface Water ID	Size (Hectares)	Size (Acres)
Proposed Action	A (Water-Interior-Fresh water)	0.2	0.4
	B (Water-Interior-Fresh water)	0.1	0.3
	C (Water-Interior-Fresh water)	0.5	1.2
	D (Water-Interior-Fresh water)	0.2	0.4
	Ditches	0.9	2.2
Total		1.9	4.5

Chapter 3 Affected Environments

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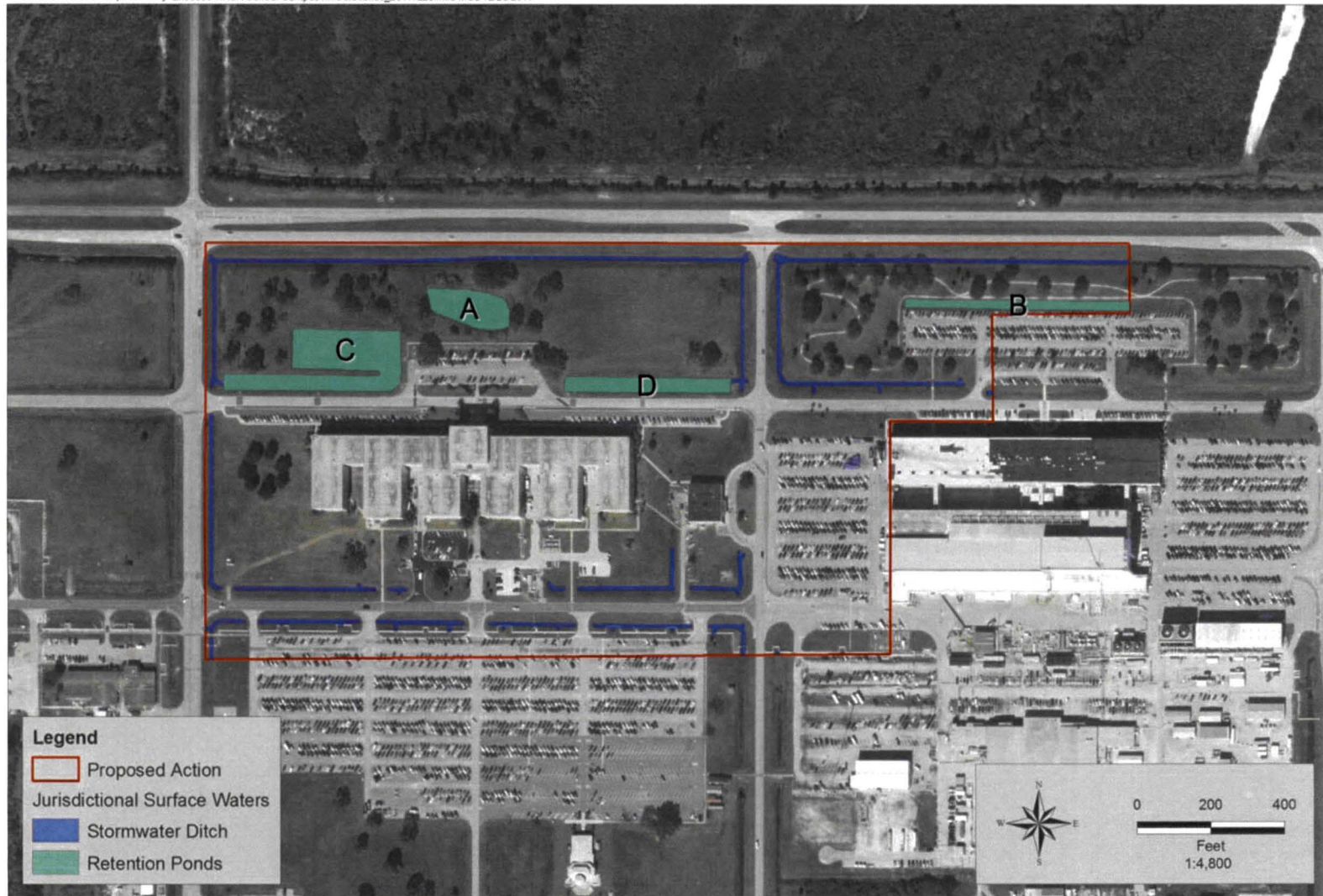


Figure 3-3 Proposed Action Site –Wetland Map

3.3.2 Wildlife

3.3.2.1 Birds

KSC and the surrounding coastal areas provide habitat for 330 bird species. Approximately 90 of these species are breeding residents, over 100 species have been documented to winter on the Center, and the remaining species are transients that regularly uses the Center's terrestrial and aquatic habitats for brief periods (U.S. Geological Survey, 2007).

Due to the developed nature of the Proposed Action site and lack of native upland habitats, bird utilization is very limited. Species that can be expected at the Proposed Action site include transient and common species such as cardinals (*Cardinalis cardinalis*), mourning dove (*Zenaida macroura*), American robin (*Turdus migratorius*), fish crow (*Corvus ossifragus*), mocking bird (*Mimus* sp.), Carolina wren (*Thryothorus ludovicianus*), and several gull species. The ditches and surface waters could also provide suitable foraging habitat for wading bird species such as the little blue heron (*Egretta caerulea*), snowy egret (*Egretta thula*), tricolored egret (*Egretta tricolor*), white ibis (*Eudocimus albus*), and wood stork (*Mycteria Americana*). In addition, nesting birds such as the least tern (*Sterna antillarum*) and black skimmer (*Rhychops niger*) nest on flat gravel rooftops. The buildings on the Proposed Action site may be used by these species, and an established least tern colony has been documented on the HQ Building roof in the past few years.

3.3.2.2 Mammals

Thirty species of mammals inhabit KSC lands and waters (Ehrhart, 1976). Typical terrestrial species include the opossum (*Didelphis virginiana*), hispid cotton rat (*Sigmodon hispidus*), raccoon (*Procyon lotor*), river otter (*Lutra canadensis*), and bobcat (*Lynx rufus*). Due to the regional loss of large carnivores such as the Florida panther (*Puma concolor coryi*) and red wolf (*Canis rufus*), the bobcat and otter now hold the position of top mammalian predators on KSC.

Additionally, a proliferation of mid-level predators such as the raccoon and opossum has resulted from an imbalance of predator/prey ratios. Opportunistic species such as the cotton rat and eastern cottontail rabbit (*Sylvilagus floridanus*) account for a large portion of the small mammal biomass. At least three species of bats have been documented. They occasionally use KSC facilities as roost sites and must be relocated and excluded from re-entry when conflicts with facility operations occur. Two mammal species common in the waters of the IRL are the Atlantic bottlenose dolphin (*Tursiops truncatus*) and the West Indian manatee (*Trichechus manatus*).

Typical terrestrial mammalian species that may use the herbaceous maintained areas or ditches within the Proposed Action site include the raccoon (*Procyon lotor*), armadillo (*Dasypus novemcinctus*), feral hog (*Sus scrofa*), eastern cottontail rabbit (*Sylvilagus floridanus*), hispid cotton rat (*Sigmodon hispidus*), and opossum (*Didelphis virginiana*). Most mammals would utilize native vegetation communities found offsite, only using these upland turf

areas or ditches at night, which would require crossing main roads.

3.3.2.3 Herptofauna

Fifty species of reptiles and 19 species of amphibians are known to occur at KSC (Seigel et al., 2002). The onsite vegetation communities are very low-quality due to the lack of cover and continual disturbance from mowing and thus primarily support common species. Non-listed reptilian species such as the common cooter (*Pseudemys* sp.), musk turtle (*Sternotherus odoratus*), soft-shelled turtle (*Apalone ferox*), garter snake (*Thamnophis sirtalis*), Carolina anole (*Anolis carolinensis*), brown anole (*Anolis sagrei*), chorus frog (*Pseudacris* sp.), Southern leopard frog (*Rana sphenoccephala utricularia*), Southern toad (*Anaxyrus terrestris*), and green tree frog (*Hyla cinerea*) are expected to utilize the herbaceous upland areas as well as the surface-water ditches as potential foraging areas. Additional information regarding the gopher tortoise and federally listed reptilian species is provided in NASA (2007).

3.4 Threatened and Endangered Species

At present, 19 federal and state laws deal directly with the conservation and preservation of flora and fauna in Florida. The primary objectives of these laws are to establish the listing and de-listing processes for endangered and threatened species, maintain data on current populations of species, identify and maintain critical habitat, and protect those species that have been identified as threatened or endangered.

3.4.1 Listed Wildlife

Thirty State or federally listed wildlife species use the lands or waters of KSC (NASA, 2007) (Table 3-2). Of the 30 listed wildlife species, 14 are federally listed.

Of the 30 listed wildlife species, the Florida scrub jay (*Aphelocoma coerulescens*), wood stork (*Mycteria americana*), little blue heron (*Egretta caerulea*), snowy egret (*Egretta thula*), white ibis (*Eudocimus albus*), American alligator (*Alligator mississippiensis*), Florida manatee (*Trichechus manatus latirostris*), and Southeastern beach mouse (*Peromyscus polionotus niveiventris*) are the most common.

Of these 30 listed species, 19 species could potentially use developed vegetation or surface water communities found within the Proposed Action site (Table 3-2). While the man-made surface waters could provide foraging habitat for listed wading bird species such as wood stork, little blue heron, snowy egret, Florida sandhill crane (*Grus canadensis pratensis*), roseate spoonbill (*Ajaia ajaja*), and white ibis, these communities are unlikely to be crucial due to the large acreages of surface waters in other locations and the intensive human use of facilities in the proposed project vicinity.

The Eastern indigo snake (*Drymarchon couperi*) is not a common species on KSC and thus is not expected to utilize the Proposed Actions site based on the maintained herbaceous vegetation and active human presence. No gopher tortoise burrows

Table 3-2 Threatened and Endangered Wildlife Species Documented at KSC

Species	Common Name	Potentially On-Site	Status	
Amphibians and Reptiles			State	Federal
<i>Alligator mississippiensis</i>	American alligator	Yes	SSC	T(S/A)
<i>Caretta caretta</i>	Loggerhead		T	T
<i>Chelonia mydas</i>	Atlantic green turtle		E	E
<i>Dermochelys coriacea</i>	Leatherback sea turtle		E	E
<i>Gopherus polyphemus</i>	Gopher tortoise	Yes	T	-
<i>Drymarchon couperi</i>	Eastern indigo snake	Yes	T	T
<i>Nerodia clarkii taeniata</i>	Atlantic saltmarsh snake		T	T
<i>Pituophis melanoleucus mugitus</i>	Florida pine snake		SSC	-
Birds				
<i>Pelecanus occidentalis carolinensis</i>	Eastern brown pelican		SSC	-
<i>Egretta caerulea</i>	Little blue heron	Yes	SSC	-
<i>Egretta tricolor</i>	Tricolored heron	Yes	SSC	-
<i>Egretta thula</i>	Snowy egret	Yes	SSC	-
<i>Egretta rufescens</i>	Reddish egret		SSC	-
<i>Eudocimus albus</i>	White ibis	Yes	SSC	-
<i>Rosthamus sociabilis</i>	Snail kite	Yes	E	E
<i>Caracara cheriway</i>	Crested caracara	Yes	T	T
<i>Aramus guarauna</i>	Limpkin	Yes	SSC	-
<i>Charadrius nivosus</i>	Snowy plover	Yes	T	-
<i>Haematopus palliatus</i>	American oyster catcher	Yes	SSC	-
<i>Sterna dougallii dougallii</i>	Roseate Tern	Yes		T
<i>Ajaia ajaja</i>	Roseate spoonbill	Yes	SSC	-
<i>Mycteria americana</i>	Wood stork	Yes	E	E
<i>Falco sparverius paulus</i>	Southeastern American kestrel	Yes	T	-
<i>Charadrius melodus</i>	Piping plover		T	T
<i>Sternula antillarum</i>	Least tern	Yes	T	-
<i>Rynchops niger</i>	Black skimmer	Yes	SSC	-
<i>Grus canadensis pratensis</i>	Florida sandhill crane	Yes	T	-
<i>Aphelocoma coerulescens</i>	Florida scrub-jay		T	T
Mammals				
<i>Peromyscus polionotus niveiventris</i>	Southeastern beach mouse		T	T
<i>Podomys floridanus</i>	Florida mouse		SSC	-
<i>Trichechus manatus</i>	West Indian manatee		E	E
Key: E = endangered, SSC = species of special concern, T = threatened, T (S/A) = threatened due to similarity of appearance				

Chapter 3 Affected Environments

were observed at the Proposed Action site. However, a least tern (*Sternula antillarum*) colony has been nesting on the HQ Building roof for several years. Additional information regarding the federally listed species is also provided in Section 3.4.1 of NASA (2007).

3.4.2 Listed Plants

No federally listed plant species have been found on KSC. However, 39 plant species listed by the State as threatened, endangered, or commercially exploited have been documented on KSC (NASA 2002; Schmalzer and Foster 2005). These species have been identified by agencies as being rare or restricted to sensitive habitats, with many of them occurring in coastal dune areas that are not found in the Proposed Action site.

While a formal intensive vegetation survey was not completed, no listed plant species were observed at the Proposed Action site during the November 2011 assessment. Additionally, based on the vegetation communities found at the Proposed Action site, listed plant species are not expected to occur.

3.5 Cultural Resources

Sites containing potential archaeological and/or historical resources on KSC are protected under the National Historic Preservation Act (NHPA) and the Archaeological Resources and Protection Act, which requires that every federal agency “take into account” how each undertaking could affect historic properties. NASA has executed a *Programmatic Agreement Among the National Aeronautics*

and Space Administration John F. Kennedy Space Center, Advisory Council on Historic Preservation and the Florida State Historic Preservation Officer Regarding Management of Historic Preservation and the Florida State Historic Preservation Officer Regarding Management of Historic Properties at the Kennedy Space Center, Florida, KCA-4185. This agreement outlines roles, responsibilities, and protocols for cultural resources at KSC. NASA has mapped areas proposed for construction in previous studies and has also developed an archaeological site location predictive model to aid NASA when reviewing any siting and/or dig permit activities. Areas that have low potential and/or no known archaeological sites within the Area of Potential Effect generally do not require a Phase I or II archaeological survey. Remediation or construction activities have contract clauses that state that when any archaeological material (e.g., artifacts and/or cultural features or human remains) is found, work must stop immediately and the KSC Historic Preservation Officer must be contacted. Materials and remains will need to be identified in accordance with the Native American Graves Protection and Repatriation Act.

The Proposed Alternative site is within a developed and disturbed area of low potential of archaeological significance. However, the HQ Building (8BR1691) and Central Instrumentation Facility (CIF) (8BR1692), which are within the Proposed Alternative site, are listed historic properties in the National Register of Historic Places (NRHP) and are protected under the NHPA, 36 CFR Part 800: Historic Properties, and KCA-4185, Management of Historic Properties at KSC.

The HQ Building, constructed in 1965, was listed in the NRHP on January 21, 2000 in the context of the Apollo program. This building is significant at the national level under Criterion A in the area of Space Exploration and under Criterion C in the area of Architecture. Because the HQ Building has achieved exceptional significance within the past 50 years, Criteria Consideration G applies. This historic property was designed as the KSC administrative center where all major decisions were made and meetings conducted. Stylistically, the HQ Building is representative of the International style. The building was designed so that it could be enlarged incrementally. Although the interior has been modified, the HQ Building still retains the same configuration as in the 1960s and continues to function as the administrative center for KSC, housing many contractor and NASA offices (NASA Cultural Resources Web site, 2011). The resource boundary extends from the outer perimeter of the building approximately 3 meters (10 feet), which includes all necessary components historically required to support its functions.

The CIF was built in 1965 and is the hub of instrumentation and data-processing operations. This building is three stories tall, contains 12,669 square meters (136,378 sq ft) of floor space, and is west of the HQ Building. The building houses offices, laboratories, and test stations. Systems receive, monitor, process, display, and record information received from space vehicles during test, launch, flight, and landing. The CIF also houses KSC calibration labs and the administration computers. The CIF was added to the NRHP on January 21, 2000 in the context of the Apollo program.

3.6 Geology and Soils

KSC is on the east region of Peninsular Florida, which gradually rises above a much larger feature called the Florida Plateau. Four distinct geologic 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 silty or clayey sands, Central and Lower Miocene compacted clays and silts, and Eocene limestones.

The Natural Resources Conservation Service mapped four soil series within the 21.2-hectare (52.4-acre) Proposed Action site: Immokalee, Riviera, Pomello, and Urban Land (Figure 3-4).

The Urban Land series comprises 13.0 hectares (32.2 acres) and is the most common soil series within the Proposed Action site. This soil series consists of highly disturbed soils, which have been filled and graded for urban development. The second most common soil within the Proposed Action area is the Immokalee series, which comprises 5.8 hectares (14.3 acres). Immokalee soils consist of deep and very deep, poorly drained and very poorly drained soils that formed in sandy marine sediments. They occur on flatwoods and in depressions of Peninsular Florida. The Riviera series comprises 1.3 hectares (3.3 acres) and consists of very deep, poorly drained, very slowly permeable soils on broad, low flats and in depressions in the Lower Coastal Plain. They formed in stratified sandy and loamy marine sediments on the Lower Coastal Plain. The Pomello series comprise 1.0 hectare (2.5 acres) in the north-central and northwest corner of the site. These soils consist of very deep,

moderately well to somewhat poorly drained soils that are sandy to depths of more than 80 inches. These soils formed in sandy marine sediments in the flatwoods areas of Peninsular Florida.

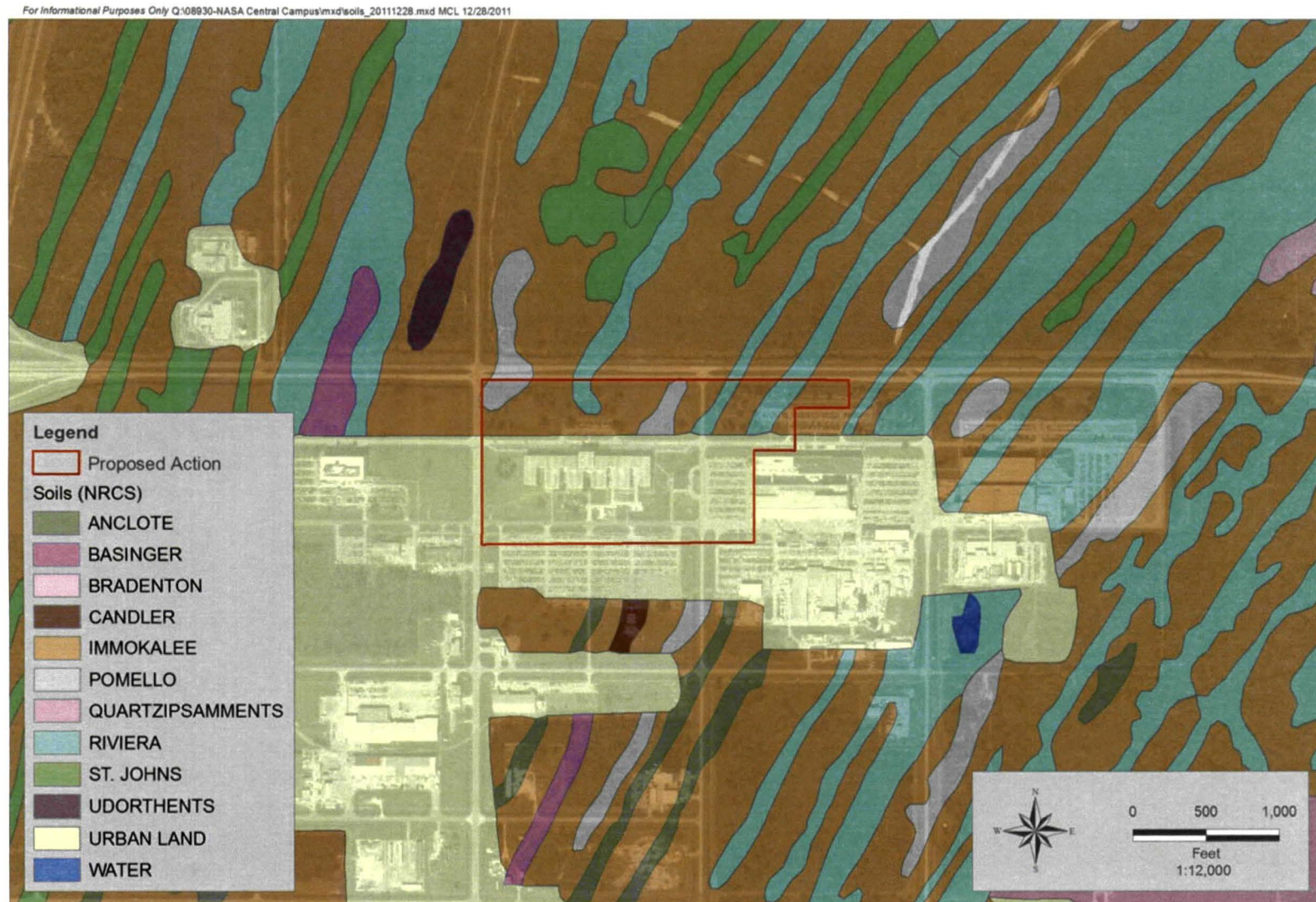


Figure 3-4 Proposed Action Site - Soils Map

3.7 Noise

Noise generated at KSC originates from five primary sources: (1) launches, (2) aircraft movements(jets and helicopters), (3) industrial operations, (4) construction, and (5) traffic. Noise generated above ambient levels by these sources has the potential to adversely affect wildlife and humans. Some typical values for noise levels are shown in Tables 3-3 and 3-4 for activities occurring at construction sites and for activities conducted routinely at KSC. The Occupational Safety and Health

Administration (OSHA) has established permissible noise exposure limits for humans. The 8-hour time-weighted average noise level on KSC is appreciably lower than the OSHA recommended level of 85 A-weighted decibels (dBA) according to the *National Environmental Policy Act; Finding of No Significant Impact; Construction, Modification, and Operation of Three Facilities in Support of the Constellation Program, John F. Kennedy Space Center (KSC), Kennedy Space Center, Florida (2007-KSC-01)*.

Table 3-3 Noise Levels (in Decibels, A-Weighted) Measured on KSC

SOURCE	NOISE LEVEL (Peak)	DISTANCE FROM SOURCE [a]			
		50 ft	100 ft	200 ft	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 a 6-dBA decrease for every doubling of distance.					

Source: *Environmental Assessment for the Construction, Modification, and Operation of Three Facilities in Support of the Constellation Program, John F. Kennedy Space Center, Florida, Final Draft*, NASA 2007.

Table 3-4 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	100	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: *Environmental Assessment for the Construction, Modification, and Operation of Three Facilities in Support of the Constellation Program, John F. Kennedy Space Center, Florida, Final Draft*, NASA 2007.

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 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 OFW as required by the Florida Statutes for waters within the National Wildlife Refuge. 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 adjacent to undeveloped areas of the lagoon, such as Mosquito Lagoon, and the northernmost portions of the IRL and Banana River (NASA 2007). The surface waters at the Proposed Action site consist of upland-cut ditches and stormwater-retention ponds.

3.9 Surface Water Resources and Drainage

The majority of the existing drainage system in and adjacent to the Proposed Action site is open roadside ditches that are piped under 1st Street, driveways, and near the

Auditorium. Additional stormwater culverts
Environmental Assessment for Central Campus Complex Modifications
March 2013

convey flow from the south side of the HQ Building to the culverts. The HQ Building parking lot sheet flows to swales connected to the 2nd Street ditch. The HQ Building site and parking lot are split into two drainage basins (Figure 3-5). The basin divide is along the center line of 2nd Street. The ditch on the south side of 2nd Street collects runoff from the parking lot and conveys flow east and then south to the Region 1 Stormwater Management System. A portion of the stormwater flow from the O&C Building parking lot and High Bay north of 2nd Street is also conveyed to the Region 1 system.

The Region 1 system is permitted by SJRWMD (permit number 4-009-16585-1/8). The system contains a drainage basin of approximately 235 hectares (582 acres) with a wet detention pond near E Avenue and 10th Street that discharges to Buck Creek. A portion of the O&C parking lot is permitted by SJRWMD (permit number 40-009-24062-1). Site runoff north of 2nd Street flows north to a large ditch along NASA Parkway that flows east. Approximately 3.2 hectares (7.8 acres) along 1st Street between C and D Avenues are permitted by SJRWMD (permit 42-009-33380-1). The permitted systems consist of two retention areas on the north side of 1st Street.

In 2005, NASA applied for a permit to construct a Region 2 stormwater management system. The Region 2 system would collect runoff from the Industrial Area and Hypergol Maintenance Facility (HMF) that are not part of the Region 1 system, including the block from NASA Parkway to 2nd Street and from Kennedy Parkway to E Avenue. The project was put on hold due to budgetary constraints before permitting was completed and has not been constructed.

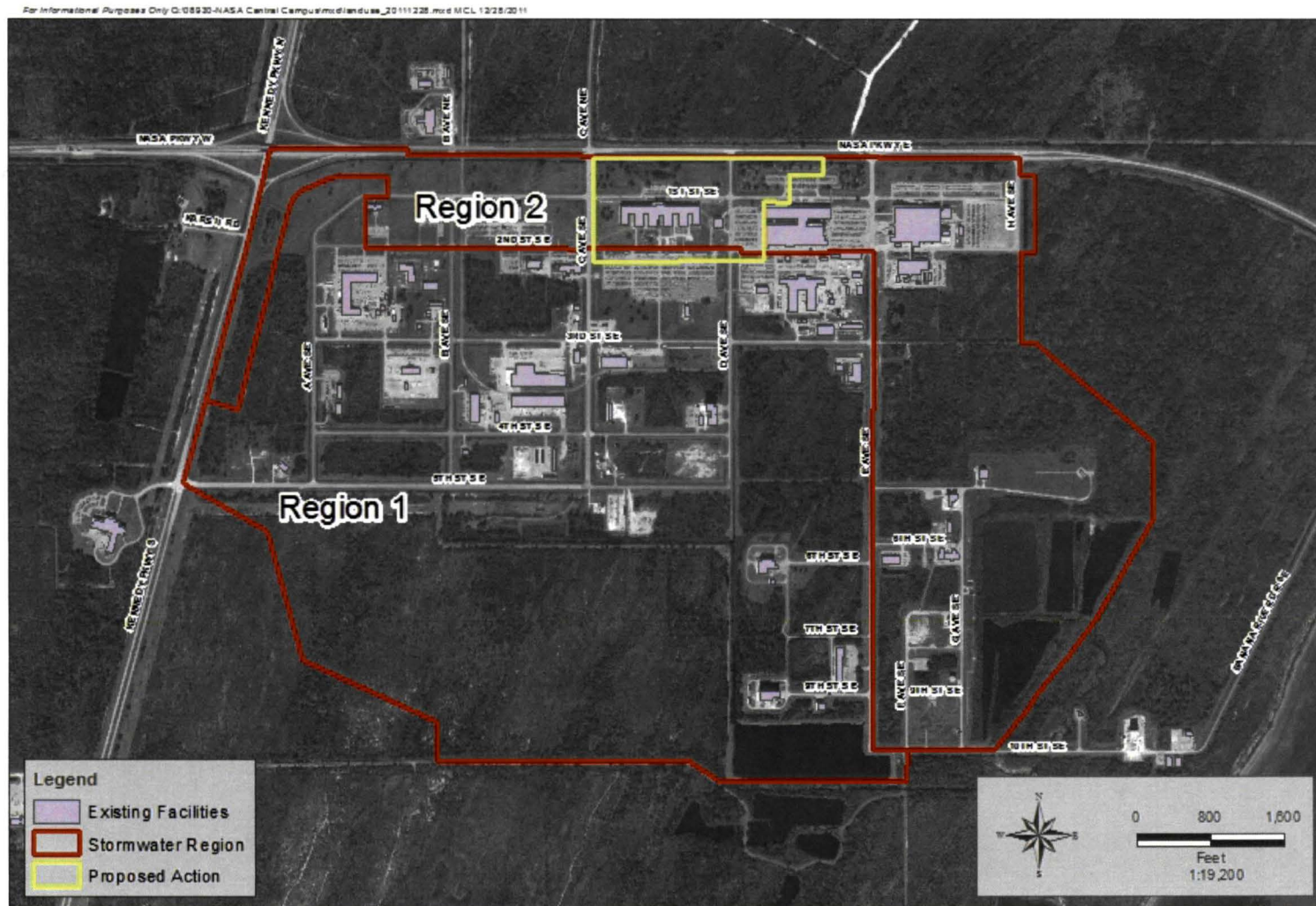


Figure 3-5 Stormwater Region Map

3.10 Floodplains

The topography of the Proposed Action site is relatively flat with a crown of road elevations ranging from 2.1 to 3.0 meters (7 to 10 feet) North American Vertical Datum 88 (NAVD 88), finished floor elevations ranging from 3.4 to 3.7 meters (11 to 12 feet) NAVD 88, and ditch bottoms approximately 0 feet NAVD 88 (Figure 3-6).

The Proposed Action site is above the 100-year floodplain based on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for the area. The 100-year floodplain, which assumes a 1% chance of water rising in a certain area to a certain height during any given year, is outside of the area. The 500-year floodplain, which assumes a 0.2% chance of water rising to a certain level in a certain area in any given year, is also outside of the Proposed Action site approximately 260 meters (850 feet) to the east (Figure 3-7).

Chapter 3 Affected Environments

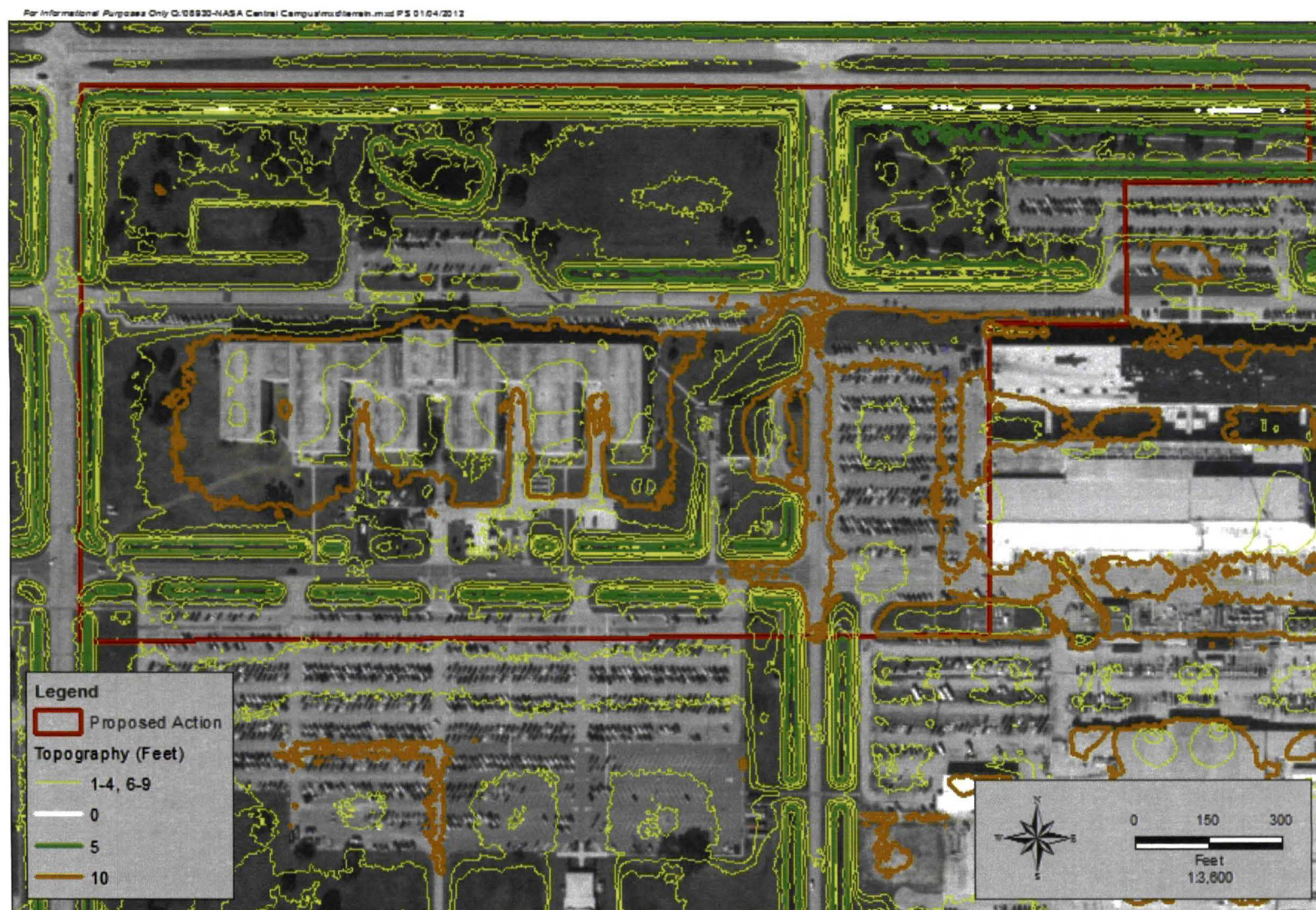


Figure 3-6 Topographic Map of Proposed Action Site

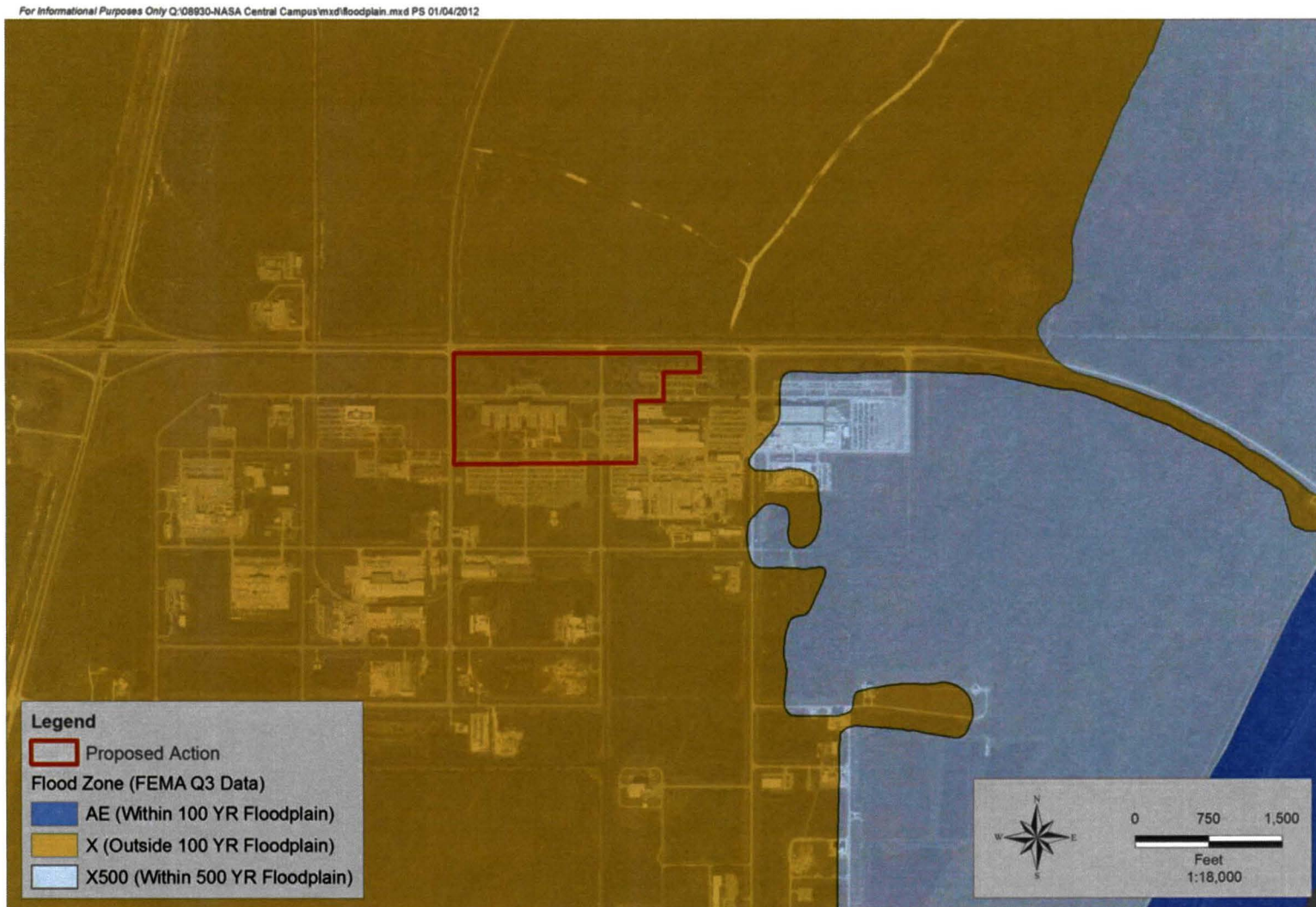


Figure 3-7 FEMA Floodplain Map

3.11 Groundwater Quality

Florida through legislation has created four categories to rate the quality of groundwater in a particular area. The criteria for these categories are based on the degree of protection that should be afforded to that groundwater source, with Class G-I as the most stringent and Class G-IV as the least stringent.

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 milligrams per liter. 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, which limits potential usage. This is evident by the high mineral content, principally chlorides, that has been measured in groundwater samples collected during various KSC surveys (NASA, 2007).

3.12 Socioeconomics

KSC is Brevard County's largest single employer and a major source of revenue for the local economy. KSC operations create a chain of economic effects throughout the region. Each job created within Brevard County's space industry is estimated to generate an additional 1.26 jobs within Florida (NASA, 2010).

Other large employers in the County are Patrick Air Force Base, the Brevard County

School District, and Health First. Approximately 13,631 personnel were employed at KSC in 2010, a number that includes contractor, construction, tenant, and permanent civil service employees. On KSC, civil service employees account for approximately 16% of the total workforce.

The highest employment levels at KSC were recorded during the Apollo program. In 1968 KSC recorded a peak population of 25,895, with an estimated one in four workers in Brevard County employed at KSC. Employment levels dropped precipitously after the end of the Apollo program to a historic low in 1976, when 8,441 personnel were employed. Employment levels rose sharply in 1979 when KSC was designated as the launch and operations support center for the Space Shuttle Program (NASA, 2007).

Before the Space Shuttle Program ended in 2010, approximately 50% of the people at KSC held positions directly related to the Shuttle and payload processing operations. The remaining workforce was employed in ground and base support, unmanned launch programs, crew training, engineering, and administrative positions. The largest concentration of personnel was stationed in the LC-39 Area, and the next largest concentration was in the Industrial Area. Remaining personnel were stationed at various outlying facilities (NASA, 2007). An 11.6% decrease in the contractor workforce in 2010 resulted from downsizing as the Space Shuttle Program came to an end (NASA, 2010).

4.0 Environmental Consequences

4.1 Summary and Status of Impacts

Impacts resulting from implementing the Proposed Action were identified and then classified in one of the following pre-determined categories:

- None —no impacts are expected.
- Minimal—impacts are not expected to be measurable or are too small to cause any discernable degradation to the environment.
- Minor—impacts that would be measurable but temporary and not substantial because the affected area is capable of recovering.
- Major—impacts that individually or cumulatively would be measurable because the affected area would not recover or would require a longer period of recovery time, or mitigation measures would be required to compensate for degradation.

Impacts from construction and operation at the Proposed Action site vary depending on the resource area evaluated. Results of the analyses are summarized in Table 4-1, which shows impacts on each media for each action. The following discussion provides details of the scope and type of impacts.

4.2 Facilities and Infrastructures

4.2.1 Transportation

4.2.1.1 Construction

The Proposed Action will close D Avenue and prohibit north and south vehicular movement through the Central Campus Complex. Additionally, 1st Street will be closed at the intersection with D Avenue and will also prohibit west and east vehicular movement.

Construction at the Proposed Action site is expected to have **minor impacts** on transportation within KSC. The existing road network will be modified, which will close existing roadways and create new vehicular and pedestrian access. Increased construction traffic would occur during normal working hours and may cause minimal traffic delays.

The No-Action Alternative will have **no impacts**.

4.2.1.2 Operation

Operation of the new facility is expected to have **no impacts** on the roads on KSC as the number of vehicles traveling to this area is not expected to change. Additionally, vehicular trips may decrease due to the consolidation of facilities, promoting and facilitating pedestrian movements to and from campus buildings.

The No-Action Alternative will have **no impacts**.

Chapter 4 Environmental Consequences

Table 4-1 Summary of Potential Impacts

Resource Area		Proposed Action		No Action
Facilities and Infrastructure				
Transportation	C	Minor		None
	O	None		None
Utilities	C	Minor		None
	O	None		None
Air Quality	C	Minimal		None
	O	None		None
Vegetation	C	Minimal		None
	O	None		None
Wildlife	C	Minimal		None
	O	None		None
Biodiversity	C	Minimal		None
	O	Minimal		None
Threatened and Endangered Species	C	Minimal		None
	O	Minimal		None
Cultural Resources	C	Major		None
	O	Major		None
Geology	C	Minor		None
	O	None		None
Noise	C	Minimal		None
	O	Minimal		None
Surface Water Quality	C	Minor		None
	O	None		None
Groundwater Quality	C	None		None
	O	None		None
Socioeconomic	C	Minimal		Minimal
	O	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 discernible degradation to the environment at KSC.			
Minor:	Those impacts that would be measurable but temporary and not substantial because the affected area is capable of recovering.			
Major:	Those environmental impacts that individually or cumulatively would be measurable because the affected area would not recover or would require a longer period of recovery time, or mitigation measures would be required to compensate for degradation.			
C:	Construction			
O:	Operation			

4.2.2 Utilities

4.2.2.1 Construction

Under the Proposed Action, changes to the sanitary sewer system would be required. Specifically, the Proposed Action will require the installation of laterals, mains, and manholes connected to the gravity sewer main system along D Avenue. Phase Two will require relocating gravity sewer mains west of D Avenue between 1st Street and 2nd Street. Potable water lines as well as electrical and communication utilities will also have to be rerouted.

The Proposed Action will bring power to the Phase I facility (new HQ Building) via three new vacuum fault interrupters (VFIs) located behind the O&C Building. The Phase I facility (new HQ Building) and the existing distribution that serves the HQ Building through power manholes MP-37 and MP-38 will provide multi-feeder connections to the future buildings for tenants that require the redundant power. The Phase II Lab Consolidation Building will be fed from the three new VFIs that serve the Phase I facility (new HQ Building).

New communication fiber and copper cabling will be provided in existing ductbank from CD&SC along NASA Parkway and within new ductbank from the Parkway to existing manhole MC-007 to serve the new HQ Building. The ductbank along NASA Parkway has six open spare conduits back to CD&SC. Communication lines to each future building and the Phase II Lab Consolidation Building will be fed via underground ductbank from the Phase I HQ hub communication room.

Construction of the Proposed Action site is expected to have **minor impacts** on the utilities at KSC. The construction would require modifications to the potable water, wastewater, electrical, and communications utilities.

The No-Action Alternative will have **no impacts**.

4.2.2.2 Operation

NASA will pursue a minimum certification goal of LEED Silver for this project. Many of the existing buildings that would be demolished were constructed in the mid-1960s and are extremely energy- and water-use-inefficient. As such, operating the new facilities constructed using new building codes are expected to substantially decrease electrical and water usage. Additionally, energy and water conservation practices implemented to obtain LEED Silver certification will further reduce utility use and allow NASA to meet EO 13514. As a result, operation of the Proposed Action site will have **no impacts** on the utilities at KSC.

The No-Action Alternative will have **no impacts**.

4.2.3 Air Quality

4.2.3.1 Construction

Site preparation and construction of the Proposed Action site would produce **minimal impacts** on surrounding air quality. Clearing land and other construction activities would generate airborne particulates from earth-moving and vegetation burning as well as hydrocarbon exhaust from heavy equipment. Such activities are expected to be small in scope

and of short duration and would not impact the region's attainment status. Best management practices (BMPs) would also be employed to mitigate for emissions due to earth-moving and burning. These BMPs include water spraying, placement of hay bales, and other forms of dust control.

Additionally, all buildings will be tested for hazardous materials such as asbestos and lead prior to any construction or demolition activities. If such materials are identified, they will be removed by a licensed contractor before they are disturbed.

The No-Action Alternative will have **no impacts**.

4.2.3.2 Operation

Operation of the new facility is expected to have **no impacts** on surrounding air quality because there will be no increase in automobile trips per weekday. Additionally, multiple lab fume hoods and back-up generators are located throughout the buildings being consolidated under the Proposed Action. By consolidating these buildings, hoods and other ventilation needs for the buildings will be reduced. Also, by consolidating these buildings, the need for multiple back-up generators can be reduced.

The No-Action Alternative will have **no impacts**.

4.2.4 Biological Resources

4.2.4.1 Vegetation

4.2.4.1.1 Construction

Impacts to primarily disturbed and maintained vegetation communities would occur from construction of and improvements to facilities and ancillary infrastructure.

Construction activities at the Proposed Action site would require filling 1.9 hectares (4.6 acres) of man-made vegetated surface waters. However, the acreage and function of these surface waters will be replaced with new stormwater treatment systems that will be required to treat stormwater runoff from new buildings and impervious surfaces.

A total of 12.5 hectares (30.2 acres) of disturbed and maintained uplands associated with the Proposed Action site will be impacted during preparation and construction. However, similar greenspace acreage is expected with the new campus design. As a result, construction at the Proposed Action site is expected to have **no impact** on native upland vegetation and surface waters, as the site was previously developed and disturbed.

There will be **no impact** to KSC wetlands because the surface waters within the Proposed Action site are either permitted stormwater treatment systems or upland cut ditches and thus are not considered wetlands. Impacts to these ditches/ponds will require an ERP from SJRWMD. Although mitigation for impacts to these systems is not expected, USACE could require mitigation to ditch impacts if these

surface waters are determined to be essential feeding areas for wood storks.

The No-Action Alternative will have **no impacts**.

4.2.4.1.2 Operation

No impacts on natural vegetation communities are expected due to the operation of the Proposed Action site. Operation of the Proposed Action site will be limited to personnel use of the newly constructed facilities and related infrastructure, which will not impact any adjacent natural vegetation communities.

The No-Action Alternative will have **no impacts**.

4.2.4.2 Wildlife

Potential impacts on wildlife by the Proposed Action site construction and operation are primarily based on habitats removed due to land clearing, site preparation, facility construction, and the long-term operations of the facility. The potential impacts to wildlife caused by construction and operation of the Proposed Action site are discussed below.

4.2.4.2.1 Construction

The onsite habitats are composed of low-quality man-made surface waters that serve as stormwater treatment systems for the existing facilities and maintained turf grass with a few mature trees. These habitats provide little to no wildlife habitat and thus are primarily utilized by common species. Additionally, these habitats will be replaced with new stormwater management systems and greenspace based on the proposed design. Thus, construction could temporarily

impact a few common wading bird, reptile, and amphibian species that utilize these ditches. More importantly, this type of habitat is very common throughout KSC and any impacted species may move to new locations to avoid these temporary impacts.

A temporary shift in populations should be expected as sensitive or wide-ranging species will move away from or avoid areas of new construction. This may increase road mortality for some species as their typical movement patterns and habitats have been altered. The increase in roadway mortality would only be temporary once the various species have relocated or become accustomed to their new habitat.

Due to the low quality of existing habitats and replacement of such habitats, construction of the Proposed Action site is expected to have **minimal impact** on wildlife.

The No-Action Alternative will have **no impacts**.

4.2.4.2.2 Operation

No wildlife impacts from the operation of Proposed Action site are expected.

The No-Action Alternative will have **no impacts**.

4.2.4.3 Biodiversity

4.2.4.3.1 Construction and Operation

Suitable habitat for at least locally common herptofauna and mammalian species would be removed or altered during the construction phase. However, construction impacts are not expected to cause major changes in the overall population size or

structure of any of these species at KSC because this type of habitat is very common. Thus, the local biodiversity from land clearing and construction of the Proposed Action site and associated road improvements are expected to cause **minimal impacts**.

The No-Action Alternative will have **no impacts**.

4.2.5 Threatened and Endangered Species

4.2.5.1 Construction

Onsite natural habitat is composed of low-quality man-made surface waters that provide minimal habitat compared to natural areas north of the project area. Construction impacts are not expected to cause major changes in the overall population size or structure of any of listed species on KSC.

While the man-made surface waters that would be lost could provide foraging habitat for listed wading bird species such as wood stork, little blue heron, snowy egret, and white ibis, these communities are unlikely to be important foraging areas due to the large acreages of these surface waters in other locations and the intensive human use of facilities in the vicinity. As such, only a temporary and minor impact would occur to these threatened and endangered wading birds. After the construction activities, these species would be able to utilize the newly constructed stormwater treatment ditches.

The HQ Building has a known least tern colony that utilizes the west end of the rooftop during the spring nesting season. An established colony has been identified to the Florida Fish and Wildlife Conservation

Commission. As a result, demolition work at the building will need to be scheduled before or after nesting season to avoid impacts to nesting birds. This colony will lose a nest site but will be able to find alternative suitable nesting sites on other existing buildings or the new HQ Building when it is completed.

Wide-ranging terrestrial species such as the Eastern indigo snake may be impacted by habitat removal and the disruption of their previous movement patterns. Eastern indigo snakes are not expected to utilize the Proposed Action site based on the maintained herbaceous vegetation and active human presence. As such, negligible to minor impacts are expected to Eastern indigo snakes. No gopher tortoise burrows were observed at the Proposed Action Site; however, a gopher tortoise survey would be completed as part of the permitting process before any demolition or land-clearing activities occurred.

The local threatened and endangered species from land-clearing and construction of the Proposed Action Site and associated roads are expected to cause **minimal impacts**. Table 3-2 summarizes the protected species that could be impacted due to the proposed site.

The No-Action Alternative will have **no impacts**.

4.2.5.2 Operation

Potential impacts to listed species as a result of the operation of the Proposed Action site facilities are primarily related to potential collisions with cars on the adjacent road network. However, since car trips are not expected to increase and large acreages of

natural habitats are in adjacent areas to support these species, **minimal impacts** to threatened or endangered species are expected due to the operation of the Proposed Action site.

The No-Action Alternative will have **no impacts**.

4.2.6 Cultural Resources

4.2.6.1 Construction and Operation

Construction and operation of the Proposed Action site is expected to have **major impacts** on the cultural resources at KSC. Both the HQ Building and the O&C are listed on the NRHP. As part of the proposed action, the HQ Building would be demolished. Before any demolition activity, the FL SHPO, ACHP, and interested parties must be consulted in accordance with the NHPA and KCA-4185, which will require the Section 106 Review process to be followed (<http://www.achp.gov/shpo.html>).

Numerous mitigation options are available to address impacts to cultural resources. However, due to the proposed demolition of the HQ Building and the CIF, historic recordation will likely be the proposed strategy to mitigate these proposed cultural resource impacts. *Recordation* consists of reviewing as-built drawings and archival photographs, preparing a written historic description of the facilities, photographing the facilities, conducting interviews, or any other medium or any combination thereof, to be determined in consultation with the parties noted above.

NASA consulted with the FL SHPO, ACHP, and interested parties on the demolition of the HQS Building in 2011. The FL SHPO has requested additional information (e.g., case

study and public involvement conducted by NASA) before concurrence. NASA is preparing a second response to address any concerns. After receiving concurrence on the HQ demolition project, both parties will determine the appropriate mitigation strategy.

The No-Action Alternative will have **no impacts**.

4.2.7 Geology and Soils

4.2.7.1 Construction

Proposed Action site preparation activities will present the only potential impact on the geology and soils within the project area. However, the geology and soils due to construction at the Proposed Action Site is considered **minor impact**. Land-clearing and excavation for roadway foundations and stormwater systems will require that the upper soil strata layers be removed. This may affect shallow subsurface flows of water after rainfall events. However, this would be mitigated with site grading and construction of the required stormwater system.

For projects generating land-disturbing activity in excess of 1 acre, an NPDES Construction Generic Permit would be required. Major provisions of this permit program are submitting a Notice of Intent, a Notice of Termination, and a construction site Stormwater Pollution Prevention Plan.

Regardless of the size of the land disturbance, contractors will be required to follow state and federal guidelines during construction and/or paving activities to ensure that water quality is protected from possible soil erosion and sedimentation; adhere to the Sediment and Erosion Control Plan and the Stormwater Pollution

Prevention Plan; and implement standard erosion and sedimentation control techniques as appropriate.

Standard erosion and sedimentation control techniques include using vegetative and structural protective covers (e.g., permanent seeding, groundcover), using sediment barriers (e.g., straw bales, silt fence, brush), constructing water conveyances (e.g., slope drains, check dam inlet, and outlet protection), and repairing bare and slightly eroded areas quickly.

EO 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*, requires that all new construction comply with the *Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings* (Guiding Principles). This includes employing design and construction strategies that reduce stormwater runoff. Furthermore, Section 438 of the Energy Independence and Security Act of 2007 requires that any development or redevelopment project involving a federal facility with a footprint exceeding 465 square meters (5,000 square feet) shall use site planning, design, construction, and maintenance strategies to maintain or restore the predevelopment hydrology of the property with regard to temperature, rate, volume, and duration of flow.

Compliance with this requirement can be met through the implementation of Low Impact Development technologies, which would strive to maintain or restore natural hydrologic functions of a site and achieve natural resource protection. Examples include but are not limited to minimizing total site impervious areas, directing building drainage to vegetative buffers,

using permeable pavements where practical, and breaking up flow directions from large paved surfaces.

The No-Action Alternative will have **no impacts**.

4.2.7.2 Operation

Vehicle use will be restricted to constructed roadways; vehicles will not be allowed in undeveloped areas. Operating the actual buildings would not result in impacts to the soils or geology of the Proposed Action site. As a result, operation of the Proposed Action Site is expected to result in **no impacts** on the geology or soils of the local area.

The No-Action Alternative will have **no impacts**.

4.2.8 Noise

4.2.8.1 Construction

Ambient noise levels are expected to increase during construction activities and daily operations as a result of the Proposed Action site construction. Noise generated by construction vehicles is expected to be below all noise thresholds and will occur for a brief period. EPA's recommended upper-level noise threshold is 85 dBA for a 24-hour timeframe (*KSC-DF-3080 Environmental Resource Document, Division D*). Non-construction worker staff at KSC will be present in adjoining buildings during construction. These noise levels will have a **minimal impact** on these workers as building walls and distances from the construction site will decrease levels.

No known noise receptors (e.g., wildlife or sensitive equipment) are in or around the site that are especially sensitive to the expected noise levels. Furthermore, the effects of noise on wildlife have been studied at KSC during the launch of space vehicles (KSC, 2005). 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 long-term adverse effects. Other studies conducted on wading bird colonies subjected to military overflights (152 meters [500 feet] of altitude) with noise levels up to 100 dBA observed no productivity-limiting responses and only a short-term interruption of their daily routine (*Environmental Assessment for the Construction, Modification, and Operation of Three Facilities in Support of the Constellation Program, John F. Kennedy Space Center, Florida*, Final Draft, NASA 2007). Due to construction of the Proposed Action site, there will be **minimal impact** to the noise levels at KSC.

The No-Action Alternative will have **no impacts**.

4.2.8.2 Operation

Operation of the Proposed Action site is expected to have **minimal impacts** on the noise levels since operations will not be significantly altered beyond current use.

The No-Action Alternative will have **no impacts**.

4.2.9 Surface Water Quality

4.2.9.1 Construction

Construction of the Proposed Action Site will have **minor impacts** on the surface-water quality. Although several existing surface waters will be filled, these serve as stormwater treatment systems that will be replaced in conjunction with constructing a new stormwater management system for the new facilities.

In accordance with FAC Rule 40C-42.022(1), a stormwater ERP is required to construct a stormwater management system that serves a project that exceeds any of the following thresholds:

- Construction of 372 square meters (4,000 square feet) or more of impervious or semi-impervious surface area subject to vehicular traffic, such as roads, parking lots, driveways, and loading zones.
- Construction of 836 square meters (9,000 square feet) of total impervious surface.
- Construction of 2 hectares (5 acres) or more of recreational area (e.g., golf courses, tennis courts, putting greens, driving ranges, or ball fields).

In addition, an ERP is required to alter, remove, reconstruct, or abandon existing stormwater management systems that serve a project and that may be expected to result in any of the following: increase in pollutant loadings (including sediments) in stormwater runoff from the project, increase in peak discharge rate, decrease in onsite or

in stream detention storage, or replacement of roadside swales with curb and gutter.

During actual construction and regrading, activities within surface waters will be **minimized** by ensuring that BMPs such as silt fence and turbidity barriers are installed downstream of any activities in surface waters to avoid negative impacts to water quality within the downstream portion of these surface waters as well as downstream receiving water bodies.

The documents associated with the NPDES General Permit (if applicable) will be updated accordingly. Minimizing adverse effects to local hydrology would also need to occur in accordance with EO 13514.

The No-Action Alternative will have **no impacts**.

4.2.9.2 Operation

Operation of the Proposed Action site is expected to have **no impact** on surface-water quality. The stormwater management system that will be required for the construction of the new facility will provide high-pollutant-removal efficiency for any water generated by the impervious surfaces associated with the new facilities. Additionally, since the project will apply to be a minimum of LEED Silver certified, stormwater practices that follow LEED principles—such as pervious pavement, cisterns, and other methods to reduce stormwater—are expected to be incorporated into the design.

Additional impervious surfaces from structures and paving would have the potential to concentrate rain water and increase stormwater run-off and erosion

events. Facilities constructed as part of the project would include stormwater run-off control features such as gutters, concrete swales, and culvert drain systems.

The No-Action Alternative will have **no impacts**.

4.2.10 Floodplains

4.2.10.1 Construction and Operation

Construction of the Proposed Action site will have **no impact** on floodplains in the area as the site is not within the 100-year or 500-year floodplain.

The No-Action Alternative will have **no impacts**.

4.2.11 Groundwater Quality

4.2.11.1 Construction

Construction of the Proposed Action site could temporarily increase the amount of sediments and pollutants that could migrate into the groundwater system. However, implementing and maintaining stormwater BMPs during construction will minimize these impacts. Additionally, the required stormwater treatment system will be installed during construction and runoff will be diverted into these systems for treatment. Therefore, construction of the Proposed Action site will have **no impact** on groundwater quality.

The No-Action Alternative will have **no impacts**.

4.2.11.2 Operation

Operations of the Proposed Action site could generate pollutants typically created by

runoff from the new buildings and roadways. The required stormwater management system will prevent stormwater contaminants from migrating downward into the Surficial Aquifer by facilitating the transport of runoff into the surface-water management systems that would be constructed along with the Proposed Action site buildings and roadways. Therefore, **no impacts** on groundwater quality from the operation of this facility are expected.

The No-Action Alternative will have **no impacts**.

4.2.12 Socioeconomics

4.2.12.1 Construction

Approximately 500 construction workers are expected during construction at the Proposed Action site. These would be drawn from the local workforce with an expected positive impact on the local economy of approximately \$90M (Jacobs Engineering, 2009). As a result, the construction of the Proposed Action site is expected to have **no impacts** on socioeconomics and the workforce at KSC during construction. Alternatively, construction of these new facilities will provide a positive, though temporary, impact on the local and regional economy.

The No-Action Alternative will have **minimal impacts** as the expected positive impact by additional jobs and revenue will not be realized.

4.2.12.2 Operation

Personnel that will be relocated into the new facilities are the same personnel that currently work at KSC. As a result,

operations of the Proposed Action site are expected to have **no impacts** on the socioeconomics of KSC as the number of NASA and contractor personnel at KSC will remain the same.

The No-Action Alternative will have **no impacts**.

4.3 Permits, Licenses, and Approvals

The following permits, licenses and approvals will be required if the Proposed Action is implemented.

- A Modification to existing Environmental Resource Permit (ERP) from the St. Johns River Water Management District (SJRWMD) (Permit 4-009-16585-1) for construction of a new stormwater treatment system and impacts to existing surface water systems (i.e., stormwater treatment swales).
- A Federal Dredge and Fill permit from the U.S. Army Corps of Engineers (USACE) for filling jurisdictional surface waters.
- A National Pollutant Discharge Elimination System (NPDES) Permit from the Florida Department of Environmental Protection (FDEP) for construction activities.
- A Notice of Intent to Use the General Permit for Construction of Water Main Extensions for Public Water Systems (PWSs) through FDEP, DEP Form 62-555.900(7).

Chapter 4 Environmental Consequences

- A Notification/Application For Constructing a Domestic Wastewater Collection/Transmission System through FDEP, DEP Form 62-604.300(8)(a).
- Section 106 Review.

5.0 Environmental Justice

On February 11, 1994, the President of the United States signed EO 12898, *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 on low-income and minority populations in the KSC area were addressed as part of this Environmental Assessment. This project, for all alternatives addressed, would be implemented within the boundaries of KSC.

The closest residential areas are 3 kilometers (1.8 miles) south on Merritt Island and 12 kilometers (7.6 miles) west in Titusville. No groups of low-income or minority populations have been identified in either location. In addition, the distances of these areas from the Proposed Action site 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 regional and local workforce and provide a short-term economic benefit to the local area.

6.0 Cumulative Impact

Cumulative impact is the incremental impact on the environment that results from the impact of the proposed action when added to other past, present, and reasonably foreseeable future actions, regardless of which agency or person undertakes them. Cumulative impacts are interdisciplinary and multi-jurisdictional and usually do not conform to political boundaries.

To determine the cumulative effects in the analysis area, present and future actions within the same geographic region were evaluated. These actions predominantly include recent and future development projects. The cumulative impacts addressed in this section are those relating only to the activities included in this Environmental Assessment and several potential future projects associated with KSC's new mission.

While these projects may result in environmental impacts due to green sites being developed, the Proposed Action presented in this document will result in **no impacts** or **minor impacts** with the exception of impacts to cultural resources. In addition, the incremental impact of the Proposed Action would be **minimal** when added to impacts from other past, present, and foreseeable future actions. Therefore, the Proposed Action's demolition and construction would not cause significant cumulative impacts on the environment.

6.1 No Action Alternative

If no action is taken, no cumulative negative impacts to environmental resources or categories discussed in previous sections would occur.

6.2 Proposed Action Alternative

The Proposed Action Alternative project and several future development projects to upgrade or consolidate various facilities are being assessed in association with KSC's new mission. KSC is evaluating the siting and/or design of several projects such as the (1) Consolidated Waste Management Facility, (2) Oily Wastewater Facility, (3) Horizontal Launch and Landing Area, and (4) Converter Compressor Facility.

7.0 Mitigation Activities

The Proposed Action will have a major impact on the cultural resources at the site. Specifically, the HQ Building and the CIF that are scheduled for demolition will be affected. These buildings have been identified by the NRHP.

Numerous mitigation options are available to address impacts to cultural resources. However, due to the proposed demolition of the HQ Building and the CIF, historic recordation will likely be the proposed strategy to mitigate these proposed cultural resource impacts. *Recordation* consists of reviewing as-built drawings and archival photographs, preparing a written historic description of the facilities, photographing the facilities, conducting interviews, or any other medium or any combination thereof, to be determined in consultation with the parties noted below.

As previously mentioned, NASA initiated consultation with the FL SHPO, ACHP, and interested parties on the demolition of the HQ Building in 2011,. The FL SHPO has requested additional information (e.g., case study and public involvement conducted by NASA) before concurrence. NASA is preparing a second response to address any concerns. After receiving concurrence on the HQ Building demolition project, both parties will determine the appropriate mitigation strategy.

8.0 Preparers, Contributors, and Contacts

The individuals who provided details, data, or analyses and who prepared this document

are listed in Table 7-1. The table provides information concerning which section(s) each person was involved in writing or assembling.

Table 7-1 List of Individuals Who Prepared This Document

Preparers	Affiliation	Professional Title	Contribution
Stein, Philip	Jones Edmunds & Associates, Inc.	Environmental Scientist	Document Preparation
Bukata, BJ, MS, PWS	Jones Edmunds & Associates, Inc.	Environmental Scientist	Document Preparation and Review
Schmid, Joe	Jones Edmunds & Associates, Inc.	Senior Editor	Document Formatting and Editing
Chambers, Justin, PE	Jones Edmunds & Associates, Inc.	Project Engineer	Document Review
Lake, Matt	Jones Edmunds & Associates, Inc.	GIS Analyst	GIS Data and Graphics
Szabo, Steve, PE	Jones Edmunds & Associates, Inc.	Project Manager	Document Review
Schroeder, Wallace, PE	NASA/KSC	Project Manager, NASA Facilities Engineering	Document Review
Naylor, Barbara	NASA/KSC	Environmental Protection Specialist/Historic Preservation Officer	Cultural Resources, Reviewer
Phillips, Lynne	NASA/KSC	Physical Scientist	Document Review
Shaffer, John	NASA/KSC	Lead, Environmental Planning	Document Review
Thon, Jeff	NASA/KSC	Aerospace Engineer	Interview Concerning Noise Sources
Trout, Shannah	IHA	Environmental Engineer	Cultural Resources, Data, and Text
Berry, Stephen	TEC, Inc.	Senior Project Analyst	Independent Technical Review

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