ENVIRONMENTAL ASSESSMENT
FOR THE
ADVANCED TECHNOLOGY DEVELOPMENT CENTER
AT THE
CAPE CANAVERAL SPACEPORT, FLORIDA

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Environmental Assessment
for
Advanced Technology Development Center at the Cape Canaveral Spaceport, Florida

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Abstract

This Environmental Assessment (EA) addresses the proposed action to construct the Advanced Technology Development Center (ATDC) on approximately 28 acres of land defined as Launch Complex 20 (LC-20) at the Cape Canaveral Air Force Station (CCAFS), Florida. The complex would provide for large-scale research, development, and test area for Spaceport technologies. These technologies include cryogenic systems, launch structures, umbilicals, sensors and electronics, integrated vehicle management, process engineering and range systems.

The preferred action, one alternative location, and the No Action alternative were considered and environmental consequences evaluated to determine the extent of impacts to the environment. The first alternative location is at Kennedy Space Center's Fire Training Area (FTA) located north of the Industrial Area.

EXECUTIVE SUMMARY

This Environmental Assessment (EA) addresses the proposed action to construct the Advanced Technology Development Center (ATDC) at two alternative locations at the Kennedy Space Center (KSC) and Cape Canaveral Air Force Station (CCAFS), hereafter to be collectively referred to as the Cape Canaveral Spaceport (CCS).

The proposed complex would include seven new facilities: A Liquid Oxygen (LO_X) Storage area with a 56k gallon capacity capable of testing LO_X cryogenic components and flowing LO_X to customer provided equipment; a Liquid Hydrogen (LH_2) Storage area with a 68K gallon capacity capable of testing LH_2 cryogenic components, and flow LH_2 to customer supplied equipment; a liquid Nitrogen (LN_2) Storage Area with an 8K gallon capacity capable of testing $LH_2/LO_X/LN_2$ cryogenic components, LN_2 processes and systems, flowing LN_2 to customer supplied equipment, and cryogenic densification; a Launch Mount capable of accommodating various launch structures and vehicle simulators, as well as, testing ground to mobile launch platform (MLP) umbilical systems; a static test demonstrator called an Iron Rocket will be constructed on the launch platform, which includes a 12K gallon LO_X tank and 20K gallon LH_2 tank, which will be used for vehicle fuel testing and checkout of vehicle instrumentation systems; a Processing Building containing checkout and control systems capable of performing closed loop, command and control for the ATDC facilities, as well as, developing new processing techniques; and finally, a Shop Building capable of supplying the necessary operations, maintenance, and logistical support for the ATDC.

Three alternatives were evaluated to determine the extent of impacts to the environment at CCS. The Proposed Action is located at Launch Complex 20 (LC-20) on CCS. Alternative 2 is located on CCS at the Fire Training Area (FTA). And the No Action Alternative, would leave conditions at CCS as they are now.

This document describes environmental portions of CCS, which relate to each of the alternatives. Issues identified are utilities, air quality, biological resources, threatened and endangered species, cultural resources, geology, noise, surface water quality, groundwater quality, socioeconomics, and land use.

The results of the assessment of these environmental issues indicate that minimal impacts at the Proposed Action site are increased loads to existing utilities; air quality impacts resulting from the construction of the facility (i.e., elevated dust levels) and introduction of LO_X, LH_2, and LN_2; surface water impacts due to construction of impervious areas; biological resource impacts due to construction activities, and impacts due to construction and operational activities such as exterior lighting to threatened or endangered species including sea turtles and species of special concern such as the gopher tortoise. There will be no impacts to groundwater quality, or site geology.

Implementation of the Alternative Site 2 would have similar impacts as the Proposed Action with the potential for greater impacts to human and biological resources and wetlands. The impacts would be increased loads on existing utilities; air quality impacts from construction of the facility and introduction of LO_X, LH_2 and LN_2; surface water impacts from increased impervious areas; biological resource impacts due to construction activities, as well exterior lighting to threatened and endangered species although less impacts than the Proposed Action. There would be no impact to groundwater or site geology. There would be impacts to existing facilities at this alternative site.

The No Action alternative would have no environmental impacts. However, there would be potential socioeconomic impacts due to space technology programs being performed at other locations other than CCS.

Impacts to will be mitigated using Best Management Practices (BMP's) during construction to minimize dust in the air, such as daily watering of exposed areas. Impacts to sea turtles will be mitigated through a strict light management plan approved by the United States Fish and Wildlife office. Impacts to gopher tortoise will be mitigated by implementing a strict relocation plan.

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LIST OF ABBREVIATIONS AND ACRONYMS

ac	acre(s)
ASTs	above storage tanks
ATDC	Advance Technology Development Center
BMPs	Best Management Practices
CCAFS	Cape Canaveral Air Force Station
CCS	Cape Canaveral Spaceport
CNS	Canaveral National Seashore
dBA	decibels, weighted to the A-scale
EA	Environmental Assessment
ELV	Expendable Launch Vehicle
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FTA	Fire Training Area
gal	gallons
ha	hectare(s)
JBOSC	Joint Base Operating Support Contract
KSC	Kennedy Space Center
LC-20	Launch Complex 20
LH_2	Liquid Hydrogen
LN_2	Liquid Nitrogen
LOx	Liquid Oxygen
MINWR	Merritt Island National Wildlife Refuge
mgd	millions gallons per day
mLd	million liters per day
NAAQS	National Ambient Air Quality Standards
NGVD	National Geodetic Vertical Datum
NHPA	National Historic Preservation Act
NPS	National Park Service
O_3	ozone
OFW	Outstanding Florida Waters
PAMS	Permanent Air Monitoring System
SFA	Spaceport Florida Authority
SLF	Shuttle Landing Facility
U.S.	United States
USFWS	U.S. Fish and Wildlife Service
WWTP	Wastewater Treatment Plant
VAB	Vehicle Assembly Building

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1.0 PURPOSE AND NEED FOR ACTION

1.1 Purpose

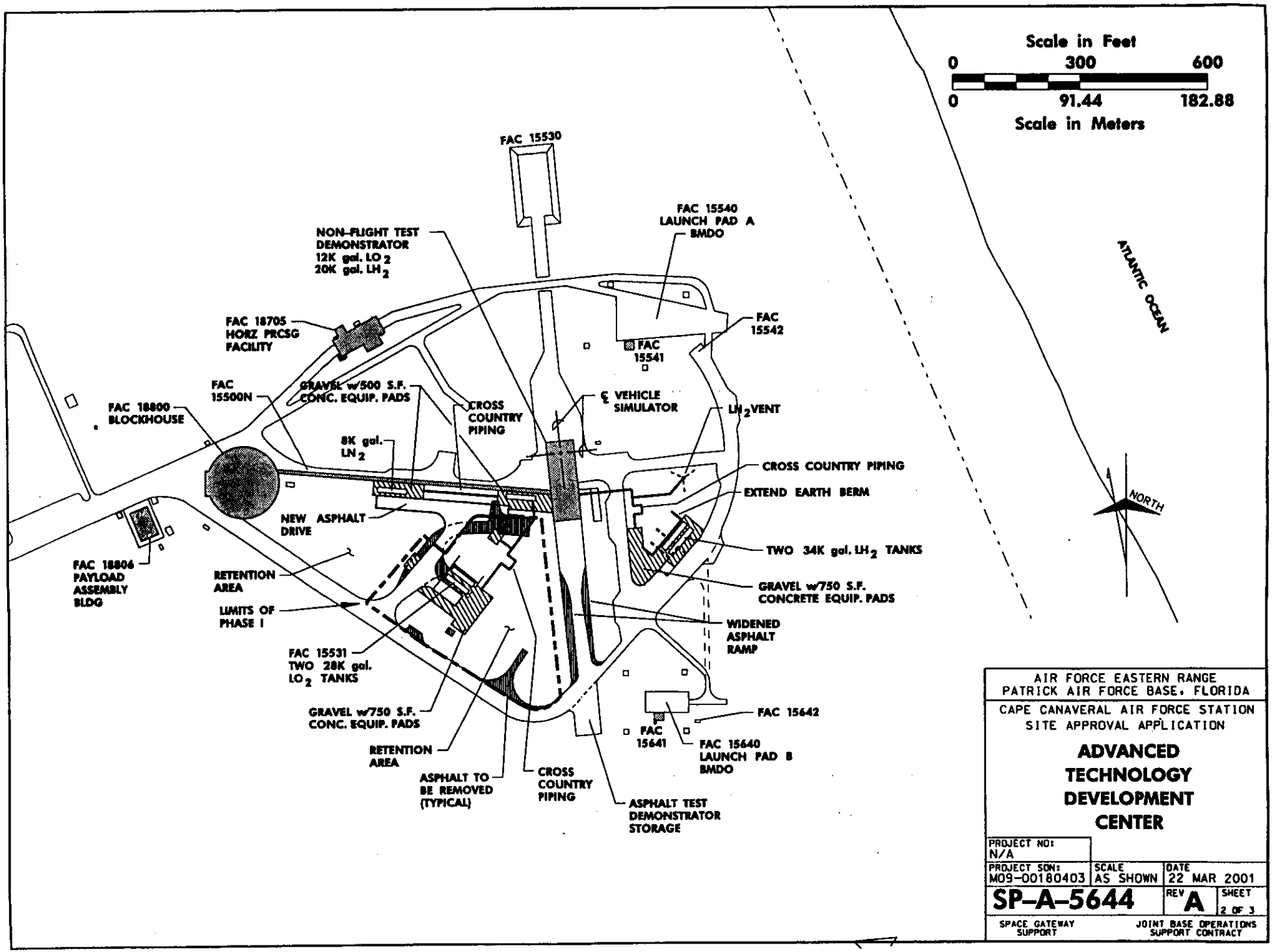
The purpose of the proposed action is to implement the best engineering solution for the construction and operation of the new Advanced Technology Development Center (ATDC) at the Cape Canaveral Spaceport (CCS). The ATDC would accommodate the proposed Liquid Oxygen (LOx), Liquid Hyrdogen (LH_2), Liquid Nitrogen (LN_2), Launch Mount, Iron Rocket, Processing Building, and Shop Building.

The ATDC will be built in phases over a period of five years. The first segment of the ATDC, the cryogenics area, will include a LO_X area which is designed to accommodate a 56K gallon storage vessel to be used to test cryogenic components, process systems, and flow LO_X to customer supplied equipment. The LH_2 area will be designed to accommodate a 68K gallon storage vessel capable of testing LH_2 cryogenic components, process systems, and customer supplied equipment. The LN_2 area will accommodate an 8K gallon LN_2 storage vessel capable of testing LN_2, LO_X, and LH_2 cryogenic components, process systems, flow LN_2 to customer supplied equipment and for cryogenic densification. A Launch Mount is to be built to simulate launch conditions. This Launch Mount will be capable of accommodating various launch structures and vehicle simulators, as well as testing ground to Mobile Launch Platform (MLP) umbilical systems. An "Iron Rocket" will be built atop the Launch Mount. The Iron Rocket will include a 12K gallon LO_X tank and 20K gallon LH_2 tank, which will act as a Static Test Demonstrator with "flight tanks" and vehicle instrumentation systems, and umbilical systems. A Processing Building containing checkout and control systems capable of performing closed-loop command and control for any combination of ATDC facilities, as well as, develop new processing techniques. And finally, a Shop Building capable of supplying the necessary operations, maintenance, and logistical support for the ATDC (see Figure 1).

1.2 Need for Action

As the primary site for space flight, CCAFS and KSC have joined forces to develop the Cape Canaveral Spaceport (CCS). The combination of manned and unmanned space flight vehicles has made the Spaceport the Center for Potential Research and Development of New Technologies.

FIGURE 1


Scale in Feet
0
300
600
0
91.44
182.88
Scale in Meters
ATLANTIC OCEAN
NORTH
FAC 15530
FAC 15540
LAUNCH PAD A
BMDO
NON-FLIGHT TEST
DEMONSTRATOR
12K gal. LO2
20K gal. LH2
FAC 18705
HORZ PRCSG
FACILITY
FAC 15542
FAC 15541
FAC 15500N
GRAVEL w/500 S.F.
CONC. EQUIP. PADS
CROSS
COUNTRY
PIPING
℄ VEHICLE
SIMULATOR
LH2 VENT
FAC 18800
BLOCKHOUSE
8K gal.
LN2
CROSS COUNTRY PIPING
EXTEND EARTH BERM
NEW ASPHALT
DRIVE
TWO 34K gal. LH2 TANKS
FAC 18806
PAYLOAD
ASSEMBLY
BLDG
RETENTION
AREA
GRAVEL w/750 S.F.
CONCRETE EQUIP. PADS
LIMITS OF
PHASE I
WIDENED
ASPHALT
RAMP
FAC 15531
TWO 28K gal.
LO2 TANKS
GRAVEL w/750 S.F.
CONC. EQUIP. PADS
FAC 15642
FAC
15641
FAC 15640
LAUNCH PAD B
BMDO
RETENTION
AREA
ASPHALT TO
BE REMOVED
(TYPICAL)
CROSS
COUNTRY
PIPING
ASPHALT TEST
DEMONSTRATOR
STORAGE
AIR FORCE EASTERN RANGE
PATRICK AIR FORCE BASE, FLORIDA
CAPE CANAVERAL AIR FORCE STATION
SITE APPROVAL APPLICATION
ADVANCED
TECHNOLOGY
DEVELOPMENT
CENTER
PROJECT NO:
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SPACE GATEWAY
SUPPORT
JOINT BASE OPERATIONS
SUPPORT CONTRACT

The nation currently lacks a comprehensive, large-scale research and development test area for Spaceport Technologies. Spaceport Technologies are defined as the methods, mechanisms, electronics, and machinery used to safely process space cargo and payloads, space vehicles, and launch/land and recover space vehicles. The existing facilities at the CCS are disjointed and have significant operational restrictions placed upon them, which makes development of new Spaceport Technologies at existing facilities limited. These limited opportunities have created extremely high costs associated with this type of technology. With today's infrastructure, it is difficult to implement technology and techniques to improve the cost-effectiveness or safety of accessing space.

The ATDC will become the premier site and a national resource for full-scale research, demonstration, testing and qualification of Spaceport Technologies without operational constraints found at the existing facilities at KSC or CCAFS. The ATDC will allow for the development of future generation spacecraft and Spaceport development initiatives in partnership with other KSC, governmental and industry representatives. The ATDC will allow for improved processing techniques intended for the Space Shuttle and new Expendable Launch Vehicles (ELVs) with no operational risk to those programs. The ATDC can be used as a "real world" testing area for Spaceport Technologies that have shown promise in a laboratory environment. The ATDC is the key supporting project of CCS's Strategic Plan of evolving to a Spaceport Technology Center.

1.3 Scope of Environmental Assessment

The scope of this environmental assessment addresses the environmental impacts of construction and operation of the ATDC at two alternative locations. The Proposed Action is on the Cape Canaveral Air Force Station at Launch Complex 20 (LC-20). The first alternative is to construct the ATDC on the Kennedy Space Center at the Fire Training Area (FTA). The two locations are shown on Figure 2. This assessment addresses the impacts of any potential test programs to be completed at the ATDC. The types of programs include testing of cryogenic components in a launch configuration and new Spaceport Technologies.

2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.1 General

In an effort to continue to be the forerunner in Spaceport Technology and Exploration, NASA is proposing to construct a multi-use Spaceport Technology "testbed" called the Advanced Technology Development Center (ATDC), which could be utilized by a number of different space-related customers. Various vehicle programs that could possibly be supported in this proposed facility are existing launch vehicles and developing launch vehicles and spacecraft. This new facility will be built in phases over a five-year period. The facilities would include cryogenic storage and systems areas, a launch mount with a static test demonstrator stand, and processing and support facilities. The facility would be approximately 28 acres in size when completed.

The cryogenic storage and systems areas will include Liquid Oxygen (LO_X), Liquid Hydrogen (LH_2), and Liquid Nitrogen (LN_2) storage vessels. There will be a 56K gallon LO_X dewar, a 68K gallon LH_2 dewar, and a 8K gallon LN_2 dewar.

The first segment of the ATDC, the cryogenics area, will include a LO_X area which is designed to accommodate a 56K gallon storage vessel to be used to test cryogenic components, process systems, and flow LO_X to customer supplied equipment. The LH_2 area will be designed to accommodate a 68K gallon storage vessel capable of testing LH_2 cryogenic components, process systems, and customer supplied equipment. The LN_2 area will accommodate an 8K gallon LN_2 storage vessel capable of testing LN_2, LO_X, and LH_2 cryogenic components, process systems, flow LN_2 to customer supplied equipment and for cryogenic densification. A Launch Mount is to be built at the existing launch stand at LC-20 and will be capable of accommodating various launch structures and vehicle simulators, as well as testing ground to Mobile Launch Platform (MLP) umbilical systems. A structure called an "Iron Rocket" will be built atop the Launch Mount and will include a 12K gallon LO_X tank and 20K gallon LH_2 tank, which will act as a Static Test Demonstrator with "flight tanks" and vehicle instrumentation systems, and umbilical systems. A Processing Building containing checkout and control systems capable of performing closed-loop command and control for any combination of ATDC facilities to be constructed at the site. And finally, a Shop Building capable of supplying the necessary operations, maintenance, and logistical support for the ATDC will be designed.

Three alternatives are considered for the construction of the ATDC (see Figure 2). 1) Proposed Action: Construct the ATDC at

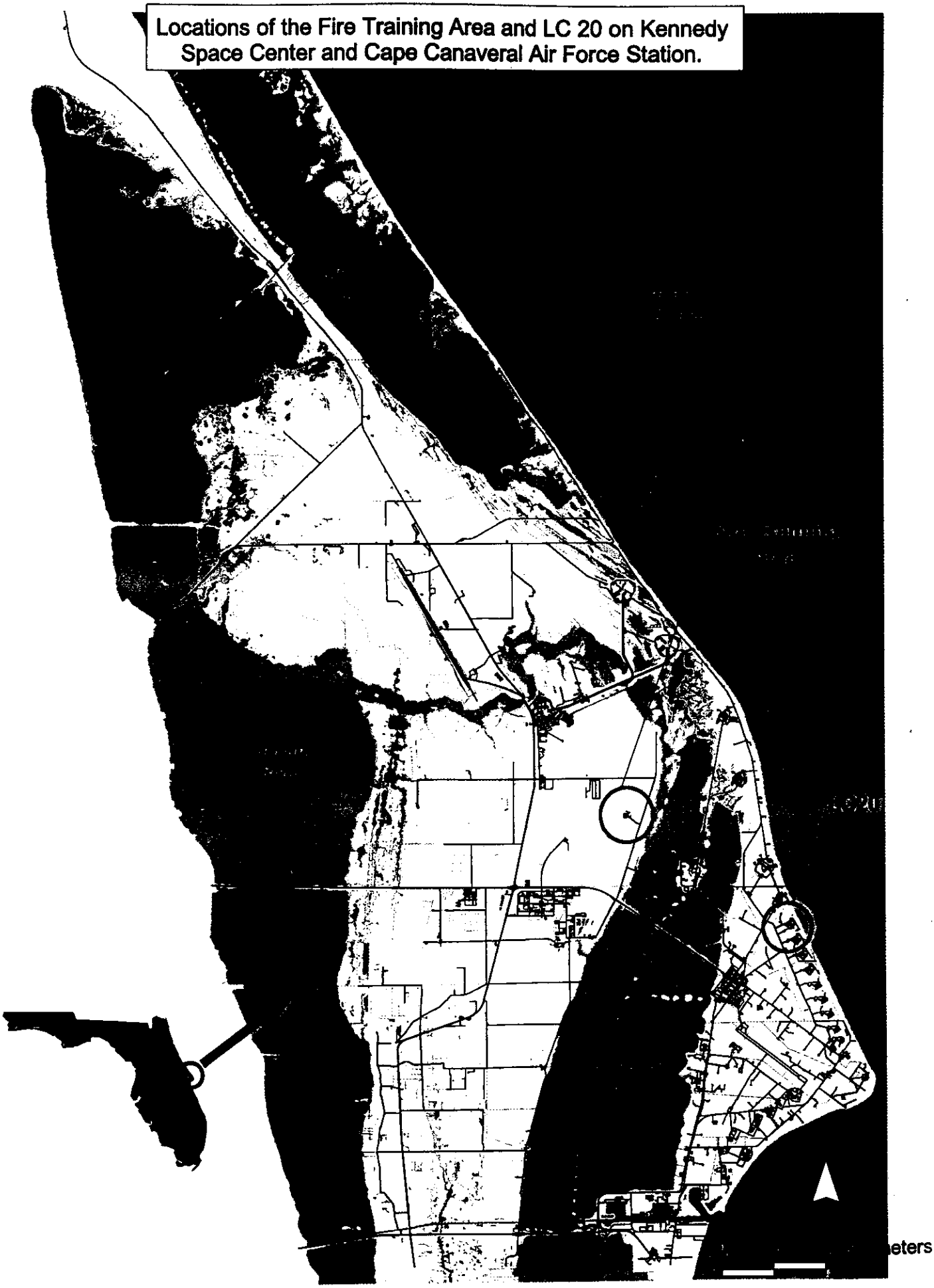

Figure 2 ATDC proposed and alternative locations.

LC-20 on Cape Canaveral Air Force Station; 2) Alternative 2: Construct the ATDC at the FTA at Kennedy Space Center; and 3) the No Action. Under the first two alternatives, the same design of the ATDC, as described in this section, was placed over each site to evaluate the impacts of construction on various environmental issues. The No Action alternative simply states that the facility is not built and the only impacts are to the research and development plans of the Cape Canaveral Spaceport.

2.2 Proposed Action: Construct the ATDC at Launch Complex 20 Cape Canaveral Air Force Station

The Proposed Action is to construct the facility complex within the boundary of LC-20. This action will impact approximately 28 acres of previously developed land inside the perimeter fence of LC-20. Implementation of this action would require no additional land clearing with new structures being built on previously cleared areas. New impervious areas will be constructed on previously cleared vegetated areas. These vegetated areas are mostly open grassy areas interspersed with sparse shrub vegetation (Figure 3).

2.3 Alternative 2: Construct the ATDC at the Fire Training Area at Kennedy Space Center.

This alternative is to construct the ATDC at the Fire Training Area on KSC off of Static Test Road. Implementation of this alternative would require clearance of some disturbed grassy areas. The area has been previously developed for fire training purposes for emergency response personnel. The area is a high sandy ridge made from hydraulic fill material from the Banana River (see Figure 4).

2.4 No Action

Under the No Action alternative, the ATDC would not be built.

Launch Complex 20 on Cape Canaveral Air Force Station, FL

Figure 3. ATDC proposed site Launch Complex 20, Cape Canaveral Air Force Station, FL.

Fire Training Area on Kennedy Space Center, FL

Figure 4. ATDC alternative site Fire Training Area, Kennedy Space Center, FL.

3.0 AFFECTED ENVIRONMENTS

3.1 General

Cape Canaveral Spaceport (CCS) encompasses nearly 63,133 ha (156,000 ac) on KSC and CCAFS. It is located on the east coast of central Florida. CCS is bordered on the west by the Indian River Lagoon, on the southeast by the Banana River, the north by the Mosquito Lagoon and the east by the Atlantic Ocean. KSC is the primary launch site for NASA's Space Shuttles with two active launch pads and is the primary eastern U.S. landing site for Space Shuttle fights. CCAFS is the primary eastern range launch site for Air Force Expendable Launch Vehicles, the Titan IV, Atlas and Delta rockets. CCAFS is also supporting the new Evolved Expendable Launch Vehicles (EELV), which are the new era of medium and heavy launch vehicles. In addition to supporting the nation's space mission operations, CCS contains within its boundaries the Merritt Island National Wildlife Refuge (MINWR) and the Canaveral National Seashore (CNS), which are managed by the U.S. Fish and Wildlife Service (USFWS) and the National Park Service (NPS), respectively. This unique relationship between space flight and preservation of the environment is carefully managed to ensure that both objectives are pursued without conflict. The existing environment at each of the alternative sites is described in detail in the following sections.

3.2 Facilities and Infrastructure

Transportation

CCS is serviced by over 340 km (211 mi) of roadway with 263 km (163 mi) of paved roads and 77 km (48 mi) of unpaved roads (Figure 5). Of the five access roads onto CCS, NASA Causeway West serves as the primary access road for cargo, tourists, and personnel entering and leaving. This four-lane road originates in Titusville as State Road 405 and crosses the Indian River Lagoon onto KSC. Once passing through the Industrial Area, the road reduces to two lanes of traffic. It then crosses the Banana River and enters the Cape Canaveral Air Force Station (CCAFS). The second point of entry onto CCS is from the south via South Kennedy Parkway, which originates on north Merritt Island as State Road 3. This road is the major north-south artery for KSC and is also a four-lane highway. The third entry point is accessible from Titusville along Beach Road, which connects to North Kennedy Parkway. The fourth access point is south

Fire Training Area on Kennedy Space Center and LC 20 on Cape Canaveral Air Force Station

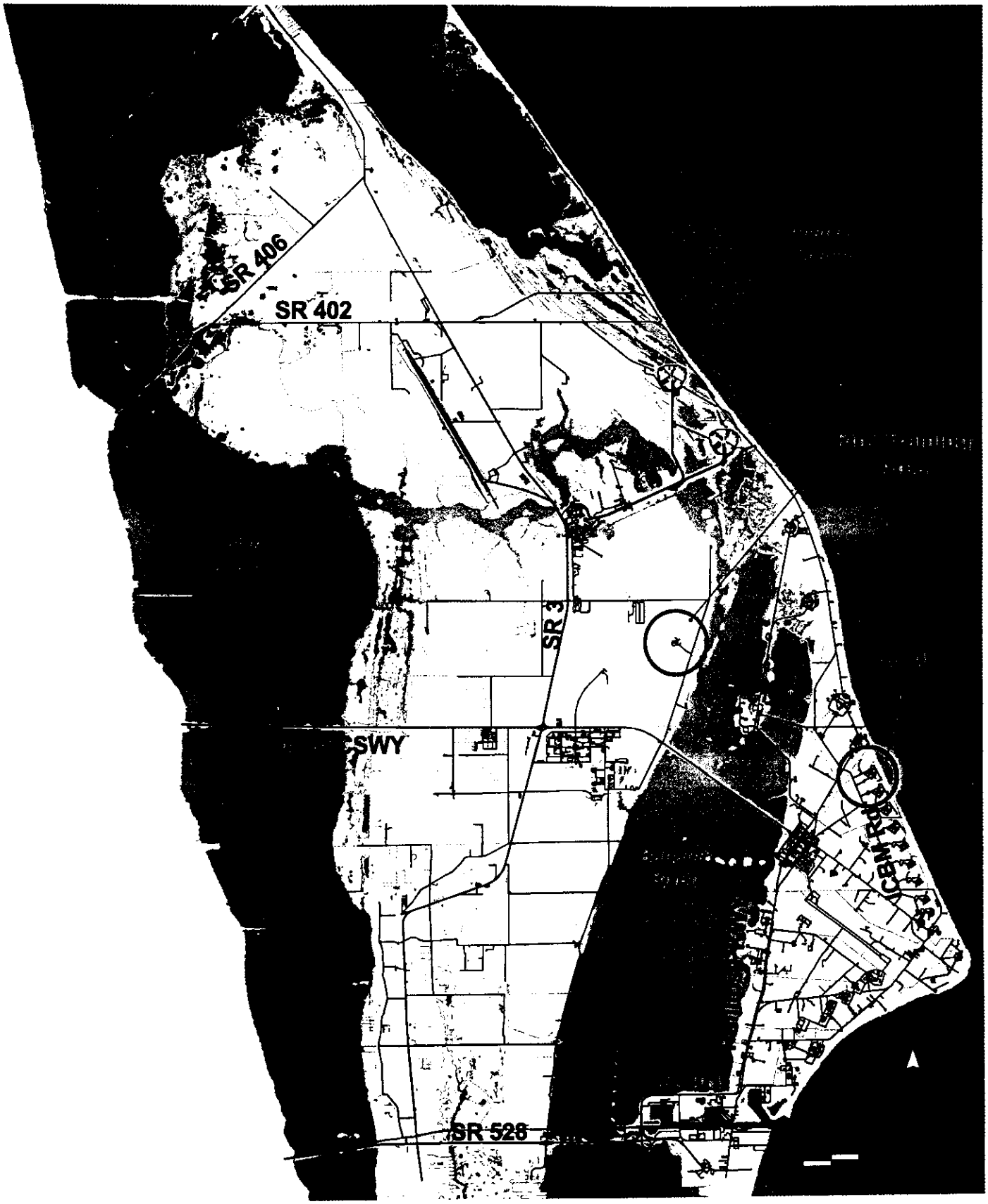

Figure 5. Transportation routes to ATDC.

of Oak Hill at the intersection of U.S. 1 and North Kennedy Parkway. The final access point is Route 410, which originates from State Road A1A in Cape Canaveral and Cocoa Beach. Route 401 brings traffic into CCAFS from the south along Phillips Parkway.

Access to the Proposed Action site is from ICBM Road just south of Launch Complex 34 and Alternative 2 is from Static Test Road off of NASA Causeway East.

Wastewater Treatment

The sanitary sewer system at CCS is composed of several centralized sewage treatment plants on KSC and one large centralized treatment plant on CCAFS designed to treat effluent in specific areas of KSC and CCAFS. There is also the Trident Wastewater treatment plant, which pre-treats various industrial wastewaters prior to incorporation into domestic wastewater treated at the centralized WWTP on CCAFS. Sewage Treatment Plant (STP) #1 is located south of the KSC Industrial Area and serves the Unified S-Band, the Visitors Complex, and the Industrial Area. STP #4 is located in the Vehicle Assembly Building (VAB) Area and serves the SLF and the VAB Area. STPs #5 and #6 serve LC-39A and LC-39B, respectively. In addition to these plants, several isolated facilities utilize small package plants to treat effluent while still others use septic tanks and drain fields. Recently, KSC has installed a force main connected to the WWTP at CCAFS which has connected STP#1 and STP#4 to the CCAFS WWTP.

For the Proposed Action there is no existing connection to a WWTP. There is an option to connect to a septic system, however, Air Force policy dictates that all domestic wastewater systems be connected to a WWTP if utilities are available. There are three existing septic systems at LC-20. One is associated with the blockhouse, one at the old launch pad area, and one at the new Spaceport Florida facility. The nearest wastewater connection at the Proposed Action is at the intersection of ICBM Road and Phillips Parkway. Presently, Alternative 2 has septic systems. The nearest wastewater connection for Alternative 2 is the force main on Kennedy Parkway North, which connects to the CCAFS WWTP.

Electricity

The power and lighting distribution systems for KSC and CCAFS have a total capacity of 137,000 kilovolt/amps (kVA), which is provided by Florida Power and Light (FPL). The power entering KSC is distributed from two main switching stations. These are the C-5 Substation which services the LC-39 Area and the Orsino Substation which services the Industrial Area.

Power for the Proposed Action is supplied by an aboveground line containing 2 circuits located along ICBM Road. There is a junction for LC-20, which feeds an underground cable to the existing blockhouse. Power for Alternative 1 is supplied by an underground power cable (13.8 kV) buried in a duct bank on the south side NASA Causeway and then along the western side of Static Test Road.

Communications

The CCS Communications System provides a variety of services including 1) conventional telephone service; 2) transmission of large volumes of test data to central collection or reduction stations; 3) transmission of timing information from operations centers to data gathering instrumentation at widely scattered locations; 4) transmission of weather and range safety data; 5) communication with satellites, Space Shuttles, and other hardware in space. The major segments of the KSC Communications System are the three distribution and switching stations. These are the First Switch - Industrial Area, the Second Switch - VAB Area, and the Third Switch - VAB Area. These three stations combine to provide service for over 18,500 telephones on KSC. The communications system at CCAFS is in a 4-inch, 6-way underground duct bank feeding communications lines to all the facilities.

Potable Water

CCS's potable water is supplied by the City of Cocoa, which obtains its water from artesian wells located west of the St. Johns River in Orange County. Water enters KSC along State Road 3 from a 60 cm (24 in) water main and extends north along Kennedy Parkway South to the VAB Area. The average daily demand for water is 3.8 mLd (1 mgd). Total storage capacity at KSC is approximately 15 mL (4 mg) in 10 ASTs. CCS also receives water from Cit of Cocoa at the south gate to CCAFS at Pump Station #2.

Potable water service for the Proposed Action is supplied by an 18-inch Air Force water line. Pump Station 4 is located across ICBM Road adjacent to Launch Complex 15 (LC-15) and supplies non-potable deluge water. Water for Alternative 2 is provided by the 12-inch water line running along the west side of Static Test Road.

3.3 Air Quality

The ambient air quality at CCS is generally good. The ambient air quality is predominantly influenced by daily KSC and CCAFS operations such as vehicle traffic, utilities fuel combustion, standard refurbishment and maintenance operations, and incinerator operations. Air quality is also influenced to some extent by emissions sources outside of CCS, primarily two regional power plants located within a 18.5 km (10 mi) radius of CCS. In addition to these sources, other operations occurring on an infrequent basis throughout the year also play a role in the quality of air at CCS. These include space launches and land management practices such as controlled burning, which influence air quality as episodic events.

The ambient air quality is monitored by a Permanent Air Monitoring System (PAMS) station located at the Environmental Health Facility at KSC at L7-1557. The PAMS station continuously monitors the concentrations of sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), and total inhalable (10-micron) particulates, as well as meteorological data. Currently, CCS is located within an area, which is classified as attainment with respect to National Ambient Air Quality Standards (NAAQS) established by the EPA for all criteria pollutants (KSC 1997-A).

Although rarely exceeding established standards, ozone (O_3) is the most consistently high criteria pollutant at CCS.

CCS is located within an area of attainment. Therefore, the project proponent is responsible for obtaining all air quality permits required by law.

3.4 Biological Resources

Vegetation

Vegetation on KSC can be categorized into upland and wetland communities. The wetlands on KSC consist of both coastal and freshwater communities and cover approximately 15,300 ha (38,000 ac). Upland communities on KSC are characterized by well drained, acidic, sandy soils that experience only brief periods of standing water. Upland communities are highly dependent upon periodic fire for the maintenance of habitat structure and vegetation composition. Scrub and pine flatwoods are the dominant upland communities on KSC. Pine flatwoods are typically composed of an overstory of slash pine (*Pinus elliotti*) with an understory of myrtle oak (*Quercus myrtifolia*), sand live oak (*Q. geminata*) and saw palmetto (*Serenoa repens*). The scrub communities on KSC are typically composed of scrub oak species

(*Q. myrtifolia, Q. geminata, Q. chapmanii*) with varying amounts of saw palmetto. Vegetation in xeric scrub is ideally about 1.5 m (2.2 ft) in height with no notable overstory; only an occasional slash pine or cabbage palm (*Sabal palmetto*) may be present. Several species of plants found on CCS are listed as species of special concern, threatened or endangered by the Florida Committee on Rare and Endangered Plants and Animals (FCREPA). While there is no regulatory implication of the FCREPA listings, these species have been identified by researchers as being rare or restricted to vulnerable habitats.

Approximately 70 percent, or 4,477 ha (11,063 ac) of CCAFS have been retained in a natural state of virgin stand and secondary growth of vegetation indigenous to the Florida coastal dune, coastal strand or coastal scrub plant communities. This type of environment offers habitat for various species of resident and migratory wildlife.

The Coastal Dune occurs on the first set of landward dunes. It is dominated by sea oats (*Uniola paniculta*) with other grasses including slender cordgrass (*Spartina patens*) and beach grass (*Panicum amarum*). Small shrubs such as beach berry (*Scaevola plumieri*), marsh elder (*Iva imbricata*) and Croton punctatus occur along with herbs including beach sunflower (*Helianthus debilis*), railroad vine (*Ipomoea pes-caprae*) and camphorweed (*Heterotheca subaxillaris*).

Coastal strand occurs inland from the coastal dune area on more stabilized dunes. It is a dense shrub community dominated by saw palmetto (*Serenoa repens*) with other shrubs such as sea grape (*Coccoloba uvifera*), southern bayberry (*Myrica cerifera*), nakedwood (*Mycianthes fragrans*), snowberry (*Chiococca alba*). Farther inland, sand live oak (*Quercus virginiana var. geminata*) is more abundant.

The coastal dune consists of the area from the high tide line to a point between the primary and secondary dune crest. Sea oats inhabiting this zone are listed as species of special concern, removal or disturbance of sea oates is prohibited.

Wetlands and Floodplains

The wetland communities on CCS can be characterized as freshwater herbaceous marsh and forested hammock systems, brackish water lagoons, open ocean, and managed fresh and brackish water impoundments. CCS is bordered on the western edge by the Indian River Lagoon (IRL). The IRL has been nationally recognized for its quality and species diversity. The IRL within the boundaries of the Merritt Island Wildlife Refuge is designated as an Outstanding Florida Water, and is also an *Estuary of National*

Significance and has been nominated as an *Estuary for National Research*. The IRL system throughout KSC is dominated by shallow flats of dense submerged aquatic vegetation including the seagrasses *Halodule wrightii, Syringodium filiforme, Ruppia maritima,* the macroalga *Caulerpa prolifera* and *Gracilaria spp.* The edge of the IRL is dominated by mixed salt-tolerant grasses. Impounded salt marsh waters are found throughout KSC and are managed by USFWS located on MINWR. Aquatic habitats inland on CCS include willow swamps, freshwater gramminoid marshes, and cattail marshes. The wetlands and surrounding waters of CCS support large wintering populations of waterfowl, as well as transient and resident wading bird populations.

There are no wetlands within the boundary fence on the Proposed Action site (see Figure 6). However, there are drainage canals on the edge of the property. These canals will not be impacted by this proposed project since permitted stormwater systems will be constructed if needed to treat any runoff from the site.

There are no wetlands on Alternative 2; however, the area surrounding the site contains wetlands consisting of dense stands of red maple, wax myrtle and some oaks. This site was generated in the 1960's from hydraulic fill material dredged from the adjacent Banana River (Figure 7).

In accordance with EO 11988, "Floodplain Management," NASA has implemented NMI 8800.10, "Floodplain and Wetland Management," to regulate activities within flood prone and wetland areas. The 100-year floodplain at KSC is established at the +4 National Geodetic Vertical Datum (NGVD). Approximately 78 percent of the KSC land area is within this designation. The location of the Proposed Action, and Alternative 2, are both outside the 100 and the 500-year floodplains.

Wildlife

The Indian River Lagoon system has nearly 150 species of fish. Lagoons and rivers support commercial fishery operations for both shellfish and finfish, including blue crabs, shrimp, clams, and mullet. Offshore, the CCS area has been one of the most productive fisheries along the east coast of Florida where commercial scallop fishery had dominated (NPS 1986). A number of renewable oyster leases are also held in the waters near CCS.

CCS and the surrounding coastal areas provide habitat for over 300 bird species; nearly 90 species are resident breeders, over 100 species winter at CCS, and the remainder are migratory (Breininger 1985). Twenty-four species are on the protected species list (Breininger 1984). Uplands areas

Florida Land use Classification Codes (FLUCCS) for LC20 on Cape Canaveral Air Force Station, FL

Beaches Other Than Swimming Beaches
Coastal Scrub
Xeric Oak
Wetland Scrub
Rural land in transition without positive indicators of intended use
Military
Transmission Towers
Roads and Highways
Reservoirs - <10 acres (4 hectares)
Streams and Waterways
Ocean

0 0.2 0.4 Kilometers

Figure 6. Land use map for proposed site Launch Complex 20

Florida Landuse Classification Codes (FLUCCS) for the Fire Training Area on Kennedy Space Center, FL.

- Cabbage Palm
- Cabbage Palm Savannah
- Freshwater Marshes
- Mixed Hardwoods
- Palmetto Prairies
- Xeric Oak
- Temperate/Tropical Hardwood
- Wax Myrtle
- Wetland Scrub
- Saltwater Marshes
- Wet Prairies
- Open water within a freshwater marsh
- Disturbed Shrub and Brush
- Spoil Areas
- Rural land in transition without positive indicators of intended use
- Roads and Highways
- Governmental
- Streams and Waterways
- Embayments/Lagoon

N

0 0.2 0.4 Kilometers

Figure 7. Land use map for alternative site Fire Training Area, Kennedy Space Center, FL.

on CCS provide important habitat for many bird species, including the Pileated woodpecker, migratory warblers, and the threatened Florida srub jy (*Aphelcoma coerulscens coerulscens*).

More than 31 species of mammals inhabit CCS lands and waters. Typical terrestrial species include the bobcat (*Lynx rufus*), river otter (*Lutra canadensis*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), and cotton rat (*Sigmodon hispidus*). Due to the regional loss of large carnivores such as the Florida panther, black bear and red wolf, the bobcat and otter now hold the position of top mammalian predators on CCS. Additionally, a proliferation of smaller predators such as the raccoon and opossum has resulted from an imbalance of predator/prey ratios. Opportunistic species such as the cotton rat now account for a large portion of the small mammal biomass rather than habitat-specific species such as the Florida mouse and southeastern beach mouse. CCS maintains the largest population of southeastern beach mice in the state of Florida. This species is practically extirpated everywhere else. A large population of feral hogs is present on CCS. These hogs are actively removed by the MINWR and JBOSC Wildlife Control Officer to minimize their detrimental impacts on native communities. Two mammal species common in the CCS waters of the IRL are the Atlantic bottlenosed dolphin (*Tursiops truncatus*) and the West Indian manatee (*Trichechus manatus*). The manatee is a federally listed endangered species and both the manatee and dolphin are protected under the Marine Mammal Protection Act (MMPA).

Herpetofauna

Fifty-two species of reptiles (12 federally or state protected) and 16 species of amphibians (one species of special concern) potentially occupy the CCS region. Relatively common species on CCS include the American alligator (*Alligator mississippiensis*), yellow rat snake (*Elaphe obsoleta*), and a variety of frog species. An important reptile resident of the Space Center is the gopher tortoise (*Gopherus polyphemus*). The gopher tortoise excavates burrows, which are used by many other species. For this reason, the tortoise is considered a keystone species, which means the existence of other species are dependent on the existence of gopher tortoise. Marine turtle species (all federally listed) use Cape Canaveral Spaceport beaches for nesting during the summer months and can be found in the offshore waters year round. Juvenile green turtles utilize the Indian River Lagoon and the submarine basins at Port Canaveral.

3.5 Threatened and Endangered Species

At present, there are over 19 federal and state laws in effect which deal directly with the conservation and preservation of wildlife in Florida. The primary objectives of these laws are to establish the listing and delisting processes for endangered and threatened species, to maintain data on current populations of species, to identify and maintain critical habitat areas, and to protect those species which have been identified as endangered or threatened. The varied habitat types at CCS and its protection as a wildlife refuge has allowed for a diverse list of flora and fauna to flourish. Many of these plants and wildlife are listed as endangered or threatened and thrive in the undeveloped and pristine areas of CCS.

A field survey conducted at the site of the Proposed Action, and at Alternative 2, identified gopher tortoise (*Gopherus polyphemus*), which are on the state of Florida listed species of special concern (SSC), to be present at both sites. In addition, due to the Proposed Action site's close proximity to the Atlantic Ocean, and the nesting areas of sea turtles such as the loggerhead (*Caretta caretta caretta*), Atlantic Green turtle (*Chelonia mydas myda*) and the Leatherback (*Dermochelys coriacea coriacea)*, there is potential for impacts to these species. The Atlantic coastal beaches along the CCS are used extensively during the summer months for nesting by large numbers of sea turtles. NASA and the Air Force have conducted a program to monitor and protect the sea turtle nesting areas for many years. Light management plans to reduce the amount of artificial light, which impacts the nesting and hatchling turtles, have been implemented as well as nest predator control programs

The surrounding habitat at both alternative locations is considered viable scrub jay habitat. However, ATDC operations will have no permanent impact on scrub jays.

3.6 Cultural Resources

Sites containing potential archeological and/or historical resources on CCS are protected under the National Historic Preservation Act (NHPA), which requires that every Federal Agency "take into account" how each undertaking could affect historic and prehistoric sites. The areas proposed for alteration in this study have been previously surveyed and mapped by NASA and the Air Force to indicate their potential for containing historical artifacts (AC 1992). Areas, which have low potential for historical artifacts, may not require additional Phase I or II archaeological surveys. The site of the Proposed Action and Alternative 1 have been classified as areas of low potential for containing items of historical or archaeological significance.

In addition, the remaining launch structure at LC-20 is not a historical property.

3.7 Geology and Soils

CCS is located on Peninsular Florida, which gradually rose above a much larger feature called the Florida Plateau. The Florida Plateau is one of the world's most stable areas and is a carbonate platform on which thousands of feet of limestones and dolomites have accumulated. Lithography, stratigraphy and geologic structures are important controls of groundwater quality, distribution of aquifers and confining beds and the availability of groundwater.

Soils at CCS generally originated from relict beach ridges formed by the action of wind and waves along the shore and their subsequent denudation, as well as, deposition in marine estuary environments.

The soils in the area of the Proposed Action (see Figure 8) consist of Canaveral-urban land complex and urban land. This complex consists of Canaveral sand and urban land. About 20 to 40 percent of the acreage is covered with buildings. About 70 percent of the land not covered by structures is a mixture of sand and shells that have been dredged from the Indian and Banana Rivers. Most of the areas of this complex have been artificially drained with a water table at 40-60 inches below grade during the wet season and below 60 inches in the dry seasons.

LC-20 is a regulated solid waste management unit (SWMU) under state and federal hazardous waste regulations due to historical operations at the site and releases of waste to grade. The site is currently under land use restrictions, over impacted areas at the site, which limit the site's use for purposes other than industrial use. Currently, there are no known areas that would pose a risk to workers. The soil at the site has been remediated to industrial standards.

The soils in the area of Alternative 2 (see Figure 9) consist of urban land generated by the hydraulic dredging of the Banana River. This site also is a SWMU with similar contamination media as LC-20.

Soils surrounding LC 20 on Cape Canaveral Air Force Station

Beaches
Canaveral-Anclote complex-gently undulating
Canveral-Urbanland complex
Quartzipsamments- smoothed
Urbanland
Welaka sand
Water

N

0 0.2 0.4 Kilometers

Figure 8. Soil map for proposed site Launch Complex 20.

Soils surrounding the Fire Training Area on Kennedy Space Center, Florida

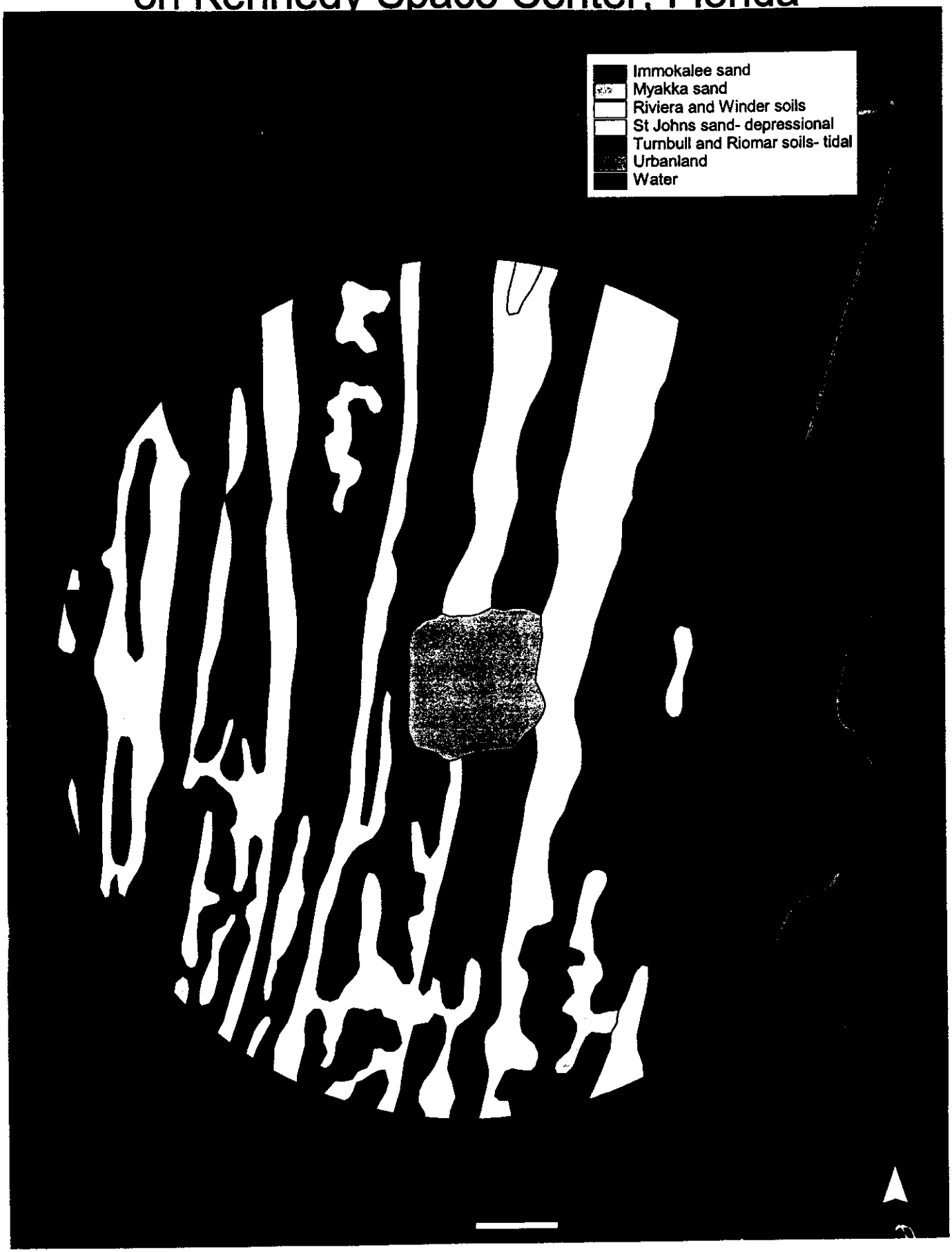

Figure 9. Soil map for alternative site, Fire Training Area

3.8 Noise

Noise generated at CCS originates from six different sources: 1) Orbiter reentry sonic booms, 2) launches, 3) aircraft movements, 4) industrial operations, 5) construction, and 6) traffic noises. Noise generated by these sources above ambient levels has the potential to adversely affect both wildlife and humans. The effects of noise on wildlife have been studied to an extent at KSC and at the CCAFS during the launch of spacecraft (KSC 1981 and Breininger 1990). These studies have shown that besides an initial startle response to launches, birds and other wildlife return to their normal activities soon afterward and show no adverse affects. Other studies conducted on wading bird colonies subjected to military overflights (500 feet of altitude) with noise levels up to 100 decibels (dBA) observed no productivity limiting responses and only a short-term interruption of their daily routine (Black 1984). Permissible noise exposure limits for man are established by the Occupational Safety and Health Administration (OSHA). The 8-hour time weighted average noise level on CCS is appreciably lower than the OSHA recommended level of 85 decibels.

3.9 Surface Water Quality

The surface waters in and surrounding CCS may best be described as shallow estuarine lagoons, which include portions of the Indian River Lagoon, the Banana River, Mosquito Lagoon, and Banana Creek. The area of Mosquito Lagoon within the CCS boundary and the northernmost portion of the Indian River Lagoon, 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 CCS have been designated as Class III, Recreation and Fish and Wildlife Propagation. All surface waters within the MINWR have the distinction of being designated as Outstanding Florida Waters (OFW) as required by Florida Statutes for waters within National Wildlife Refuges.

Several agencies including NASA, the USFWS, and Brevard County maintain water quality monitoring stations at surface water sites within and around CCS. The data collected is used for long-term trend analysis to support land use planning and resource management. Surface water quality at KSC is generally good, with the best areas of water quality being adjacent to undeveloped areas of the lagoon, such as the north Banana River, Mosquito Lagoon, and the northern most portion of the Indian River Lagoon. The site of the Proposed Action at LC-20 is bordered on the east by the Atlantic Ocean. The complex has drainage swales, which radiate from the pad surface that ultimately discharge to surrounding low areas. There are no specific surface waters that the Proposed Alternative drains into. Alternative 2 has sheet

flow drainage to the surrounding wetlands. There are no surface waters that receive direct discharge from this site.

3.10 Groundwater Quality

The State of Florida, through legislation, has created four categories to rate the quality of groundwater in a particular area. The criteria for these categories is based upon the degree of protection that should be afforded to that groundwater source, with Class G-I the more stringent and Class G-IV the least The groundwater at CCS is classified as Class G-II, which means that the groundwater is a potential potable water source and generally has a total dissolved solids content of less than 10,000 mg/L. The subsurface of CCS is comprised of the Surficial Aquifer, the Intermediate Aquifer, and the Floridan Aquifer. Recharge to the Surficial Aquifer System is primarily due to the infiltration of precipitation, however, the quality of water in the aquifer beneath CCS is influenced by the intrusion of saline and brackish surface waters from the Atlantic Ocean and surrounding lagoon systems. This is evident by the high mineral content, principally chlorides, which have been observed in groundwater samples collected during various CCS surveys.

The groundwater at the Proposed Action and Alternative 1 sites have been impacted by historical operations at both facilities. Historical operations have introduced contaminants into the groundwater, which have categorized both sites as Resource Conservation And Recovery Act (RCRA) sites. This means the groundwater and soils at the sites contain contaminants, which have made the groundwater unsuitable for human consumption and poses a potential health risk if exposure occurs. Based on the regulatory criteria, and the small probability of impacting the groundwater, there is little health risk associated.

3.11 Socioeconomics

The CCS workforce is comprised of approximately 26,000 personnel, including contractor, construction, tenant, permanent civil service employees and Air Force personnel (KSC 1997).

Approximately 50 percent of the personnel have positions directly related to the Space Transportation System (STS) and payload processing operations. The remaining work force is employed in ground and base support, unmanned launch programs, crew training, engineering, and administrative positions.

There are approximately 439 military, 379 civilian, and 6,965 contractor personnel employed at CCAFS. There is no military housing at CCAFS.

3.12 Land Use

KSC comprises approximately 56,000 ha (140,000 ac) of which nearly 95 percent is undeveloped area including uplands, wetlands, mosquito control impoundments, and open water areas. KSC is unique in that the MINWR and the CNS lie within its boundaries and are managed for NASA by the USFWS and the NPS, respectively. These agencies exercise management control over agricultural, recreational, and environmental programs within the MINWR and the CNS.

The remaining approximately 2,300 ha (6,500 ac) of KSC comprise the NASA operational area. Currently, 62 percent of this operational area is developed as facility sites, roads, lawns, and maintained right-of-ways. The remaining undeveloped operational areas are dedicated safety zones around existing facilities or are held in reserve for planned and future expansion. The developed operational areas within KSC are dominated by the VAB Area, the Industrial Area, and the SLF. These facilities account for more than 70 percent of the NASA operational area.

The area chosen for the alternative sites is currently developed and is under control by NASA and the Air Force.

CCAFS encompasses approximately 6,940 ha (15,800 ac). Because of the special nature of activities at CCAFS, several new land use categories have been identified to describe the pattern of activities on the installation. The Launch Operations category is used to identify the launch complexes and adjacent launch control facilities. Launch danger zones are associated with active launch complexes.

Launch and Range support areas contain facilities within which launch vehicles, payloads, fuels, and related equipment are processed and maintained. Explosive safety quantity distances (QD's) are associated with many of the vehicle and fuels facilities. Payloads are also processed within Launch and Range Support facilities.

Launch and Range Control facilities include those specifically associated with operations at the time of launch. These areas are scattered throughout the installation primarily along the Atlantic coastline due to safety concerns.

U.S. Navy Operations are located in the Port Operations area, a commercial and industrial port in an artificial harbor. Other Navy facilities are located between Pier Road and South Patrol Road. The Canaveral Locks connect the harbor to the Banana River. Two of the Port turning basins are used for civilian and

military vessels. A third basin was constructed by the Navy for the Trident Program and is restricted to military vessels.

Most support facilities at CCAFS are centrally located in what is known as the "Industrial Area." This includes administrative, community, recreation, and launch and range support and control, as well as, industrial land use.

Airfield land use is defined by the Skid Strip. The airfield is 457 ha (1,129 ac) in size. Airfield Operations Facility adjacent to the west end of the Skid Strip and the Shuttle Landing Facility are included in Airfield land use.

4.0 ENVIRONMENTAL CONSEQUENCES OF ALTERNATIVES

4.1 Summary of Relevant Issues and Status of Issues

Impacts of the construction and operation at each of the alternative sites vary from none to minor upon the environmental issues evaluated. Results of the analyses are summarized in Table 1, which shows the impacts to each media for each alternative.

Impacts were classified in one of five categories:

- Not Applicable (N/A) - those activities not related to the site specific or global environment
- None - those areas in which no impacts are expected
- Minimal - those areas in which the impacts are not expected to be measurable or are too small to cause any degradation to the environment
- Minor - those impacts which will be measurable but are within the capacity of the impacted system to absorb the change or can be mitigated with little effort and resources so that the impact is not substantial
- Major - those environmental impacts which individually or cumulatively could be substantial

This matrix can be used to assess the overall impacts of implementation of this project for each site alternative. The following discussion provides the detail of these impacts. This section is organized by alternative so that the impacts of each alternative can be seen as a whole.

Table 1. Impact Matrix

ISSUES	PROPOSED ACTION	ALTERNATIVE 2	NO ACTION
Facilities and Infrastructure	Minimal	Minimal	None
Air Quality	Minimal	Minimal	None
Biological Resources	Minimal	Minimal	None
Threatened & Endangered Species	Minimal	None	None
Cultural Resources	None	None	None
Geology	None	None	None
Noise	Minimal	Minimal	None
Surface Water Quality	Minimal	Minimal	None
Groundwater Quality	None	None	None
Socioeconomics	Minimal	Minimal	None
Land Use	None	None	None

4.2 Proposed Action

4.2.1 Facilities and Infrastructure

Construction of the ATDC at Launch Complex 20 is expected to have a minimal impact to utility connections and the existing infrastructure at the LC-20. The connection of the ATDC to the existing utilities is within the capabilities of the current systems (potable water, power, etc.) for this alternative. The only modification necessary will be a connection to an on-site domestic wastewater treatment system, either a septic system, or connection to the centralized WWTP on CCAFS.

4.2.2 Air Quality

Impacts to air quality may result from three activities associated with the project: site preparation activities, increased vehicle traffic, and venting of cryogenics such as LO_X, LH_2, and LN_2. The clearing of land and other construction activities for the new facilities will generate airborne particulates from earth moving and hydrocarbon exhaust from heavy equipment. Such activities are expected to be minimal in scope and of short duration. Best Management Practices (BMPs) can also be employed to mitigate for emissions from earth moving and include water spraying, placement of hay bales, and other forms of dust control.

The number of commercial vehicles required for the operations is relatively small, probably less than 25. This does not represent a major increase in traffic other than that already experienced by the site. The increase in vehicle loading is not expected to be measurable; therefore, these sources are expected to produce only minimal impacts to air quality at the site.

4.2.3 Biological Resources

Vegetation

Construction activities will impact small shrubs and grassy areas and will not negatively impact any natural communities at CCS. The impact to vegetation from the proposed action will be minimal. The quality of the uplands that exist at the site can be considered poor due to the previously disturbed/developed nature of the site and historical operations.

Wetlands and Floodplains

There are no wetlands on the proposed site that will be impacted.

Wildlife

There will be some minor impacts to wildlife anticipated from the construction and operational activities associated with the ATDC. Habitat removal would be the primary impact to wildlife. There is the potential for displacement during construction and operation, but the impact would be minimal since there is similar habitat available adjacent to the property. Gopher tortoises are present at the site and a relocation plan will be implemented prior to construction of the ATDC so impacts will be minimal. There is potential for the southeastern beach mouse to inhabit the areas inside the fence line of LC-20, but it is not considered optimal habitat. Impacts to the Southeastern beach mouse will be minimal. Trapping will be performed prior to commencement of construction to determine the presence or absence of the Southeastern beach mouse. There is also potential for the indigo snake to inhabit the area inside the fence. Impacts to the indigo snake will be minimal.

4.2.4 Threatened and Endangered Species

Sea turtles are sensitive to exterior lighting visible from the nesting beaches. Hatchlings use starlight and moonlight reflected off the ocean water for directional guidance after emerging from their nest. If the lighting inland is brighter than the reflected light off the ocean, sea turtles may become disoriented and crawl towards the artificial light sources rather than the ocean. A few hatchlings and adults become disoriented on CCS each year as a result of inland artificial exterior lighting. Due to the close proximity of LC-20 to the beach, it is probable that any additional proposed exterior lighting associated with the ATDC could have an adverse impact to nesting sea turtles and hatchlings.

The proposed project will include a system of exterior lights for operational and safety purposes. Due to its close proximity to the beach, these lights will have to comply with the 45th Space Wing Instruction 32-7001, Exterior Lighting Management, to ensure impacts to sea turtles is minimized. New exterior lighting also must conform to the site-specific Light Management Plan (LMP) and Fish and Wildlife Biological Opinion for LC-20 or modification of the LC-20 LMP. Consultation with the USFWS will be required with final approval of this plan from the USFWS. A good light management plan should render the impacts to sea turtles minimal.

Although not a threatened or endangered species, construction activities will result in the destruction of gopher tortoise burrows known to occur at LC-20. However, a relocation plan will be implemented prior to any excavation or land clearing

commencement to move these individuals out of the construction area and placed in adjacent suitable habitat.

Although there have been no documented observations within the perimeter fence of LC-20, the eastern indigo snake is known to occur in the area around LC-20 and utilize most areas on CCS. Considering the presence of gopher tortoise burrows at the Proposed Site, the area does provide suitable denning habitat. It is possible that one or more indigo snakes could be impacted by construction, however, most individuals would likely move out during construction so the impacts would be minimal.

The area within the perimeter fence of LC-20 is not considered suitable scrub-jay habitat, however, USFWS considers all scrub on CCS, suitable or not, to be part of a core scrub-jay area, indicating it is highly valuable to the recovery of the species. The areas adjacent to the proposed location, outside the perimeter fence, are viable scrub habitat. The construction of the ATDC at the proposed location will impact no scrub vegetation. However, since the adjacent land cover is viable scrub habitat, scrub jays may be temporarily impacted during construction activities and programs due to loss of foraging areas in the clearings and noise levels, which may force the scrub jays to adjacent habitat. However, this will be a minimal impact to scrub jays.

Construction and operation of the ATDC will not adversely impact any state or federally protected bird species other than possibly the scrub-jay. Activities of other birds should not be adversely impacted due to the intermittent nature of the disturbance expected by the ATDC. Due to the history of great horned owls nesting on active launch towers at CCS, it is probable that this, as well as the osprey and other species, may utilize the proposed structures of the ATDC, in particular the Iron Rocket as a nesting site. Design solutions can be implemented to minimize the potential nesting areas.

The beach adjacent to LC-20 is also habitat for the southeastern beach mouse. It is possible that the mouse also inhabits areas within the perimeter fence of LC-20. Construction activities may impact beach mice. A survey of the areas proposed for construction will be implemented prior to construction commencement. The impacts to the southeastern beach mouse will be minimal, since the area within LC-20 is not considered prime habitat.

The noise generated by construction and the intermittent activities associated with the ATDC are expected to have negligible short-term impacts to wildlife.

4.2.5 Cultural Resources

The proposed action encompasses the land and facilities located at LC-20. The Air Force has completed archeological surveys and historic property inventories that have evaluated LC-20 to determine if the Complex and its associated structures are eligible for inclusion in the National Registry of Historical Property (NRHP). These surveys have concluded that LC-20 contains no archeological resources and no facilities at LC-20 are eligible for listing in the NRHP. The construction of the ATDC will have no impact to any adjacent archeological or historical property.

4.2.6 Geology and Soils

The only potential impacts to the geology at this site are due to site preparation activities. Land clearing and excavation for building foundations and stormwater systems will require that the upper layers of the soil strata be removed. This alteration of the topography of the site may effect the flow patterns of surface runoff from rainfall events, but will be compensated for with the site grading and connection to a stormwater management system. None of the construction or operation activities scheduled for the ATDC will impact the larger geologic formations and aquifer. There are no potential impacts to geology expected for this alternative.

4.2.7 Noise

Ambient noise levels are expected to increase during construction activities and daily operations as a result of the ATDC being built at the LC-20. EPA recommended upper level noise threshold is 70 dBA, for a 24-hour timeframe (KSC 1997-A 1997). The noise generated by construction vehicles is expected to be below all noise thresholds and will occur for a brief period. Noise levels for operations are expected to result from increased vehicle traffic, facility equipment (air conditioners, etc.), and intermittent venting noise. The first two sources are expected to be similar to existing noise sources and, therefore, will not produce measurable impacts to noise receptors. The latter sources will be determined by the program(s) using the facility and are expected to be similar to those generated by existing launch activities at other launch pads at CCS. As the scope of these programs are not completely defined at this time, their impacts are not addressed here. They will be the subject of the programmatic evaluations being performed separately. The

potential impacts from the construction and operation of the ATDC for this alternative are therefore considered minimal.

4.2.8 Surface Water Quality

Currently, the surface water quality at LC-20 is affected by vehicle traffic, Spaceport Florida operations, and general daily site operations. The construction of the ATDC will increase the volume of traffic and number of operations conducted in the area. A stormwater management system will be constructed for any new impervious surface exceeding regulatory guidelines. The effects to surface water quality are expected to be minimal for this alternative. Presently, surface water drains radially from the pad surface along drainage swales and sheet flow. The majority of the runoff percolates into the well-drained sandy soils. Water that does not percolate will travel off site via a ditch from the existing concrete catch basin. This ditch eventually reaches a large surface water area located south of LC-20 near the beach at Launch Complex 19. During construction activities, impacts to surface waters in the area would be minimized by ensuring BMPs to control erosion and sedimentation are initiated and maintained.

4.2.9 Groundwater Quality

The groundwater quality at LC-20 has been affected by runoff from roadways, parking lots, launch structures, and historical launch operations of Titan I rockets and Titan III rocket programs. Presently, LC-20 generates the types of pollutants typically created by vehicle traffic and other day-to-day site operations. Although the amount of runoff will increase due to the ATDC, the loadings of these pollutants are not expected to increase significantly with the creation of the new facilities at the LC-20.

The Proposed Action site has been investigated as part of the Air Force Installation Restoration Program (IRP). This investigation identified contaminants in the groundwater from historical launch operations at the site, which included rocket propellant RP-1 and hydrazine. The contaminants found in the groundwater include volatile organic compounds (VOC's) and heavy metals. Personnel working during construction of the ATDC will have to be made aware of the potential exposure to these contaminants during construction de-watering. Based upon the IRP investigations, there is no risk to human health associated with the groundwater. There are no additional effects to groundwater quality expected for this alternative.

4.2.10 Socioeconomics

This alternative is expected to have an major impact on the local economy. How much is unknown at this time, but the addition of the facility is expected to attract additional projects not currently performed at CCS with an associated increase in money to local economies. The influx of potential program companies wishing to use this site for Research and Development will increase the population of residence within the central Florida area, and attract more exposure as the use of the ATDC becomes fully recognized.

4.2.11 Land Use

Construction and operation activities associated with the ATDC at this site would occur at LC-20, which is currently designated for support of space launch activities under the Department of Defense (DoD), NASA, U.S. Navy, Air Force 45th Space Wing, Spaceport Florida and commercial contractors. Proposed activities are consistent with the Base Comprehensive Plan. The proposed program will not result in conversion of any prime agricultural land or cause a decrease in the utilization of land.

This program is consistent with these land uses.

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

4.3 Alternative 2 Construction of ATDC at FTA

4.3.1 Facilities and Infrastructure

Construction of the ATDC at the KSC Fire Training Area (FTA) is expected to present minor impacts to utilities in these areas. There is existing power, communication and potable water at the site. There is no sanitary sewer connection. The domestic wastewater is handled through a septic tank system. The addition of the ATDC to this site will impact the septic system at the site. It is likely that the existing system would have to be modified.

The site is presently used for Fire Training purposes. There are existing training facilities on site that include classroom trailers and a three-story concrete structure used to train emergency personnel to handle fires. Construction of the ATDC at

this location would likely impact training operations at this site.

4.3.2 Air Quality

Impacts to air quality may result from three activities of constructing the ATDC: site preparation activities, increased sources such as vehicular traffic, and the venting of cryogenics such at LO_x, LH_2, and LN_2. The clearing of land and other construction activities for the new facilities will generate airborne particulates from earth moving and hydrocarbon exhaust from heavy equipment. Such activities are expected to be minimal in scope and of short duration. BMPs can also be employed to mitigate for emissions from earth moving. These include water spraying, placement of hay bales, and other forms of dust control.

The number of commercial vehicles required for the operations is relatively small. This does not represent a major increase in traffic other than that already experienced by the site. The increase in vehicle loading is not expected to be measurable; therefore, these sources are expected to produce only minimal impacts to air quality at this site.

The cryogenics proposed at this site will include LO_X, LH_2, and LN_2 with an associated propane gas source for a flare stack.

4.3.3 Biological Resources

Vegetation

Impact to vegetative communities at Alternative Site 1 by the construction of the ATDC will be negligible. The quality of the uplands that exist at this Alternative Site can be considered poor due to the developed condition of the site. There is little vegetation on the site, and the site itself was generated by hydraulic fill pumped from the Banana River when the barge Saturn Barge Canal was constructed in the 1960's. There are no vegetation species on site that are of a concern. The majority of the area is covered in grasses with small palmettos sporadically around the site.

Wetlands and Floodplains

There are no wetlands at Alternative Site 1; however, the surrounding areas are jurisdictional wetlands. These wetlands could be impacted by runoff from construction activities and future stormwater runoff. These can be managed using BMP's, which address construction erosion control, and a permitted stormwater management system. The elevation of the site, which

ranges from +12 to +14 NGVD keeps this site well out of the flood zone elevation of +4 NGVD.

Wildlife

This site is utilized mostly by wildlife considered non-indigenous to KSC. Due to the disturbed nature of the habitat, indigenous species do not appear to utilize the site extensively. Therefore, direct impacts to these indigenous species are not expected by the removal of this habitat.

The non-indigenous species using the site would be forced to move into adjacent areas, thereby, potentially impacting the native wildlife through competition. However, given the relatively large amount of available habitat adjacent to the site, such impacts are not expected to be measurable and are, therefore, considered minimal.

4.3.4 Threatened and Endangered Species

Inspection of the site revealed active gopher tortoise burrows scattered throughout the site. Construction activities will result in the destruction of some of these gopher tortoise burrows known to occur at the Fire Training Area. A relocation plan will be implemented to move any individuals out of the area into suitable adjacent habitat. Therefore, impacts to the gopher tortoise will be minimal.

Although there have been no documented observations within the perimeter of the FTA, the eastern indigo snake is known to occur in the area around the FTA and utilize most areas on CCS. Considering the presence of gopher tortoise burrows at the proposed site, the area does provide suitable denning habitat. It is possible that the indigo snake could be impacted by construction, however, it is expected that most individuals would move out during construction so the impacts would be minimal and temporary.

The area within the perimeter fence of the FTA is not considered suitable scrub-jay habitat, however, FWS considers all scrub on CCS, suitable or not, to be part of a core scrub-jay area, indicating it is highly valuable to the recovery of the species. The construction of the ATDC at the proposed location will impact no scrub vegetation. However, the adjacent areas to the FTA is known scrub-jay habitat, with scrub-jays present during inspection of this FTA. It is probable that there will be short-term impacts to the scrub-jay during construction of the ATDC, however, these impacts will be negligible. These impacts include loss of foraging areas from construction and noise generated during construction and operation of the ATDC.

Construction and operation of the ATDC is not expected to adversely impact any state or federally protected bird species other than possibly the scrub-jay. Activities of other birds should not be adversely impacted due to the intermittent nature of the disturbance expected by the ATDC. Due to the history of great horned owls nesting on active launch towers at CCS, it is probable that this, as well as the osprey, which are presently using lighting fixtures for nesting areas, and other species, may utilize the proposed structures of the ATDC, in particular the "Iron Rocket" as a nesting site. Engineering designs can reduce this potential impact.

4.3.5 Cultural Resources

The area proposed for this alternative has been previously mapped by NASA to indicate its potential for containing historical artifacts. As a result of this study, this area has been classified as having a low potential for containing items of historical or archaeological significance. The construction and operation of the ATDC at this site will pose no impact to these resources and no additional Phase I or II archaeological surveys will need to be conducted.

4.3.6 Geology and Soils

The only potential impacts to the geology at this site are due to site preparation activities. Land clearing and excavation for building foundations and stormwater systems will require that the upper layers of the soil strata be removed. This alteration of the topography of the site may affect the flow patterns of surface runoff from rainfall events, but will be compensated for with the site grading and connection to a stormwater management system. None of the construction or operation activities scheduled for the ATDC will impact the larger geologic formations and aquifer. There are no potential impacts to geology expected for this alternative.

4.3.7 Noise

Ambient noise levels are expected to increase during construction activities and daily operations as a result of the ATDC being built at the FTA. The noise generated by construction vehicles is expected to be below all noise thresholds and will occur for a brief period. EPA recommended upper level noise threshold is 70 dBA, for a 24-hour timeframe (KSC 1997-A 1997). In addition, there are no known noise receptors (e.g., wildlife) in or around the site, which are especially sensitive to the expected noise levels or which will be permanently impacted. Noise levels for operations are expected to result from increased vehicle traffic,

facility equipment (air conditioners, etc.), and intermittent venting noise. The first two sources are expected to be similar to existing noise sources and, therefore, will not produce measurable impacts to noise receptors. The latter sources will be determined by the program(s) using the facility. As the scope of these programs are not completely defined at this time, their impacts are not addressed here. However, it is expected to be similar to existing launch operations at the CCS. They will be the subject of the programmatic evaluations being performed separately. The potential impacts from the construction and operation of the ATDC for this alternative are, therefore, considered minimal.

4.3.8 Surface Water Quality

Currently, the surface water quality at the FTA is affected by vehicle traffic, and general daily site operations. The construction of the ATDC will increase the volume of traffic and number of operations conducted in the area, but is not expected to result in an increase in the runoff amount or loading entering adjacent surface water drainage ditches. This is because a new permitted surface water management system would be used to attenuate runoff from the site and reduce pollutant loadings entering the Banana River. During actual construction activities, impacts to surface waters in the area will be minimized by ensuring that BMPs to control erosion and sedimentation are initiated and maintained.

4.3.9 Groundwater Quality

The groundwater quality at the FTA has been affected by runoff from roadways, parking lots and historical operations associated with the Fire Training exercises performed at the site. These operations have generated contamination in the surficial aquifer. These contaminants have been evaluated through the NASA Remediation Group and found to exceed industrial levels under RCRA and a remedial action is being planned. The contaminants of concern in the groundwater are hydrocarbons and volatile organic compounds (VOC's). Although the amount of runoff will increase, the loadings of these pollutants are not expected to increase significantly with the creation of the new facilities at the ATDC. There are no effects to groundwater quality expected for this alternative.

4.3.10 Socioeconomics

This alternative is expected to have a major impact to the workforce at CCS. How much is unknown at this time, but the addition of the facility is expected to attract additional projects not currently performed here with an associated increase

in money to local economies. The influx of potential program companies wishing to use this site for Research and Development will increase the population of residence within the central Florida area, and attract more exposure as the use of the ATDC becomes fully recognized. The introduction of the ATDC at this site would have an increase in worker safety due to the hazardous operations associated with the project. This site is located within 1 mile of the heavily populated KSC Industrial Area. The CCS Master plan is being generated which has designated all hazardous operations such as the ATDC to be conducted across the Banana River at CCAFS. The ATDC at this alternative would also impact training operations that are presently performed at this site.

4.3.11 Land Use

Only a very small portion of the total acreage of KSC has been developed or designated for NASA operational and industrial use. Of the 56,000 ha (140,000 ac) of total KSC area, less than 5 percent is designated for KSC operational area and only 62 percent of this area has been developed. The impacts to land use at KSC as a result of the construction of this facility are expected to be none.

KSC is within the Coastal Zone as defined by Florida Statutes (FDER 1984). As such, a Coastal Zone Consistency Determination is required. The results indicate that this alternative can be implemented within existing environmental regulations. It has been determined to be consistent with the Florida Coastal Zone Management Plan.

4.4 No Action Alternative

There will be no environmental impacts with the No Action Alternative. However, the ability of CCS to expand and promote development of new technologies will be lessened since this type of research and development facility will be moved to other locations. This will take away potential employment opportunities at CCS, therefore, impacting the local ecomomy.

5.0 MITIGATION OF PROPOSED ACTION

5.1 Summary of Mitigation Actions

The implementation of the Proposed Action, construction of the ATDC at LC-20 has the potential to create minor impacts to gopher tortoise, Southeastern beach mouse, Indigo snakes and sea turtles. To mitigate these impacts, implementation of a biological survey, Relocation Plan and Light Management Plan will be incorporated into the design of this facility. A formal Section 7 consultation with FWS will not be completed since the project will not permanently remove vital habitat or severely impact any threatened and endangered species. However, an informal consultation with the FWS will be done to ensure their concurrence with the planned biological survey, Light Management Plan and Relocation Plan.

Construction of the ATDC will not commence until a Biological Survey of the site is completed which will identify all gopher tortoise burrows within the project boundary. The burrows will be inspected using an infrared burrow scope to determine if the burrow is occupied by either a gopher tortoise or a commensal species such as the Indigo snake. If occupied, the gopher tortoise will be trapped using a bucket trap, or excavated out of the burrow using a backhoe if time for bucket trapping is not available. The gopher tortoise will be relocated under a permit from the Florida Fish and Wildlife Conservation Commission to adjacent suitable habitat at LC-20, outside the proposed construction areas. The commensal species, if present, will be given an opportunity to leave the burrow. Once void of gopher tortoise and any commensals, the burrows will be collapsed so further use of the burrow is avoided. This relocation plan will be scheduled to coincide as closely as possible with construction start times so that re-establishment of active gopher tortoise burrows in the construction areas can be avoided.

The planned biological survey will determine if in fact the Southeastern beach mouse is present at the proposed site. If the Southeastern beach mouse is found to be present, an informal consultation with FWS will be conducted to determine a mitigation strategy.

The construction and activation of the ATDC should not have a major impact on sea turtles because the ATDC construction and operation is not planned to occur during nighttime hours. Construction and operation of the ADTC will be done during daylight hours. In addition, design of any exterior lights will have to comply with the 45th Space Wing AFI 32-7001 to ensure impacts to sea turtles is minimized. New exterior lighting will

conform to the site-specific Light Management Plan (LMP) and Fish and Wildlife Biological Opinion for LC-20 or modification of the LC-20 LMP. Informal consultation with the FWS will be required with final approval of this plan from the FWS. A good Light Management Plan is expected to render the impacts to sea turtles minimal.

6.0 ENVIRONMENTAL JUSTICE

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

The EO directs Federal Agencies, including NASA, to develop environmental justice strategies. Further, EO 12898 requires agencies, to the greatest extent practicable and permitted by law, to make the achievement of environmental justice part of their 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, CCS has developed a plan to comply with the EO AF and NASA's Agency-wide strategy. As part of that plan, the impacts to low-income and minority populations in the CCS area were addressed as part of this EA. This project, for all alternatives addressed, would be implemented within the boundaries of CCS. The closest residential areas are 13 km (9.5 mi) to the south on Merritt Island and 12 km (7.6 mi) to the west in Titusville. No groups of either low-income or minority populations have been identified in either location. In addition, the distances of these areas from the proposed site alternative preclude any direct impacts from construction or operations. Economic impacts are not expected to adversely affect any particular group. Construction personnel would be drawn from the local workforce and provide a short-term economic benefit to the local area.

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8.0 REFERENCES

AC 1992	Archaeological Consultants, Archaeological Survey to Establish Zones of Archaeological Potential (ZAPs) in the Shuttle Landing and KSC South Areas (Option 2) of the Kennedy Space Center, 1992, John F. Kennedy Space Center.
Breininger 1984	Breininger, D.R.; P.A. Schmalzer; and R.C. Hinkle, "Comprehensive List of Endangered and Potentially Endangered Plants and Animals at John F. Kennedy Space Center, Florida," 1984, John F. Kennedy Space Center, Florida.
Breininger 1985	Breininger, David R., "Wildlife/Habitat Association Model and Bibliography for John F. Kennedy Space Center, Florida," 1985, John F. Kennedy Space Center, Florida.
Breininger 1990	Breininger, D.R.; M.J. Kehl, Report to Clay Gordin/6550 ABG/DEEV on July 5, 1990.
FDER 1984	Florida Department of Environmental Regulation, 1984. Florida Coastal Management Program Federal Consistency Evaluation Procedures. Office of Coastal Management, Department of Environmental Regulation, Tallahassee, Florida.
Hall 1991	Hall, Carlton, Ambient Water Quality Conditions at the John F. Kennedy Space Center. John F. Kennedy Space Center, Florida, 1991.
Launch Base Support Env. Contract	Spaceport Florida Authority and Department of the Air Force 45th Space Wing, "Environmental Baseline Survey, Proposed Outgrant of Launch Complex 20 to the Spaceport Florida Authority at Cape Canaveral Air Force Station, Florida" June 1998
KSC 1978	National Aeronautics and Space Administration, Washington, D.C., "Environmental Impact Statement: Space Shuttle Program," Washington, D.C., 1978.

KSC 1992	National Aeronautics and Space Administration, Kennedy Space Center, "Facilities Master Plan, Volume I, John F. Kennedy Space Center," John F. Kennedy Space Center, December 11, 1992.
KSC 1997-A	National Aeronautics and Space Administration, Kennedy Space Center, "Environmental Resources Document, John F. Kennedy Space Center," John F. Kennedy Space Center, February 1997.
KSC 1999-B	National Aeronautics and Space Administration, Kennedy Space Center, "Environmental Assessment for the Flight Vehicle and Landing Support Complex at the Shuttle Landing Facility", John F. Kennedy Space Center, May 1999
KSC 2000-A	National Aeronautics and Space Administration, Kennedy Space Center, "Environmental Assessment for the Space Experiments Research Processing Laboratory" John F. Kennedy Space Center, May 2000
NPS 1986	National Park Service, Cape Canaveral National Seashore Management Plan, 1986, Canaveral National Seashore, Florida.
USDA-SCS 1974	United States Department of Agriculture Soil Conservation Service, "Soil Survey of Brevard County, Florida," November 1974.
Vista Technologies Inc. 2000	Draft Environmental Assessment of the Commercialization of Space Launch Complex 15 Cape Canaveral Air Force Station, Florida, May 2000