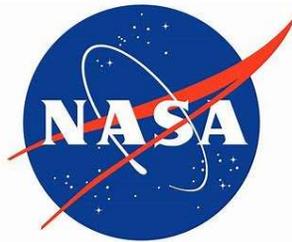

**Environmental Assessment
for Exploration Park North at the
John F. Kennedy Space Center,
Kennedy Space Center, Florida**

August 2021

**National Aeronautics and Space Administration
John F. Kennedy Space Center
Kennedy Space Center, Florida**



**Prepared for:
Space Florida, Cape Canaveral, Florida**



ENVIRONMENTAL ASSESSMENT FOR EXPLORATION PARK NORTH JOHN F. KENNEDY SPACE CENTER, FLORIDA

Abstract

This Environmental Assessment (EA) evaluates the environmental effects of the proposed construction of an Astronaut Training Facility on a site referred to as Exploration Park North. The site is located north of Space Florida's Exploration Park Phase I at Kennedy Space Center (KSC).

The purpose of the Proposed Action is to construct and operate an Astronaut Training Facility at Exploration Park North that would include astronaut training facilities—and various support facilities for future commercial astronauts and other aerospace customers. The need for the Proposed Action is consistent with National Aeronautics and Space Administration Interim Directive 8600.121, KSC's 2020 Vision Plan, and Section 6.3.1 of Space Florida's 2017 Master Plan. Project construction is proposed to begin in 2021 and the Astronaut Training Facility would be fully operational in 2022.

This EA evaluated the potential environmental impacts associated with the No Action Alternative and the Proposed Action (Space Florida's Preferred Alternative), and include the following resources categories: transportation, utilities, air quality, biological resources (habitat and non-listed wildlife species), threatened and endangered wildlife species, cultural resources, geology and soils, noise, surface water quality, groundwater quality, and socioeconomics.

Environmental impacts from the Proposed Action and No Action Alternatives were classified as **none**, **negligible**, or **minor**. Under the No Action Alternative, the astronaut training facility would not be constructed. Apart from socioeconomics, the No Action Alternative would result in **no** impacts; **minor adverse** impacts to socioeconomics would be expected. However, the No Action Alternative was not selected because it does not meet the purpose and need of the Proposed Action. As required by the National Environmental Policy Act, the No Action Alternative was carried forward for analysis in the EA for the purposes of analyzing the consequences of not undertaking the Proposed Action and establishing a comparative baseline.

Specifically, the construction portion of the Proposed Action would result in **negligible adverse impacts** to utilities, threatened and endangered species, and cultural resources; **minor adverse** impacts to transportation, vegetation, wildlife, and floodplains; and **minor beneficial** impacts to socioeconomics. Further, implementation of the operation portion of the Proposed Action would result in **negligible adverse** impacts to vegetation, wildlife, threatened and endangered species, and floodplains. **Minor adverse** impacts to transportation and utilities and **minor beneficial** impacts to socioeconomics are expected as a result of the operation of the Proposed Action. Mitigation is proposed for the Proposed Action to compensate for the **minor** impacts to wetlands.

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List of Abbreviations and Acronyms

APE	Archaeological Area of Potential Effects
BO	Biological Opinion
CANA	Canaveral National Seashore
CCSFS	Cape Canaveral Space Force Station
CCS	Cape Canaveral Spaceport
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cm	centimeter
CRAS	Cultural Resource Assessment Survey
EA	Environmental Assessment
ERP	Environmental Resource Permit
FAA	Federal Aviation Administration
FDEP	Florida Department of Environmental Protection
FLUCFCS	Florida Land Use, Cover and Forms Classification System
FPL	Florida Power & Light
ft ²	square feet
GIS	geographic information system
ha	hectare(s)
IRL	Indian River Lagoon
KSC	Kennedy Space Center
kV	kilovolt(s)
LC	Launch Complex
LEED	Leadership in Energy and Environmental Design
LiDAR	Light Detection and Ranging
LPZ	low-probability zone
m	meter(s)
m ²	square meter(s)
MINWR	Merritt Island National Wildlife Refuge
MPZ	moderate-probability zone

List of Abbreviations and Acronyms

NASA	National Aeronautics and Space Administration
NAVD 88	North American Vertical Datum of 1988
NEPA	National Environmental Policy Act
NID	NASA Interim Directive
NPDES	National Pollutant Discharge Elimination System
NPR	NASA Procedural Requirements
NPS	National Park Service
OLS	orbital launch system
REC	Record of Environmental Consideration
SCW	Space Commerce Way
SJRWMD	St. Johns River Water Management District
SLSL	Space Life Sciences Laboratory
SMS	stormwater management system(s)
SR	State Road
U.S.	United States
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USFWS	U.S. Fish and Wildlife Service
VAB	Vehicle Assembly Building
VC	Visitor Complex
WWTP	wastewater treatment plant
ZAP	Zone of Archaeological Potential

EXECUTIVE SUMMARY

This Environmental Assessment (EA) has been prepared in compliance with the National Environmental Policy Act (NEPA) of 1969, as amended (42 U.S. Code [U.S.C.] Sections 4321–4370) and according to the *Procedures of Implementation of NEPA for the National Aeronautics and Space Administration (NASA)* (Title 14, Code of Federal Regulations [CFR], Part 1216 Subparts 1216.1 and 1216.3), the Council on Environmental Quality (CEQ) NEPA implementing regulations (40 CFR Parts 1500–1508), and Federal Aviation Administration Order 1050.1F, *Environmental Impacts: Policies and Procedures*.

This EA addresses the Proposed Action, which is also the Preferred Alternative, and the No Action Alternative. The Proposed Action is for NASA to execute a real property agreement with Space Florida for Exploration Park North which would allow construction of an Astronaut Training Facility, and to determine the extent of impacts on the environment at the Kennedy Space Center (KSC). The Proposed Action consists of the proposed construction and operation of an Astronaut Training Facility at Exploration Park North. The facility would include astronaut training facilities and various support facilities for future commercial astronauts and other aerospace customers. The No Action alternative would involve not constructing the training facility.

The Proposed Action will require permits from the St. Johns River Water Management District (SJRWMD) and the Florida Department of Environmental Protection (FDEP).

This document describes those portions of the KSC environment that relate to each of the proposed alternatives. Resources evaluated in this document include transportation, utilities, air quality, land use, biological resources including habitat and non-listed wildlife species, threatened and endangered wildlife species, cultural resources, geology and soils, noise, surface water quality, groundwater quality, and socioeconomics.

Impacts resulting from implementing the Proposed Action and No Action Alternative were identified then classified into one of the following pre-determined categories: **None, Negligible, or Minor**. The results of the assessment of environmental issues from constructing the Proposed Action indicate overall **minor adverse impacts** would occur on transportation due to the increased traffic during construction, on vegetation habitat and wildlife due to the habitat impacts proposed, and on floodplains due to site development fill requirements. A wetland mitigation plan to offset primary and secondary wetland impacts as a result of the construction of the Proposed Action would be prepared and implemented in accordance with state and federal agency regulations. **Negligible adverse impacts** would occur to utilities, threatened and endangered wildlife, and cultural resources as a result of construction of the Proposed Action. Construction of the Proposed Action would result in **Minor beneficial impacts** on socioeconomics.

Based on current information available, **negligible adverse impacts** would occur to threatened and endangered species, cultural resources, and floodplains as a result of the operation of the Proposed Action. **Minor adverse impacts** would occur to transportation, utilities and **minor**

Executive Summary

beneficial impacts to socioeconomics as a result of the operation of the Proposed Action. No monitoring strategies are provided or recommended for these resource areas.

Cumulative Impacts analysis indicates that **no significant cumulative impacts** would occur to transportation, utilities, vegetation, wildlife, threatened and endangered species, cultural resources, and floodplains from implementation of the Proposed Action.

Impacts from the No Action Alternative are expected to have **no** impacts on the various resource categories. **Minor adverse** impacts to socioeconomics are expected if the No Action Alternative were selected. Table 3-1 of this document summarizes the results of the analyses, to include the impacts on each environmental issue for each proposed action.

The No-Action alternative and Proposed Action are not expected to produce any consequences related to Environmental Justice, since all activities are located away from population centers. The Proposed Action is not expected to affect the surrounding communities any differently than the current programs at KSC.

Space Florida expects to begin project construction in 2022, and the Astronaut Training Facility would be operational in 2023.

1.0 PURPOSE OF AND NEED FOR THE PROPOSED ACTION

1.1 Introduction

This Environmental Assessment (EA) evaluates the environmental effects of the proposed construction and operation of an Astronaut Training Facility at a site referred to as Exploration Park North, which is just north of Exploration Park Phase I. The facility would include astronaut training facilities, astronaut accommodations, support facilities, parking, and stormwater management ponds. Space Florida expects to begin project construction in 2021, and the Astronaut Training Facility would be fully operational in 2022.

Space Florida has prepared this EA in accordance with the National Environmental Policy Act (NEPA) (42 U.S. Code [U.S.C.] Sections 4321–4370), as implemented by the Council on Environmental Quality (CEQ) Regulations (40 Code of Federal Regulations [CFR] Parts 1500–1508), and National Aeronautics and Space Administration (NASA) procedural requirements for implementing NEPA (NASA Procedural Requirements [NPR] 8580.1). NASA is the lead agency in the preparation of this EA and has participated in the document development to ensure the document meets their agency requirements.

1.2 Background

Space Florida was created pursuant to Chapter 331, Part II, Florida Statutes, as an independent special district and subdivision of the State of Florida. The purpose of Space Florida is to foster the growth and development of a sustainable and world-leading aerospace industry in Florida. Space Florida leverages Florida’s highly skilled workforce and existing infrastructure to attract and expand the next generation of space industry businesses.

Exploration Park is leased for 60 years by Space Florida from NASA. Space Florida and NASA jointly developed plans and a lease for Exploration Park Phase I with State-funded construction of horizontal infrastructure. In accordance with the 2017 Cape Canaveral Spaceport Master Plan, planned expansion of Exploration Park would create an opportunity for the first inter-connected commerce and mission zone for multiple users, provide an opportunity to further enhance the workplace environment with community support functions, and promote the Cape Canaveral Spaceport (CCS) as a unified multi-sector spaceport (Space Florida, 2017). The CCS, in which Space Florida has an operational spaceport authority role, is the premiere transportation hub for global commercial space commerce. Space Florida oversees management and operation of key elements of Florida’s existing space transportation capability.

1.3 Location

Exploration Park Phase I is a 60-acre (24-hectare [ha]) property just outside the secured perimeter of Kennedy Space Center (KSC) (Figures 1-1 and 1-2; NASA, 2020a). The Proposed Action (Exploration Park North) is an approximately 66-acre (27-ha) site immediately north of Exploration Park Phase I. From the north and south, Interstate (I)-95 provides highway access to Exploration Park via State Road (SR) 405 and SR 528. Multi-lane arterial highways, including

Chapter 1 Purpose of and Need for the Proposed Action

SR 50 and SR 528, provide access to Exploration Park from the west. An EA for Exploration Park Phase I was completed in 2008 (NASA, 2008).

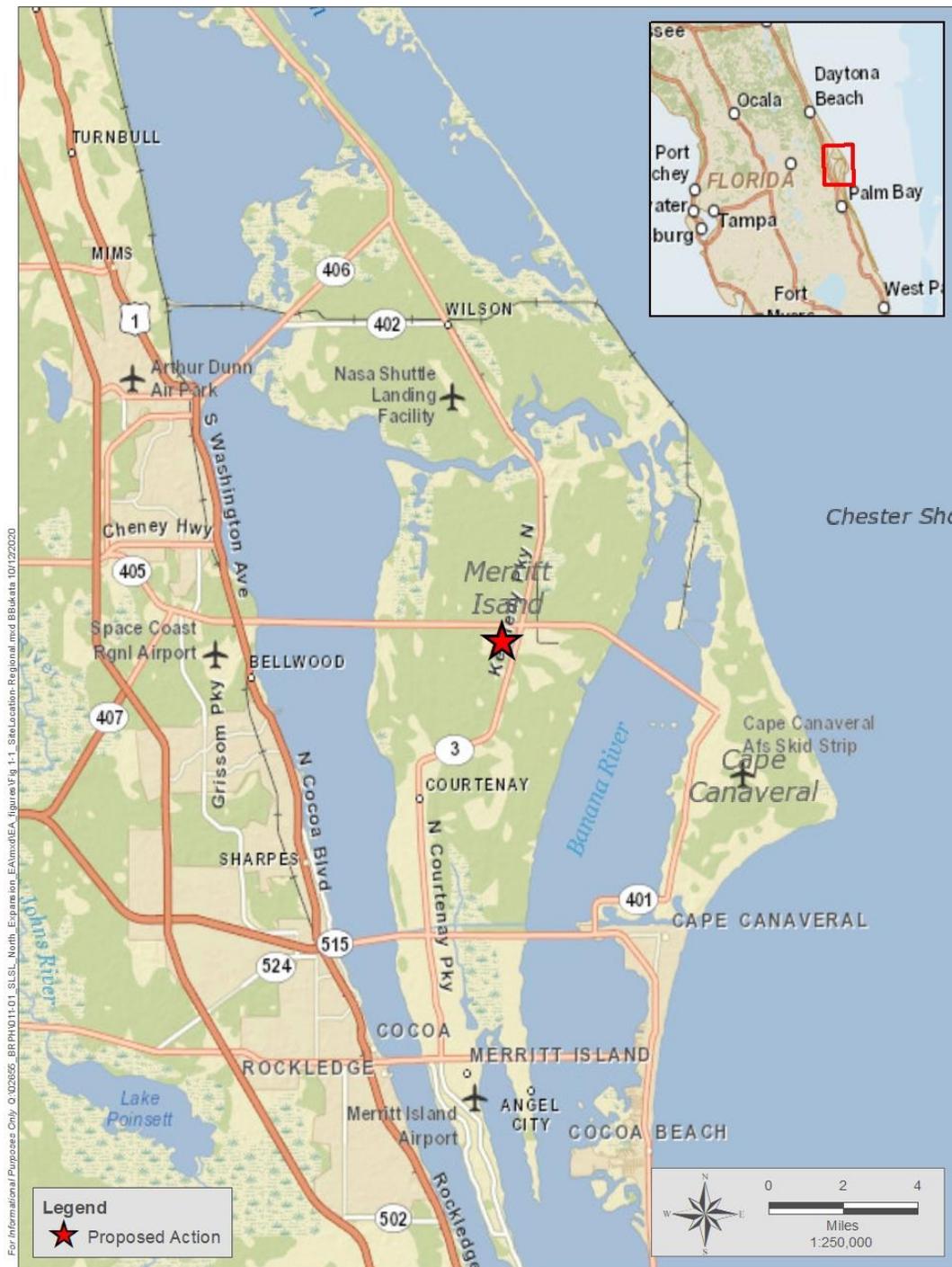


Figure 1-1 Regional Location Map

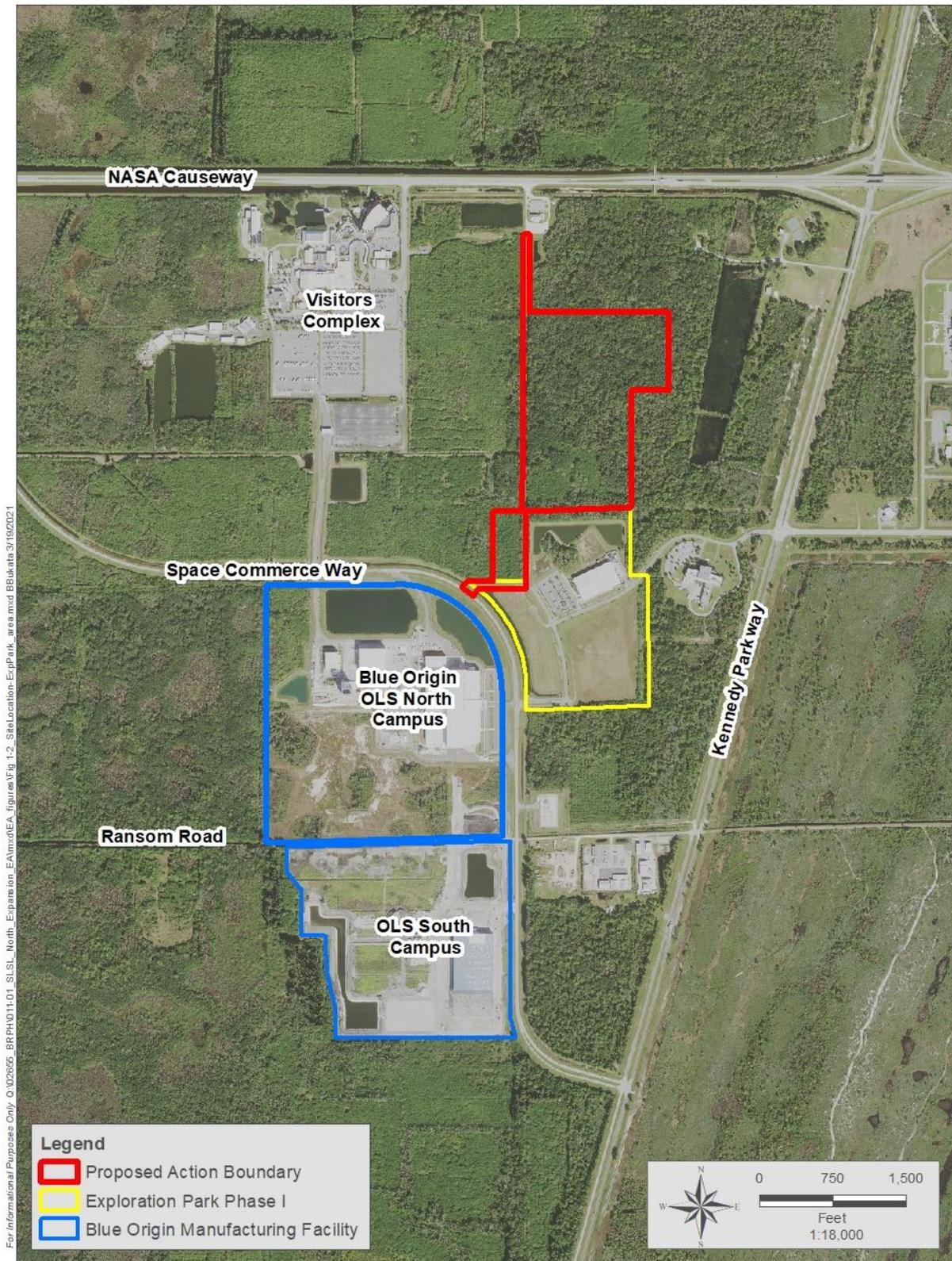


Figure 1-2 Aerial Location Map

1.4 Purpose of and Need for the Proposed Action

The purpose of the Proposed Action is in support of Space Florida to execute a real property agreement with NASA for Exploration Park North to allow for the construction of an on-site multi-purpose facility and various support facilities required to support commercial human spaceflight (astronaut) training and space tourism. The Proposed Action is consistent with NASA Interim Directive (NID) 8600.121, KSC's 2020 Vision Plan, and Section 6.3.1 of Space Florida's 2017 Master Plan as it is a related commercial space facility.

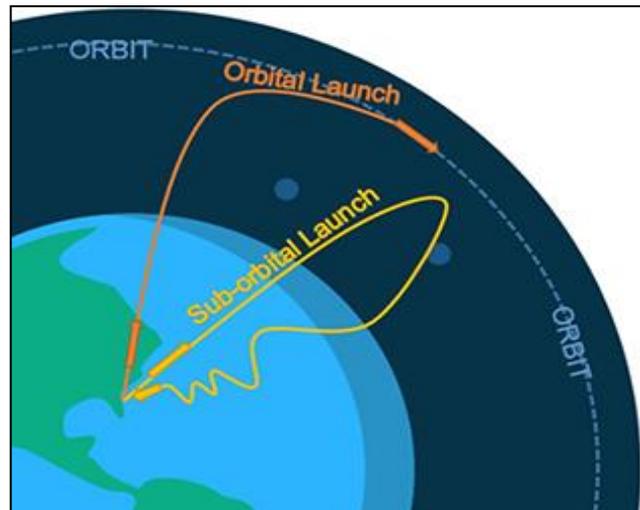


Figure 1-3 Human Space Flight
(FAA, 2020b)

As stated in NID 8600.121, “NASA Strategic Objective 2.1 directs the Agency to lay the foundation for America to maintain a constant human presence in low-Earth orbit to be enabled by a commercial market” (NASA, 2019a). This directive will enable private astronaut missions of up to 30 days on the International Space Station to perform duties that fall into the approved commercial and marketing mission outlined in NID 8600.121 (NASA, 2019b). The President’s National Space Policy, issued in December 2020, outlines America’s principles and goals regarding our national interests and activities in space. The policy reaffirms America’s leadership in outer space, emphasizes the importance of the commercial space sector to economic growth, and reaffirms the importance of all nations acting responsibly for the safety, stability, security, and long-term sustainability of space activities. While the United States would prefer that the space domain remain free of conflict, we will be prepared to meet and overcome any challenges that arise, while promoting burden sharing and marshaling cooperative responses to threats. In collaboration with other U.S. government agencies and private sector partners, the Department of State will:

- Demonstrate U.S. leadership in international fora to strengthen deterrence and contribute to international security and stability.
- Encourage and uphold the right of nations to responsibly and peacefully use space, while identifying and resolving behaviors that threaten that right.
- Encourage other nations to adopt regulations and practices for the commercial space sector which encourage transparent, private sector opportunities and reduce costs associated with unnecessary regulatory differences.
- Facilitate new commercial market opportunities for U.S. space capabilities and services.

Chapter 1 Purpose of and Need for the Proposed Action

- Expand a U.S.-led coalition of space exploration partners to return humans to the Moon for long-term exploration and utilization, followed by human missions to Mars and other destinations.
- Encourage international support for the responsible recovery and use of outer space resources.

In addition to NASA’s directive, KSC’s 2020 Vision Plan describes creating space tourist support infrastructure as a future project consistent with future space demands (NASA, 2020b). The historic success of the May 30, 2020 launch by SpaceX, which sent the first two commercially flown NASA astronauts to the International Space Station, was a milestone for the commercial space industry. This launch proved the commercial space sector has the capability and wherewithal to meet the stringent requirements set forth by NASA, making human spaceflight commercially viable in the 21st Century. Although the individual cost to travel to the International Space Station, or to the Moon in the future, may be limited to individuals of high net-worth at this time, this success provides opportunities for other entrepreneurial-minded commercial space entities to identify more affordable space experiences to the outer edge of Earth’s atmosphere for short-duration flights in the foreseeable future. Figure 1-3 depicts the human spaceflight vision. One market forecaster predicts commercialized space travel is likely to become a significant part of the \$1.5 trillion global tourism industry within the current decade (Masters, 2020). With the expansion of available competitors within the commercial launch vehicle market, a concurrent demand for privatized training for this sector of commercial astronauts is also growing for them to safely and effectively experience the edge of space and beyond.

Space Florida’s 2017 Master Plan describes the expansion of Exploration Park for commercial and industrial uses supporting CCS. This Master Plan envisions a time on or before 2025 where CCS “will be home to a fleet of many types of space-faring vehicles, with all combinations of vertical and horizontal modes of launch and landing. It will host multiple space carriers serving multiple markets with demand for services to suborbital space and high-value Earth orbits. Launch frequency will increase from the present tempo of one or more per month, to one or more per week, and then to one or more per day” (Space Florida, 2017).

According to NASA (2019c), up to two short-duration private astronaut missions would be enabled per year to the International Space Station in the near term. The missions would use U.S. transportation vehicles certified by NASA in accordance with NASA’s Commercial Crew Program. Per NASA (2015), anyone traveling to the International Space Station would have to train with NASA, and orbital missions would require training that meets Federal Aviation Administration (FAA) requirements. Up to 3 months of training is expected to be required before the space flight (Harwood, 2020; Quine, 2020).

- Flight Crew – crew on board a vehicle during launch and/or reentry.
 - Human Spaceflight Participant – someone engaged in spaceflight as a paying passenger and is not a member of the crew or launch provider.
 - Orbital Flight – occurs when a spacecraft is placed on a trajectory with sufficient velocity to place it into orbit around the Earth.
 - Suborbital Flight – occurs when a spacecraft reaches space, but its velocity is such that it cannot achieve orbit.
- Source: FAA, 2020b.

Chapter 1 Purpose of and Need for the Proposed Action

However, private spaceflight astronauts could be trained at commercial space campuses that would involve short- to longer-duration training in the form of classes lasting days to weeks to meet the needs of a growing market for space tourism. Within this context, “space tourism” is defined as space travel for recreational, leisure, or business purposes. The suborbital space tourism could come from a number of space vehicle methods such as horizontal lift and landing commercial space providers, as well as vertical lift and landing vehicles and even balloon-based commercial space operations that could be served by the CCS.

NASA established a Suborbital Crew Office within NASA’s Commercial Crew Program, which is overseeing development of new orbital-class space capsules (Clark, 2020). These suborbital flights are expected to be more accessible, affordable, and available than missions to the International Space Station (NASA, 2020c). NASA released a Request for Information on June 23, 2020, from potential sources for suborbital crew space transportation services. The FAA codified training requirements for crew, operators, and space flight participants in 14 CFR Part 460, Human Space Flight Requirements. These requirements pertain to all applicants seeking a license or permit for suborbital or orbital spaceflight for the purposes of putting flight crew and/or spaceflight participants into space (FAA, 2020a).

As part of the Proposed Action, the training capabilities of this new commercial astronaut training campus are expected to include orbital and suborbital training facilities in support of prospective commercial space trainees.



<https://www.nasa.gov/multimedia/imagegallery/index.html>

2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.1 Proposed Action

A critical action to complete for any proposed new site development at KSC is for the project proponent to submit a KSC Environmental Checklist (KSC Form 21-608v2). This form is reviewed by KSC Environmental Management Branch (SI-E3) staff who then generate a Record of Environmental Consideration (REC) in response to the Checklist, which is provided to the project proponent. Refer to Appendix 1 for a copy of this REC form.

The Proposed Action is to construct and operate an Astronaut Training Facility at Exploration Park North. Figure 2-1 shows the relationship of the Proposed Action project limits and the boundaries of Exploration Park Phase I. The facility would include astronaut training facilities, astronaut accommodations, and auxiliary support facilities for future commercial astronauts and other customers. Figure 2-2 shows the approximately 66-acre (27-ha) development area, outlined in green, would include a master stormwater management system. The new development would be accessed via a road connected to New Space Drive. A secondary access road would be constructed at the northwest corner of the campus connecting to Range Road. Minor road improvements including paving and drainage would be required. This secondary road would provide redundant access to the campus for emergency and security vehicles only. A security gate would be constructed at this northwest, secondary access point to the campus.



<https://www.nasa.gov/multimedia/imagegallery/index.html>

In addition to the proposed development area as shown in Figure 2-2, are various support facilities and covered parking equipped with a solar panel array south and contiguous to the Proposed Action area in a portion of Exploration Park Phase I. The parking area will initially be within the Proposed Action boundary and if overflow parking is necessary at a future date it would occur in portions of Exploration Park I. The potential environmental impacts from support facilities outside the Proposed Action boundary were addressed in the Exploration Park Phase I EA and are not analyzed in this EA (NASA, 2008). The Exploration Park Phase 1 EA analyzed the development and operation of a 66-acre (27-ha) parcel of land to be used as a mixed use technology and commerce park. Specific to roads, the Exploration Park Phase 1 EA analyzed impacts from a connector road that would be constructed at the intersection of SCW and Ransom Road which would be followed by a road connecting Exploration Park to the Space Life Science Lab (i.e., Odyssey Way). Impacts to air quality, climate, biological resources, threatened and endangered species, cultural resources, geology and soils, noise, surface water quality, groundwater quality, socioeconomics and land use were analyzed. No significant impacts were expected (NASA, 2008).

A security gate would separate the publicly accessible dining facility from the training campus and astronaut accommodations facilities. In addition to the access route from New Space Drive

in Exploration Park Phase I to the main entrance of the publicly accessible Astronaut Training Visitor Complex and dining facilities, a second access to Space Commerce Way (SCW) will also be constructed. As noted above, the proposed development of this area was included in the Exploration Park Phase I EA and will not be analyzed in detail in this EA. This proposed access road will be addressed in the cumulative analysis portion of this EA to confirm that the environmental conditions and potential environmental impacts of this area remain the same as those assessed under the previous NEPA coverage.

2.2 Screening Factors

The location and views from the site are critical to Space Florida's customers' envisioned program. The Proposed Action objective is to create a training experience for commercial space astronaut trainees, their guests, and visitors in an area benefiting from NASA's natural areas that provides a buffer and seclusion from nearby developed areas, including natural or manmade water features, and offers rooftop views of launches from NASA and Cape Canaveral Space Force Station (CCSFS) from the centralized complex (expected to be approximately 100 feet [30.5 m]). While achieving the program and vision of the client, NASA safety and security requirements must be considered, and as such, the secured entrance gates must not be visible from the proposed buildings.

NEPA's implementing regulations provide guidance on the consideration of alternatives to a Proposed Action and require rigorous exploration and objective evaluation of reasonable alternatives. Only those alternatives determined to be reasonable and meet the purpose and need require detailed analysis. Potential alternatives that meet the purpose and need were evaluated against the following screening factors:

- Consistent with 2014 Master Plan long-term planning initiatives and within 2020 Vision Plan Spaceport Growth Boundary and provide for future phased development.
- Near launch and landing sites at KSC and CCSFS, and on lands leased from Space Florida in support of commercial aerospace.
- Close to the KSC security gate to limit the distance a quarantined commercial space astronaut would have to travel to access a commercial space launch vehicle for health and safety reasons.
- A location that can provide a private and secluded setting surrounded by natural areas.
- In an area with existing utility and transportation infrastructure.
- Close to the KSC operational areas but outside of the NASA KSC security boundary for KSC security reasons.
- Minimize or avoid unnecessary adverse environmental and/or cultural impacts.



Figure 2-1 Aerial Map



Figure 2-2 Conceptual Plan View Map of Proposed Action

- Minimize or avoid development in floodplain.
- Minimize overall development costs (i.e., wetland mitigation, fill, and utilities).

Various alternatives were evaluated against the screening factors and only one reasonable action alternative was determined. Therefore, the Proposed Action is also the Preferred Alternative.

2.3 Alternatives Carried Forward for Analysis

Using the screening factors listed in Section 2.2, reasonable alternatives were considered that met the purpose and need for the Proposed Action. As a result of that effort, the Preferred Alternative and No Action Alternative were carried forward for analysis.

2.3.1 No Action Alternative

Under the No Action Alternative, an Astronaut Training Facility would not be constructed, and Space Florida would be unable to support NID 8600.121, KSC's 2020 Vision Plan, and Section 6.3.1 of Space Florida's 2017 Master Plan. The No Action Alternative would not meet the purpose and need for the Proposed Action; however, as required by NEPA, the No Action Alternative is carried forward for analysis and will be used to analyze the consequences of not undertaking the Proposed Action. The No Action Alternative serves to establish a comparative baseline for analysis.

2.3.2 Proposed Action (Preferred Alternative) – Construct Astronaut Training Facility

After applying the screening factors, only one reasonable alternative existed; therefore, the Preferred Alternative will also be known as the Proposed Action hereafter and is depicted on Figure 2-1.

Figure 2-2 shows the Proposed Action comprises approximately 60 acres (24 ha) north of Exploration Park Phase I. The Proposed Action parcel and development footprint provides adequate natural buffers that would remain undeveloped, allows for future expansion, reduces environmental impacts and development costs, and meets the program requirements and objectives.

The Proposed Action would require the following permits:

- An Environmental Resource Permit (ERP) through St. Johns River Water Management District (SJRWMD) to construct a new stormwater management system and to authorize wetland impacts and the proposed wetland mitigation plan.
- A Section 404 Dredge and Fill Permit issued by the FDEP to authorize wetland impacts and the proposed wetland mitigation plan if the wetlands are considered jurisdictional.

- A National Pollutant Discharge Elimination System (NPDES) Permit through the Florida Department of Environmental Protection (FDEP) for stormwater discharges associated with construction activities greater than 5 acres (2 ha).
- FDEP water and wastewater permits.

Project construction is proposed to begin in 2021, and the Astronaut Training Facility would be fully operational in 2022.

2.4 Alternatives Considered But Not Carried Forward to Detailed Analysis

CEQ Regulations (40 CFR 1502.14) require a reasonable range of alternatives be analyzed to include the No Action Alternative. Reasonable alternatives include those alternatives that meet the purpose and need of the Proposed Action.

In addition to the Preferred Alternative location, three approximately 40-acre (16-ha) parcels were evaluated (Figure 2-3). When assessed against the nine screening factors listed in Section 2.2, the following conclusions were determined for Parcels A, B, and C:

- Parcel A is a former citrus grove now dominated by a monoculture of Brazilian pepper (*Schinus terebinfolius*) and thus would not provide the desired aesthetics of siting the accommodations nestled within a natural forest or other natural habitat.
- All three parcels possess poor quality land cover and would not provide the desired aesthetics of siting the accommodations nestled within a natural forest or other natural habitat.
- Parcel B is comprised primarily of high-quality wetlands and floodplains and thus would result in unnecessary adverse impacts.
- Minimizing or avoiding unnecessary adverse environmental (including wetlands and floodplains) and/or cultural impacts at Parcels A, B, and C would result in an overall smaller contiguous developable area, affecting the ability to support future expansion.
- Development on any one of the three parcels would result in excessive development costs (i.e., wetland mitigation, fill, and utilities), resulting in the effort to identify additional alternative sites. (See Appendix 2, Exploration Park North: Preliminary Site Evaluation [BRPH, 2020].)

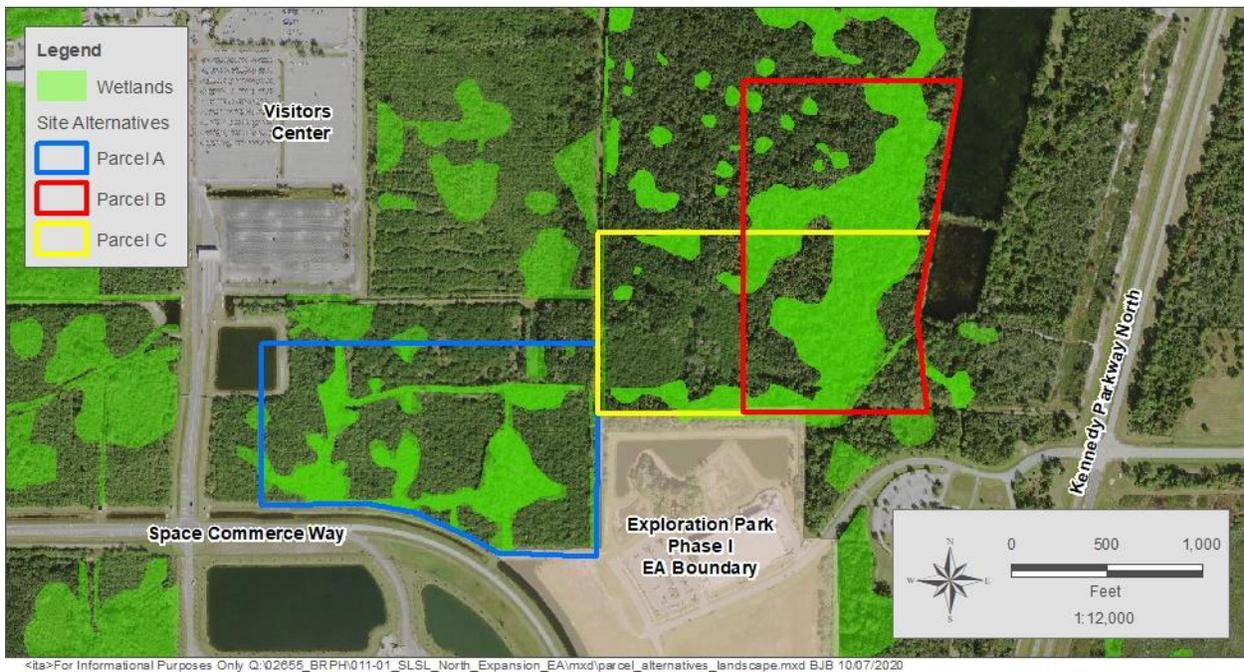


Figure 2-3 Parcel Alternatives Aerial and Wetland Map

Specific to wetlands, a Light Detection and Ranging (LiDAR)-derived digital elevation model and ground truthing determined large amounts of wetlands were scattered throughout Parcels A, B, and C. Table 2-1 summarizes these parcels’ acreage. As a result, Parcels A, B, and C as standalone individual parcels did not meet all of the nine screening factors (Section 2.2). Using conceptual design footprints, Space Florida created hybrid layouts using portions of each of the three previously identified Parcels (Figure 2-3). These hybrid parcels were then assessed against the nine screening factors, and ultimately one area was identified as meeting all screening factors and subsequently became the Preferred Alternative as described in Section 2.3.2.

Table 2-1 Upland and Wetland Acreage Summary for Parcel Alternatives

Parcel	Parcel Acreage	Wetland Acreage and Surface Water Acreage	Upland Acreage
A	38	11	27
B	40	20	20
C	37	14	23

2.4.1 Alternatives 1 through 4

Based on results of the alternatives analysis for the three initial parcels, none of the three fully met the Proposed Action objectives and development was not feasible due to expected development costs. Additional sites were then identified However, Figure 2-4 shows that within the vicinity of the three parcel alternatives, four viable site-development alternatives were

Chapter 2 Description of Proposed Action and Alternatives

identified. These alternatives were selected to further reduce environmental impacts and optimize development while accommodating the proposed facilities and stormwater management system. Parcel B itself was not directly included in the evaluation since it is comprised primarily of high-quality wetlands and floodplains, leaving little to no contiguous area available for development.

Alternatives 1 through 4 were evaluated for the following nine criteria:

1. Land cover.
2. Wetlands.
3. Floodplains.
4. Listed Wildlife Species.
5. Topography (Fill Cost).
6. Soils.
7. Security.
8. Utilities and access.
9. Developable area.



Figure 2-4 Alternatives 1 Through 4 Aerial Map

Chapter 2 Description of Proposed Action and Alternatives

Although the initial three parcels (A through C) may have scattered portions of areas that are viable for development, the area to the north presents greater development potential and fewer environmental impacts. Table 2-2 provides a weighted ranking comparison of each alternative in relation to the nine criteria. Based on site constraints and the desired facility program, Alternative 2 was determined to be the optimal site to focus the proposed development, with auxiliary and future support areas within the Alternative 3 and 4 areas. The hybridized developable area identified contiguous portions within Alternatives 1 through 4 that could be developed resulting in the least environmental impacts. The Proposed Action, identified as the Preferred Action, is an approximately 66.4-acre (26.9-ha) parcel (Figure 2-1).

Table 2-2 Alternatives 1 through 4 Analysis Summary Table

Category Weight	Land Cover		Wetlands		Floodplains		Listed Species		Topography (Fill Cost)		Soils		Security		Utilities & Access		Developable Area		Weighted Avg
	1	3	2	5	2	2	1	3	2	2	3	2	3						
North Area Alternative 2	4	Most Desirable	4	2.5 ac	5	Least impact	5	N/A	4	\$1.8 M	3	C/D	3	Least Desirable	2		5	16.5 ac	3.9
PARCEL C (Alternative 3)	2		5	0.3 ac	1	Most impact	5	N/A	3	\$2.0 M	3	C/D	5		4		2	13 ac	3.5
PARCEL A (Alternative 4)	3		2	1.3 ac	3		5	N/A	2	\$2.1 M	4	B/D	5	Most Desirable	5	Most Accessible	3	15.4 ac	3.5
North Area Alternative 1	3		2	2.6 ac	4		5	N/A	3	\$2.0 M	3	C/D	4		1	Least Accessible	5	16.6 ac	3.4
PARCEL B	1	Least Desirable	1	6.3 ac	2		5	N/A	1	\$2.3 M	3	C/D	4		3		1	7.5 ac	2.3

3.0 Affected Environment and Environmental Consequences

This chapter presents a description of the environmental resources and baseline conditions that could be affected from implementing the Proposed Action and an analysis of the potential direct and indirect effects.

Changes to the natural and human environment that could result from the Proposed Action are evaluated relative to the existing environmental conditions. Four levels of impact may be identified:

- Negligible – The impact is barely perceptible or measurable, remains confined to a single location, and would not result in a sustained recovery time for the resource impacted.
- Minor – The impact is readily perceptible and measurable; however, the impact would be temporary and the resource should recover in a relatively short period.
- Moderate – The impact is perceptible and measurable, and may not remain localized, impacting areas adjacent to the Proposed Action area; adverse impacts to a resource may require several years to recover.
- Major – An impact is predicted that meets the intensity/context significance criteria for the specified resource.

All potentially relevant environmental resource categories were initially considered for analysis in this EA. Discussion and analysis of the affected environment (i.e., existing conditions) focuses only on those resource areas potentially subject to impacts. In addition, the level of detail describing each resource below is commensurate with the expected level of potential environmental impact. Section 3.1 presents, describes, and justifies resource categories that were assessed but not carried forward for detailed analysis due to negligible or non-existing adverse impacts expected as a result of the Proposed Action.

3.1 Resource Categories Not Carried Forward for Detailed Analysis

The potential impacts to the following resource areas are considered to be negligible or non-existent and were eliminated from detailed analysis in this EA – air quality, geology and soils, noise, water resources, environmental justice (Table 3-1). The following presents, describes, and justifies this determination for these resource categories.

Table 3-1 Summary of Potential Environmental Impacts

Issues		Proposed Action	No Action
Transportation	C	Minor Adverse	None
	O	Minor Adverse	None
Utilities	C	Negligible	None
	O	Minor Adverse	None
Habitats and Vegetation	C	Minor Adverse	None
	O	Negligible	None

Chapter 3 Affected Environment and Environmental Consequences

Issues		Proposed Action	No Action
Wildlife	C	Minor Adverse	None
	O	Negligible	None
Threatened & Endangered Species	C	Negligible	None
	O	Negligible	None
Cultural Resources	C	Negligible	None
	O	Negligible	None
Floodplains	C	Minor Adverse	None
	O	Negligible	None
Socioeconomic	C	Minor Beneficial	Minor Negative
	O	Minor Beneficial	Minor Negative

Note: The “C” and “O” in the second column refer to “Construction” and “Operation”, respectively.

Air Quality: Site preparation and construction of the Proposed Action would produce **negligible adverse** impacts on the surrounding air quality. Land clearing and other construction activities would generate airborne particulates from earth moving and vegetation burning as well as hydrocarbon exhaust from heavy equipment, but such activities are expected to be small in scope and of very short (weeks to months) duration. Best management practices (BMPs) would be employed to minimize emissions from earth movement and burning. These BMPs include water spraying, placement of hay bales, and other forms of dust control. Once the contractor obtains a burn permit from KSC, burning (vegetation debris) would likely be conducted using a high-efficiency burn pit with forced-air injection, which allows for a high-temperature burn with little smoke and particulates. Operation of the Proposed Action is expected to have **negligible adverse impact** on surrounding air quality since the site will generate minimal emissions compared to manufacturing or launch facilities.

Geology and Soils: Land clearing and excavation for facility foundations and stormwater management system would require the upper soil strata layers be removed. This may affect shallow subsurface flows of water from rainfall events. However, this would be minimized with site grading and construction of the State-required stormwater management systems (SMSs). As a result, construction of the Proposed Action would result in **negligible adverse impacts** to this resource category. No operational activities would require disturbing soils or geology of the Proposed Action site. As a result, operation of the Proposed Action would be expected to produce **negligible adverse impacts** on the geologic strata or soils of the local area or region.

Noise: 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 would occur for a brief period. Noise levels would increase marginally in the vicinity of SCW temporarily due to increased construction traffic. However, this construction-related noise increase would be negligible compared to roadway and regional noise levels. Operation of the Proposed Action is expected to have **negligible adverse impact** on noise levels locally along SCW and adjacent to the roadway and **negligible adverse impact** on the noise levels regionally.

Water Resources: Construction of the Proposed Action would require the constructing dry-retention and wet-detention SMSs to treat runoff from all new impervious surfaces in accordance

with Florida water quality and quantity treatment regulations. These SMSs ensure that the new facilities have **negligible adverse impacts** on downstream surface and groundwater quality. During actual construction activities, impacts on surface waters would be minimized by ensuring that BMPs are initiated and maintained to control erosion and sedimentation. Operation of the Proposed Action is expected to have **negligible adverse impacts** on surface and groundwater resources since the SMS would offer high pollutant-removal efficiency and have no impact on the before and after surface water stages pursuant to state regulations.

Environmental Justice: The Proposed Action is not occurring near minority and/or low-income populations. Additionally, the KSC Child Development Facility is within the KSC secured area east of Kennedy Parkway and approximately 0.4 miles from the Proposed Action. As a result, the Proposed Action would not result in disproportionate impacts to minority and low-income populations and would not result in environmental health or safety risks to children.

3.2 Resource Categories Carried Forward for Detailed Analysis

Resource categories for which the Proposed Action is expected to cause potential impacts are transportation, utilities, biological resources, threatened and endangered species, cultural resources, floodplains, and socioeconomics. The following sections present the analyses of these resource categories.

3.2.1 Transportation

KSC is served by over 211 miles (340 km) of roadways with over 163 miles (263 km) of paved roads and 48 miles (77 km) of unpaved roads. KSC also has approximately 40 miles (64 km) 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 SR 405 and crosses the Indian River Lagoon (IRL) onto KSC. After passing through the KSC Industrial Area, the road reduces to two lanes, crosses over the Banana River, and enters CCSFS. The second point of entry onto KSC is from the south via Kennedy Parkway South which originates on north Merritt Island as SR 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 south of Oak Hill at the intersection of U.S. Highway 1 and Kennedy Parkway North in Volusia County (Figure 1-1).

3.2.1.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and no change to traffic patterns or additional trips would occur. Therefore, no adverse impacts to Transportation would occur with implementation of the No Action Alternative.

3.2.1.2 Proposed Action

Construction: The Proposed Action will be served via Exploration Parkway off of SCW at Exploration Park Phase I and via a right turn in and right turn out only secondary access road at the southwest corner of the facility. These two access roads will serve as the only access for staff

Chapter 3 Affected Environment and Environmental Consequences

and clientele. A third access road will be off of NASA Causeway at the badging station and will utilize Range Road. This access road will be used solely as a secondary access for emergency services.

SCW was designed and permitted as a four-lane highway, but only two lanes were constructed (Figure 1-2). However, SCW is currently being planned for expansion to four lanes within the next several years as part of a separate planning project. A design firm was selected by Space Florida in October 2020 and has begun roadway design. This will provide significant additional roadway capacity.

Construction of the Proposed Action is expected to have only **minor adverse impacts** on transportation within KSC due to the temporary construction workforce required to build the facilities. Increased construction traffic would occur during normal working hours and may cause temporary increased traffic delays.

Operation: The Proposed Action is expected to employ 20 to 50 permanent staff and will host approximately 30 astronaut trainees at any one time. A majority of these trainees will likely be escorted to and from the Orlando International Airport or a nearby regional airport to the Proposed Action facilities. In addition, the Proposed Action will house a café that can accommodate 70 people and a restaurant for up to 110 people, which will be open to the public. As a result, these facilities will likely attract KSC visitors as well as employees at nearby commercial aerospace facilities such as Blue Origin, OneWeb, and SpaceX. Although these facilities will attract individuals and thus increase traffic trips, many of these visitors and employees would be driving on SCW regardless of their final destination. Therefore, the main increase in traffic counts as a result of the Proposed Action will predominantly be a result of facility staff and, minimally, astronaut trainees. The proposed Range Road access will be for emergency services and operations only and would be gated.

Operation of the Proposed Action may increase traffic slightly on SCW and NASA Parkway West due to daily staff and astronaut trainee trips; however, with the four-lanes of SCW, this impact will have a **minor adverse impact** on SCW and the primary feeder roads NASA Parkway West and SR 3 (Kennedy Parkway)(Table 3-1).

3.2.2 Utilities

3.2.2.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and no increase in utility demand would occur. Therefore, no adverse impacts to Utilities would occur with implementation of the No Action Alternative.

3.2.2.2 Proposed Action

Wastewater Disposal

Sanitary sewer service at KSC is provided by a wastewater collection and transmission system that is separated into two primary areas – one in the Industrial Area and one in the Vehicle Environmental Assessment for Exploration Park North

Assembly Building (VAB) Area. The combined flows are pumped through a force main across the Banana River to a regional wastewater treatment plant (WWTP) at CCSFS. The Proposed Action is close to KSC's wastewater collection system infrastructure that is part of the greater Industrial Area system.

For the Proposed Action, on-site wastewater collection and transmission to KSC's system will be required. Given topography and existing system elevations, on-site lift station(s) with force (pressure) main will likely be required to achieve connection to the KSC system. Two likely options for tying the new development to the KSC system exist. One option is to construct the new force main and connect to the existing lift station along Odyssey Way southeast of the OneWeb facility. The second option is to extend the force main to an existing force main that runs along SR-3.

The wastewater flows expected to be produced by this facility will be relatively low given the proposed occupancy and because this is a proposed Leadership in Energy and Environmental Design (LEED)-certified Platinum facility. According to NASA, the KSC wastewater system and the downstream CCAFS wastewater treatment plant are approaching capacity limits due to current flows and ongoing development at KSC. The KSC system should have available capacity for the small increase in wastewater flows expected from the Proposed Action. However, until NASA and CCFAS can implement modification to increase available capacity, even small increases in flow impact the current wastewater system. As such, the construction and operation of the Proposed Action is considered to cause **minor adverse impacts** to the wastewater system.

Note: LEED is an internationally recognized green building certification system, providing third-party verification that a building (or community) was designed and built using strategies aimed at improving performance across energy savings, water efficiency, CO₂ emissions reduction, improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts. Developed by the U.S. Green Building Council (USGBC), LEED provides building owners and operators a concise framework for identifying and implementing practical and measurable green building design, construction, operations and maintenance solutions. LEED provides a point system to score green building design and construction. The system is categorized in five basic areas: Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, and Indoor Environmental Quality. Buildings are awarded points based on the extent various sustainable strategies are achieved. The more points awarded the higher the level of certification achieved from Certified, Silver, Gold, to Platinum.

Power

The electric power distribution system at KSC is provided by Florida Power & Light Company (FPL) which transmits 115 kilovolts (kV) to KSC that are distributed to two major substations – the C-5 substation, which serves the Launch Complex 39 (LC-39) Area providing 13.8 kV; and the Orsino substation, which serves the Industrial Area providing 13.2 kV. From 2014 through 2019, electricity usage on KSC ranged between 102,832 (2019) and 187,793 (2014) megawatt-hours. Electricity consistently provides 91 percent of KSC's total energy (NASA, 2020d). The high-voltage power is distributed from the substations by over 270 miles (434 km) of overhead and underground power lines to transformers and substations at various facilities. In late 2016,

Chapter 3 Affected Environment and Environmental Consequences

FPL installed a new “Mars” substation along SCW to serve commercial aerospace customers along SCW, Space Florida facilities in Exploration Park I, and the KSC Visitors Center (VC). In addition, FPL has constructed a solar farm on Jerome Road and is currently constructing an approximately 500-acre (202 ha) solar farm north of the VC.

For this Proposed Action, electrical service will be provided by the proposed 1-megawatt (MW) solar array that will be constructed with a series of canopies over the parking facilities. Any additional electrical power needed would be provided by an existing FPL underground service primary feeder currently situated along Odyssey Way. Service would then extend north to the facility via underground infrastructure. The 1-MW solar array, the newly constructed “Mars” substation, and other recent upgrades, combined with this facility being a LEED Platinum facility indicate sufficient power is available for the project. As a result, the construction and operation of the Proposed Action is expected to have **negligible adverse impacts** on power.

LEED’s Energy & Atmosphere credits aim to reduce energy use and increase renewable forms of energy. The Energy & Atmosphere credits optimizes energy performance in order to reduce the energy consumption of the building, thereby decreasing negative environmental impacts. This involves building commissioning, energy modeling, use of non-ozone depleting substances and encouragement to use renewable energy technologies.

Communications

The KSC communications system provides a variety of services at KSC 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 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 LC-39 Area (Second and Third Switches).

The Exploration Park area is served with communications infrastructure from KSC and independent vendors. These communications currently all flow through the communications room at the Space Life Sciences Laboratory (SLSL) facility. However, some Exploration Park tenants have direct independent feeds from the vendor. For the Proposed Action, necessary communications lines will be installed and connected to the existing system at Exploration Park Phase I. The existing communications system can provide the necessary increased capacity for these new facilities. As such, the construction and operation of the Proposed Action is expected to have **negligible adverse impacts** to the communications system.

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 KSC along SR 3 from a 24-inch (60-centimeter [cm]) water main and extends north along Kennedy Parkway serving KSC. The average daily demand for water is 700,000 gallons per day (2.6 million liters per day).

Various aboveground storage tanks and secondary pump systems supply water throughout KSC (NASA, 2019d).

For the Proposed Action, new water service pipelines for fire protection and potable water are expected to be extended from the existing 12-inch (30-cm) water main running along Odyssey Way. Based on the occupancy of the proposed facilities, combined with the proposed LEED Platinum goal, the potable water consumption is expected to be relatively low. Fire flow requirements are expected to be commensurate with other similar occupancies in the area. KSC water system modeling for this area indicates sufficient flow will be available to accommodate fire flows. As such, the existing water distribution system can provide the necessary increased capacity for the new facilities. Based on the size of the existing water main and expected demand associated with LEED Platinum facilities, the construction and operation of the Proposed Action is expected to have a **negligible adverse impacts** on potable water infrastructure.

3.2.3 Biological Resources

KSC covers approximately 140,000 acres (56,600 ha), of which 91 percent remains undeveloped area including uplands, wetlands, mosquito-control impoundments, and open water areas. Undeveloped areas, including abandoned citrus groves, are managed by the U.S. Fish and Wildlife Service (USFWS) Merritt Island National Wildlife Refuge (MINWR). Due to its physical location, geologic history, and mix of temperate and subtropical flora, extensive areas of NASA KSC serve as important wildlife habitat.

3.2.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and no change to biological resources would occur. Therefore, no significant impacts to biological resources would occur with implementation of the No Action Alternative.

3.2.3.2 Proposed Action

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 primarily east of Kennedy Parkway. Scrub and pine flatwoods are the common upland communities with freshwater marshes and wet prairies between the upland bands. Large areas of mangroves and salt marsh are adjacent to the estuaries on KSC.

Land cover near and within the Proposed Action can generally be categorized into forested uplands, forested wetlands, and open-water communities. The on-site land cover documented at the Proposed Action site was categorized according to the Florida Land Use, Cover and Forms Classification System (FLUCFCS) developed by the Florida Department of Transportation. Land cover within the Proposed Action site consists of three distinct upland land uses and two wetland communities.

Uplands

Approximately 33,033 acres (13,368 ha) of uplands are on KSC. These uplands are composed 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 that 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 (*Aphelocoma coerulescens*) and gopher tortoise (*Gopherus polyphemus*).

Figure 3-1 shows that the Proposed Action site consists of approximately 4.6 acres (1.9 ha) of uplands that are classified as Brazilian Pepper (FLUCFCS Code 4220), 38.4 acres (15.5 ha) of uplands classified as Temperate Hardwood (FLUCFCS Code 4250), and 5.5 acres (2.2 ha) of uplands classified as Roads and Highways (FLUCFCS Code 8140). The Brazilian Pepper community consists of low-quality upland habitat that was historically citrus groves until they were abandoned in 2008. This area is now dominated by dense Brazilian pepper and other exotic invasive vegetation. The Temperate Hardwood community is a medium- to high-quality forest dominated by live oak (*Quercus virginiana*), laurel oak (*Quercus laurifolia*), sweetgum (*Liquidambar styraciflua*), sabal palm (*Sabal palmetto*), and Brazilian pepper (*Schinus terebinthifolia*) with an understory dominated by saw palmetto (*Serenoa repens*), beautyberry (*Callicarpa americana*), wild coffee (*Psychotria nervosa*), grapevine (*Vitis rotundifolia*), and greenbriar (*Smilax* sp.). The Roads and Highways land use consists of Range Road, which is an improved dirt road that contains buried utilities and an adjacent swale and unimproved portions of Exploration Park Phase I.

Wetlands

Approximately 106,403 acres (43,061Action ha) of freshwater and saltwater wetlands are found on KSC and include diverse types such as mangrove swamps, salt marshes, shrub swamps, freshwater marshes, wet prairies, and cattail marshes (NASA, 2015). Impounded salt marsh waters are found throughout KSC and are managed by USFWS on MINWR. The wetlands and surrounding waters of KSC support large wintering populations of waterfowl as well as transient and resident wading bird populations.

The Proposed Action site contains two wetland communities (Figure 3-1). The Exotic Wetland Hardwoods community (FLUCFCS 6190) comprises approximately 6.6 acres (2.7 ha) and occurs in former citrus groves. This low-quality community is now dominated by the exotic invasive species Brazilian pepper with little to no understory consisting of dayflower (*Commelina diffusa*), pennwort (*Hydrocotyle umbellata*), and sapling sabal palm. The medium-quality Mixed Wetland Hardwood community (FLUCFCS 6170) comprises approximately 11.3 acres (4.6 ha) and is dominated by red maple (*Acer rubrum*), American elm (*Ulmus americana*), sabal palm, swamp dogwood (*Cornus foemina*), Brazilian pepper, groundseltree (*Baccharis halimifolia*), leather fern (*Acrostichum aureum*), pennywort (*Hydrocotyle umbellata*), and dayflower (*Commelina diffusa*).

Construction: Development of and around the Proposed Action is consistent with the KSC Vision 2020 Environmental Assessment, which has identified future development regions called Spaceport Growth Boundaries within KSC. Figure 3-2 shows the Proposed Action falls within the Central Space Commerce District. Figure 3-3 shows the conceptual development footprint of the Proposed Action site which would result in the loss of Brazilian pepper (4.1 acres [1.7 ha]) and Temperate Hardwood (25.1 acres [10.1 ha]) uplands and wetlands consisting of Exotic Wetland Hardwoods (6.0 acres [2.4 ha]) and Mixed Wetland Hardwoods (2.1 acres [0.8 ha]). Table 3-2 summarizes the land cover impacts. Construction is expected to have **negligible to minor adverse impacts** on upland vegetation and **negligible to minor adverse impacts** on wetland vegetation **on KSC** due to the small impact acreage, lower quality of vegetation impacted, wetland mitigation that will provide for any impacts, and the vast acreage of higher quality upland and wetland communities at KSC.

Table 3-2 Summary of Conceptual Land Cover Impacts

FLUCFCS Land Cover	FLUCFCS Code	Proposed Action (Acres [Ha])	Conceptual Impact (Acres [Ha])
Brazilian Pepper	4220	4.6 (1.9)	4.1 (1.7)
Temperate Hardwood	4250	38.4 (15.5)	25.1 (10.1)
Mixed Wetland Hardwood	6170	11.3 (4.6)	2.1 (0.8)
Exotic Wetland Hardwood	6190	6.6 (2.7)	6.0 (2.4)
Roads and Highways	8140	5.5 (2.2)	0.5 (0.2)
	TOTAL=	66.4 (26.9)	37.8 (15.3)

Before conducting any construction activities, NASA would obtain an ERP from SJRWMD and a Federal Dredge and Fill 404 Program Permit from FDEP if required. These permits will necessitate mitigation compensation for unavoidable wetland loss. Compensatory mitigation would be provided by the purchase of federal palustrine mitigation bank credits from a regional commercial mitigation bank which serves the KSC hydrologic basin.

Operation: **Negligible adverse impacts** on vegetation are expected from the operation of the Proposed Action since the proposed use is low intensity compared to manufacturing or launch facilities that occur at KSC.

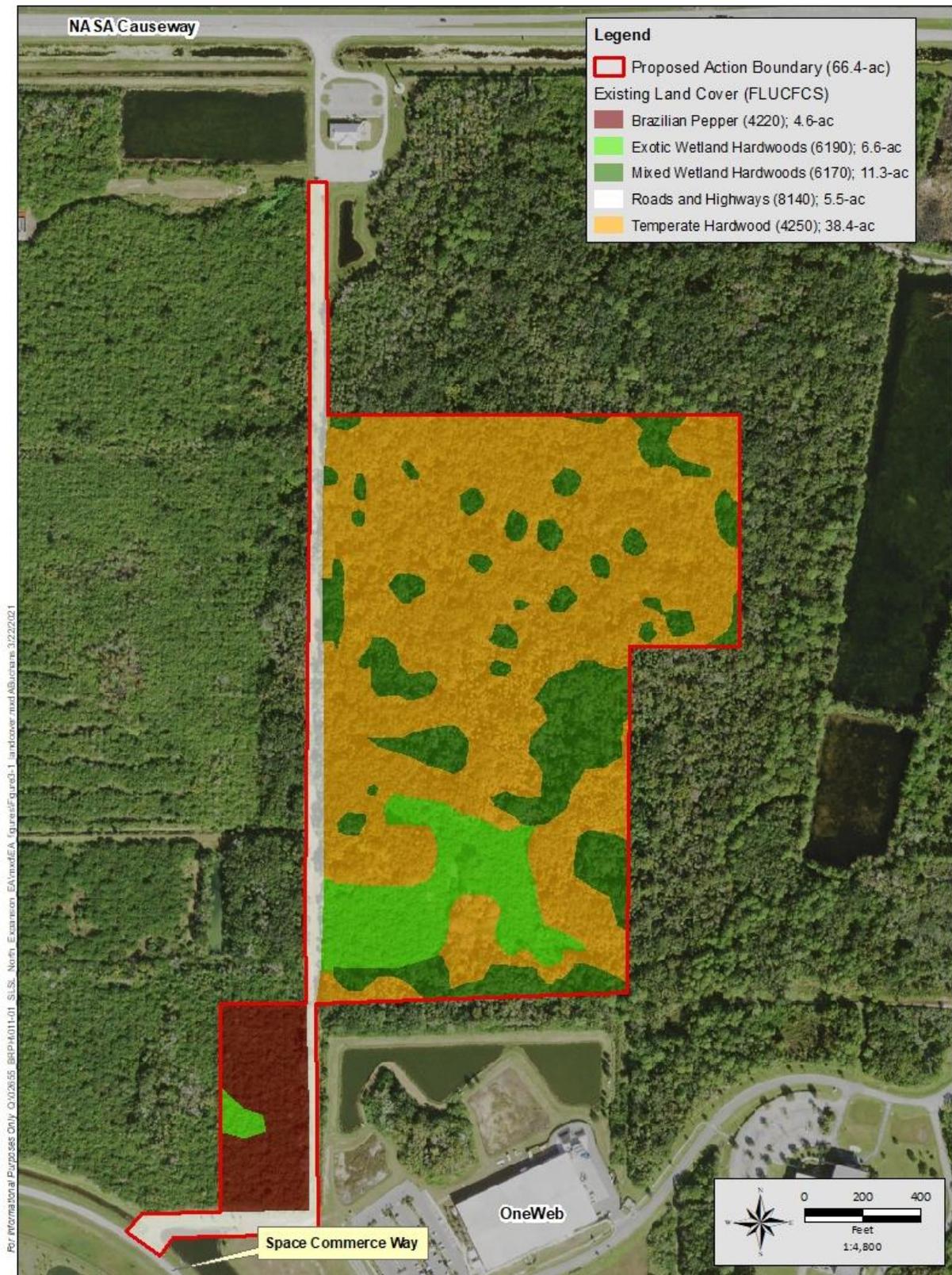


Figure 3-1 Existing Land Use

DEVELOPABLE AREA

SPACE COMMERCE DISTRICT SGB - CENTRAL

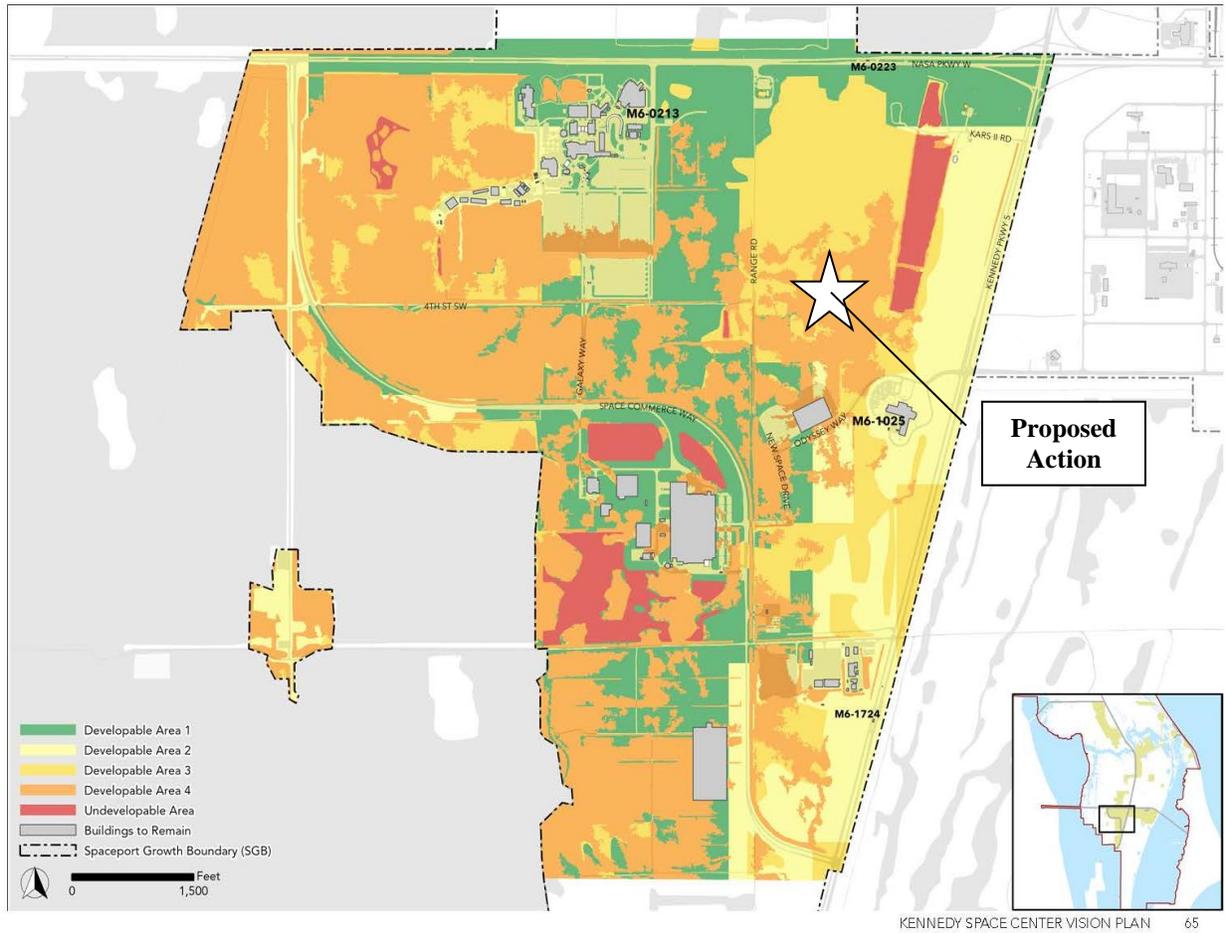


Figure 3-2 Central Space Commerce District (NASA, 2020b)

3.2.3.3 Wildlife

Birds

KSC and the surrounding coastal areas provide habitat for 318 bird species, and MINWR is considered one of the top 10 birding destinations in the U.S. Approximately 87 of these species are breeding residents, over 100 species have been documented to winter on KSC, and the remaining species are transients that regularly use KSC terrestrial and aquatic habitats for brief periods (NASA, 2020e). Non-listed bird species that could utilize or be found near the Proposed Action project area are primarily passerine birds that prefer forested habitat such as American robin (*Turdus migratorius*), Northern cardinal (*Cardinalis cardinalis*), Carolina wren (*Thryothorus ludovicianus*), Carolina chickadee (*Poecile carolinensis*), tufted titmouse (*Baeolophus bicolor*), grey catbird (*Dumetella carolinensis*), red-shouldered hawk (*Buteo lineatus*), yellow-rumped warbler (*Dendroica coronata*), and other common avian species. However, the Proposed Action site provides no foraging habitat for wading or shore birds.



Figure 3-3 Proposed Vegetation Community Impact Map

Mammals

Twenty-nine species of mammals inhabit KSC lands and waters (NASA, 2020d). 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, coyote (*Canis latrans*), and otter now hold the position of top mammalian predators on KSC.

In addition, 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 that occasionally use KSC facilities as roost sites and must be relocated and excluded from re-entry when their use of the facility conflicts with facility operations or renovations.

Terrestrial mammalian species that may use the low to medium-quality uplands within the Proposed Action site include the raccoon, armadillo, feral hog, Eastern cottontail rabbit, hispid cotton rat, white-tailed deer, and opossum. Due to the low to medium quality of on-site habitats and presence of humans, roads or developments to the north, east, and south, most of these mammals would use native vegetation communities found off site and likely only be passing through the Proposed Action site on their way to higher quality habitat.

Herpetofauna

Seventy-four species of reptiles and amphibians are known to occur at KSC (NASA, 2020d). Due to the dense canopy, high water table, and lack of well drained soils, the gopher tortoise does not inhabit the Proposed Action site. Non-listed herpetofauna that could potentially inhabit or occasionally forage the Proposed Action site include green anole (*Anolis carolinensis*), brown anole (*Anolis sagrei*), green tree frog (*Hyla cinerea*), garter snake (*Thamnophis sirtalis*), rat snake (*Pantherophis* spp.), water moccasin (*Agkistrodon piscivorus*), and black racer (*Coluber constrictor*).

Potential impacts on wildlife by the Proposed Action construction and operation are based on habitats removed by typical construction activities for clearing, road construction, and the expected long-term use of the proposed site. Effects from the construction phase of the project would undoubtedly occur and are expected to be temporary except for those caused by habitat removal and alteration. However, on-site natural habitats are composed of low- to medium-quality uplands and wetlands that provide lower habitat value and are much less accessible as a result of being bound on three sides by roadways as compared to the vast acreage of natural vegetation communities found on KSC.

Construction: Construction noise and activities of the Proposed Action would have **minor** impacts on wildlife due to the presence of wildlife habitat within the project area. Thus, **minor adverse impacts** on wildlife are expected due to habitat loss and but would not be significant to the species' continued existence. Wide-ranging species such as large mammals should not be

impacted by habitat removal since they likely avoid the Exploration Park and KSC VC complex currently, and thus, a disruption of wildlife species movement patterns due to the new facilities should not occur. The impacted species are typically sensitive to human activity and will move away from disturbance, thereby causing at least a temporary shift in the population structure.

Operation: Long-term use of the proposed site would have minimal impact on wildlife species and is expected to have **negligible to minor adverse impacts** on wildlife populations. However, wildlife species such as raccoon, opossum, and American alligator (*Alligator mississippiensis*) can propose a nuisance to facility operations due to their foraging at waste disposal areas and the potential for the American alligator to utilize open water areas such as stormwater retention ponds, pools, other water features which could put them in close contact with people. As such, a nuisance species operational plan will need to be developed to address nuisance wildlife species issues and resolutions.

3.2.4 Threatened and Endangered Species

3.2.4.1 Listed Wildlife

Numerous 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. KSC and the adjacent CCSFS provide habitat for more threatened and endangered species than any other federal property in the continental United States (Breininger et al., 1994). Thirty Florida or federally listed wildlife species regularly use the lands or waters of KSC. Of the 30 listed wildlife species, 14 are federally listed as candidate, threatened, or endangered and 16 are state listed (NASA 2020d). The Florida Fish and Wildlife Conservation Commission (FWC) in 2017 published the 2016-2026 Imperiled Species Management Plan (ISMP) for state listed species. The goal of the ISMP is to ‘conserve or improve the status of threatened species to effectively reduce the risk of extinction.’ This comprehensive document also incorporates Species Action Plans and other documents.

The lack of xeric, aquatic, and coastal habitat in the Proposed Action boundary eliminates the potential for numerous listed species. Of the 30 Florida or federally listed terrestrial wildlife species, only the eastern indigo snake could potentially use habitat of the Proposed Action site. An eastern indigo snake was observed during wildlife surveys west of the Blue Origin Orbital Launch System South Campus in association with the International Space Research Park EA. However, no indigo snakes were observed during the Proposed Action site assessments. Although indigo snakes do forage in habitats that occur in the Proposed Action boundary, their preferred habitat is well-drained sites that support gopher tortoises, which they use for refugia. The Proposed Action site is poorly drained and does not contain gopher tortoise habitat. In addition, the presence of Exploration Park Phase I to the south, the Badging Station and NASA Causeway to the north, Kennedy Parkway to the east, and SCW/Blue Origin Campus to the west greatly limit this species movements to the Proposed Action site and render the site unsuitable to support the long-term presence of eastern indigo snakes. However, the USFWS Eastern Indigo Snake Protective Measures will be implemented prior to and during construction activities.

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The majority of the listed bird species, such as the wood stork (*Mycteria americana*), would likely not use the densely vegetated communities since these species require more open foraging areas with standing water or are restricted to coastal habitats. In addition, with regard to the wood stork, Figure 3-4 shows that the project area falls within a 15-mile (42.1-km) radius from a wood stork nesting colony and, therefore, is considered core wood stork foraging area. The closest bald eagle (*Haliaeetus leucocephalus*) nest is 1.7 miles (2.7 km) to the east (Figure 3-4).

KSC has one of three remaining core Florida scrub-jay populations across the species range and has developed a habitat model that maps Auxiliary, Core, and Support Habitat. Based on this model, some Auxiliary Habitat does occur within the Proposed Action boundary (Figure 3-4). Habitat in the Proposed Action site is low- to medium-quality, poorly drained mesic forested upland and wetland habitat with areas of dense Brazilian pepper. Thus, the Proposed Action site does not currently and would not support suitable and sustainable xeric habitat for this listed species. However, prior to final design of the Proposed Action, a determination will be made by KSC staff if habitat mitigation for this species is required. If mitigation is deemed to be warranted by KSC staff, mitigation will be provided in accordance with the Florida Scrub-Jay Compensation Plan (KSC 2014).

Construction: The on-site habitats are not necessary for the survival of threatened or endangered species. However, existing habitats could possibly on occasion support listed species such as the eastern indigo snake due to their large home range. Construction impacts are not expected to cause changes in the overall population size or structure of any of listed species on KSC. As a result, impacts on local threatened and endangered species from land clearing and construction of the Proposed Action are expected to be **negligible**.

Operation: KSC is required to protect marine turtle nesting habitat by NEPA and the USFWS through the Endangered Species Act (ESA). The NEPA of 1969, as amended (42 U.S.C. 4321-4370d), and according to the procedures of implementation of NEPA for NASA [Title 14, CFR, Part 1216 subparts 1216.1 and 1216.3], requires federal agencies to assess how programs and associated actions may affect the environment. As part of this assessment, KSC has coordinated with the USFWS on the effects of exterior lighting on protected species. USFWS has issued a biological opinion (BO) based on their review of historical and expected future light management activities by KSC, and the associated effects on the loggerhead (*Caretta caretta*), green (*Chelonia mydas*), leatherback (*Dermochelys coriacea*), hawksbill (*Eretmochelys imbricata*), and Kemp's ridley (*Lepidochelys kempii*) sea turtles in accordance with Section 7 of the ESA of 1973, as amended (16 U.S.C. 1531 et seq).

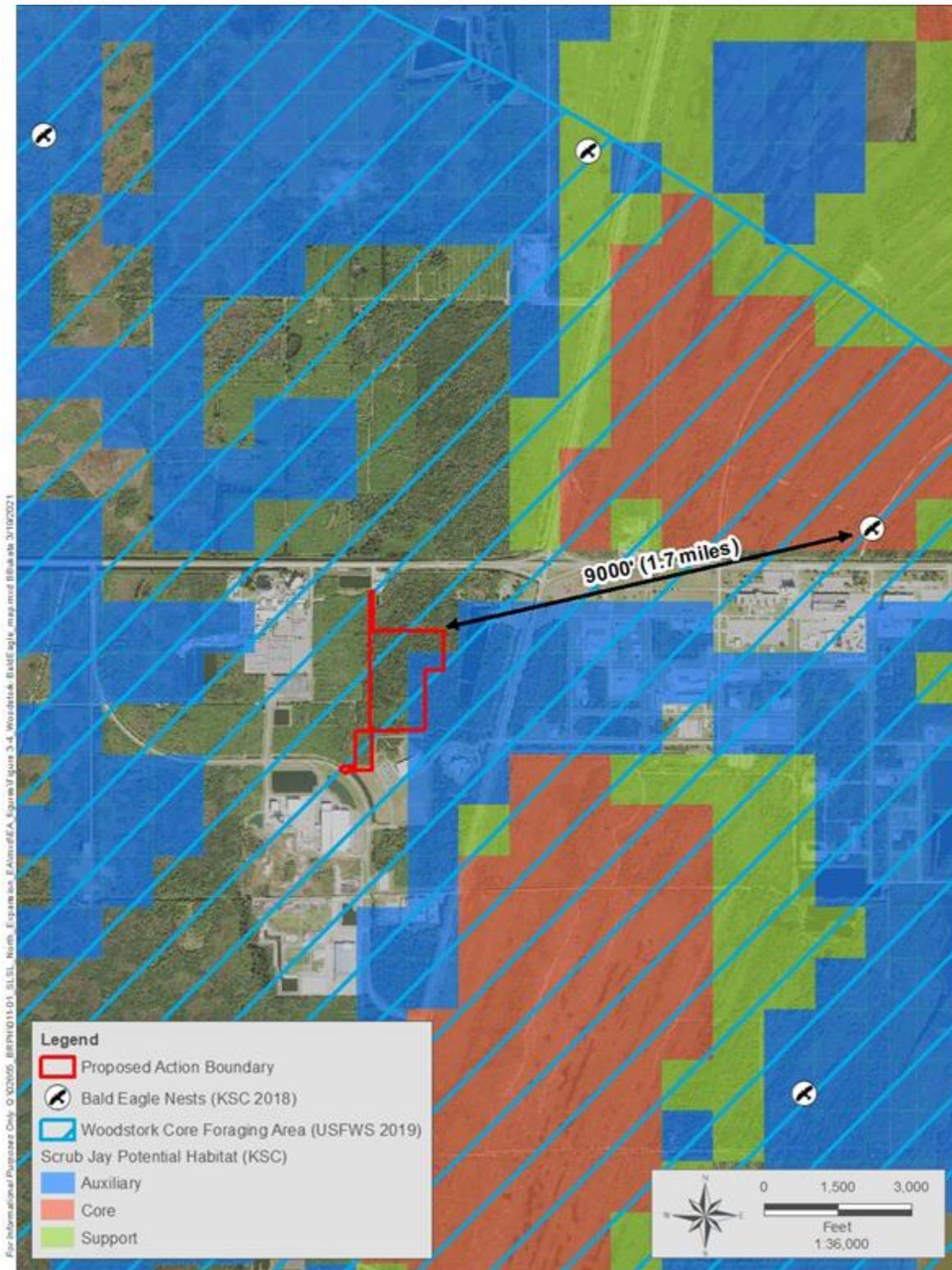


Figure 3-4 Bald Eagle Nest and Wood Stork Core Foraging Area Map

As such, exterior lighting at KSC is intended to be limited to internal lighting of signs, security, and safety illuminations of adjacent streets, parking areas, loading areas, service areas, access drives, walkways, and building entrances and exterior lighting of overall building surfaces. Such lighting will not produce any excessive glare or reflection onto any portion of any adjacent street or parcel or into the path of any oncoming or passing vehicle. All parking lots, loading areas, service areas, pedestrian walkways, and security lights, whether wall-mounted or free-standing, must be concealed-source fixtures where the lenses do not project below the opaque section of the fixture. Lighting fixtures for parking areas will be selected from NASA and USFWS standards and may only be varied with prior approval. Refer to lighting requirements in Chapter 24 of Kennedy NASA Procedural Requirements 8500.1 Rev. D (NASA 2017) for details.

The Proposed Action is within KSC Burn Unit 8.3 but only the easternmost portions of this burn unit contains fire dependent habitat (Figure 3-5). However, the operation of the Proposed Action is not expected to negatively impact MINWR's ability to conduct controlled burns in the vicinity.

Terrestrial species would avoid the Proposed Action site and can use similar habitats to the north, east, and south. However, resident populations of eastern indigo snakes are unlikely to be found due to the isolated and low quality of habitats within and adjacent to the Proposed Action. The long-term operation of the Proposed Action is not expected to have a long-term impact on local populations of listed terrestrial species such as the eastern indigo snake. As a result, **negligible adverse impacts** on threatened or endangered species are expected due to the operation of the Proposed Action.

3.2.4.2 Listed Plants

Thirty-nine plant species occurring on KSC are listed as threatened, endangered, or of special concern on state lists. For some of these species, KSC populations appear to be important to their regional and global survival (NASA, 2020e). These species are 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. No regulatory implications for the occurrences of listed plant species exist on the project site. Although a formal intensive vegetation survey was not completed, no listed plant species are expected to occur within the Proposed Action site since it does not contain or is within several miles of coastal dune habitat and also contains a large area of former citrus groves currently dominated by exotic invasive plant species. As a result, **negligible adverse impacts** are expected as a result of the construction and operation of the Proposed Action.

3.2.5 Cultural Resources

Sites containing potential archaeological and/or historical resources on KSC are protected under the National Historic Preservation Act and the Archaeological Resources and Protection Act, which require that every federal agency "take into account" how each undertaking could affect historic properties. NASA has executed a Programmatic Agreement among the NASA KSC, Advisory Council on Historic Preservation, and the Florida State Historic Preservation Officer

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regarding management of historic properties at KSC. 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 personnel when reviewing any siting and/or dig permit activities (ACI, 1992; *Archaeological Survey to Establish Zones of Archaeological Potential (ZAPs) in the Shuttle Landing/KSC South Areas (Option 2) of the Kennedy Space Center*). 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.

The preservation of archaeological deposits is directly influenced by a number of variables including soil drainage characteristics. In general, the probability of encountering archaeological resources in poorly drained soils is low. Conversely, in well drained or moderately well drained soils, the probability of encountering archaeological resources is generally considered high or moderate, respectively. Accordingly, 9.4 acres (3.8 ha) of the Proposed Action boundary are designated as a moderate-probability zone (MPZ), and 52 acres (21 ha) are designated as a low-probability zone (LPZ) due to their poorly to very poorly drained soils. As such, a Phase I Cultural Resource Assessment Survey (CRAS) was completed for the 9.4-acre (3.8 ha) MPZ area.

3.2.5.1 No Action Alternative

Under the No-Action Alternative, the Proposed Action would not be implemented, and the area would remain undeveloped. As such, **no impacts** to cultural resources would occur.

3.2.5.2 Proposed Action

In determining whether archaeological materials may be present within the project's Archaeological Area of Potential Effects (APE), a review of background information was completed in conjunction with probability modeling based on the proximity to natural, prehistoric, and historic resources. Due to the APEs proximity to previously recorded sites, aquatic environments, and historic roadways and towns, the overall project APE is classified as having a low to moderate probability for containing archaeological sites.

A Phase I CRAS was conducted December 7–9, 2020 and consisted of a historic background research, pedestrian survey, and the excavation of 31 shovel tests probes. All of the subsurface tests were negative for cultural material. Additionally, a surface scatter was documented as “The Granite Rock Homestead,” and a historic road in the southwestern portion of the APE was documented as “Howe Grove Road”. Neither of these two resources meets the minimum criteria for inclusion on the National Registry of Historic Places; therefore, both of these resources are recommended not eligible. No further archaeological investigations are proposed. The February 2021 CRAS report is included as Appendix 3 of this EA.

Construction: No significant cultural resources were identified within the APE, therefore, construction of the Proposed Action would generate **negligible impacts** to significant cultural resources.

Operation: No significant cultural resources were identified within the APE, therefore, operation of the Alternative Action will result in **negligible impacts** to significant cultural resources.

3.2.6 Floodplains

The topography in and around the Proposed Action site is relatively flat with a swale adjacent to Range Road being the lowest elevation and the crown of Range Road being the highest. Figure 3-6 shows the topography within the Proposed Action boundary ranges between approximately elevation -1.3 to 4.6 feet (-0.4 to 1.4 meters [m]) North American Vertical Datum of 1988 (NAVD 88).

Figure 3-7 shows much of KSC west of Kennedy Parkway is floodplain. FEMA Flood Insurance Rate Maps (FIRMs) 12009C12606 and 12009C 13174 were reviewed and the Proposed Action site and conceptual development footprint were determined to contain approximately 26 acres (10.5 ha) and 12.5 acres (5.1 ha) of Zone AE Floodplain, respectively (Figure 3-8). The base flood elevation for these floodplains ranges from 2.6 to 2.8 feet (0.8 to 0.85 m) NAVD 88.

3.2.6.1 No Action Alternative

Under the No-Action Alternative, the Proposed Action would not be implemented, and the area would remain undeveloped. As such, **no impacts** on floodplains would occur.

3.2.6.2 Proposed Action

Construction: Construction of the Proposed Action will impact approximately 12.5 acres (5.1 ha) of Zone AE floodplain (Figure 3-7). The Proposed Action will have **minor adverse impacts** overall due to the filling of floodplain that is required for site development and the floodplain loss is an extremely small acreage in relation to the total floodplain acreage in the region west of NASA Parkway.

Operation: Operation of the Alternative Action will result in **negligible** impact to floodplains.

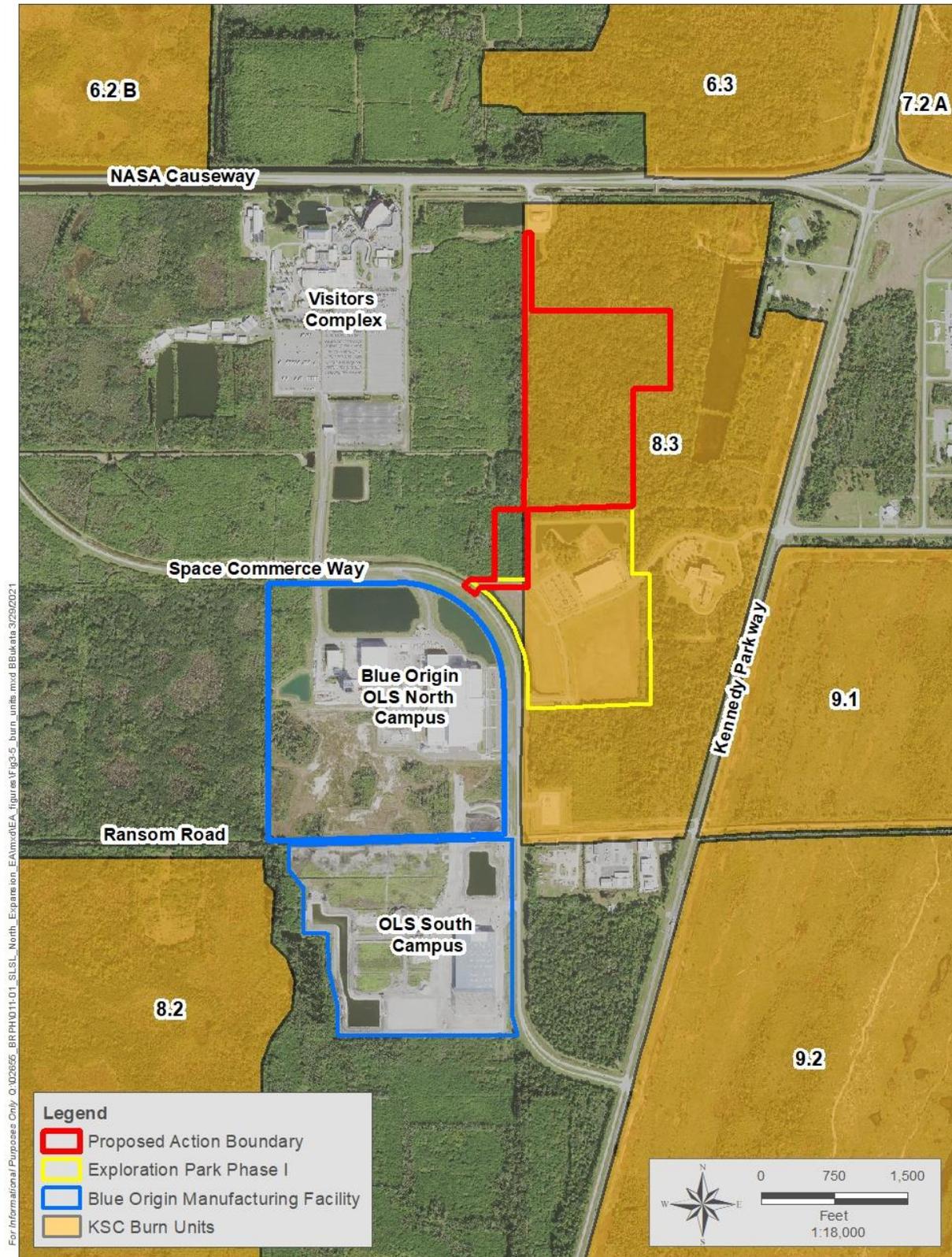


Figure 3.5 Burn Unit Location Map

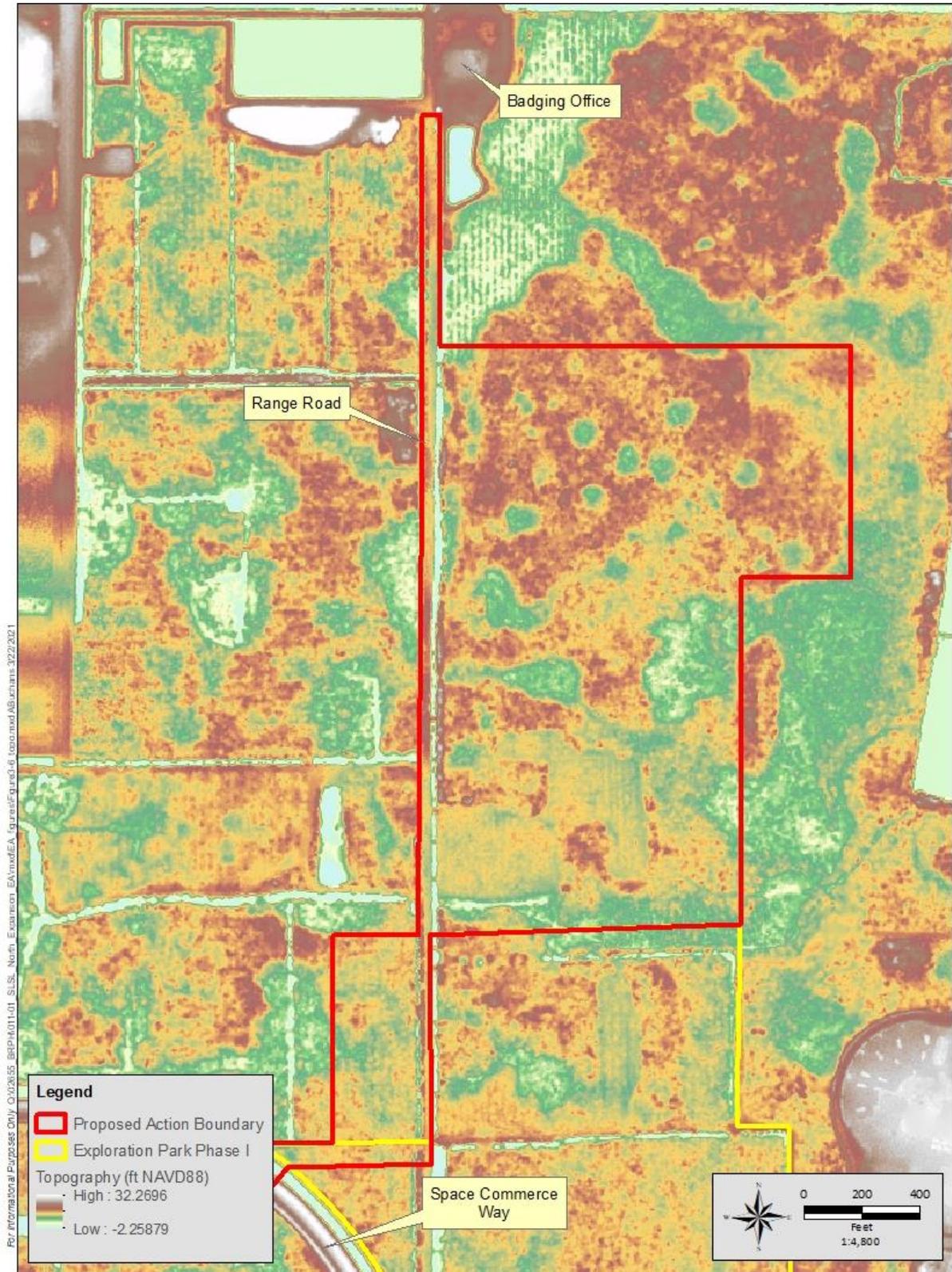


Figure 3-6 Topographic Map

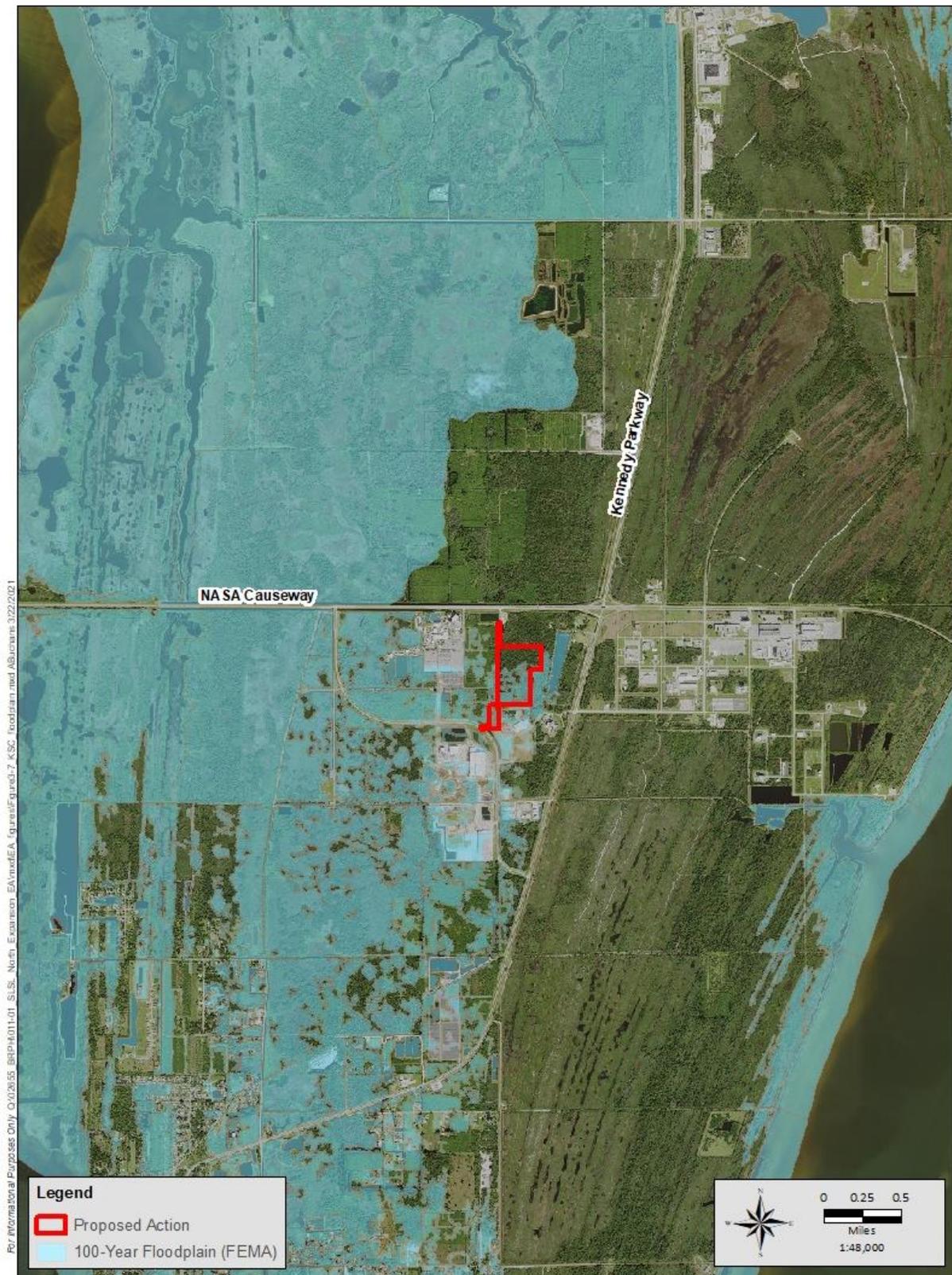


Figure 3-7 Regional Floodplain Map

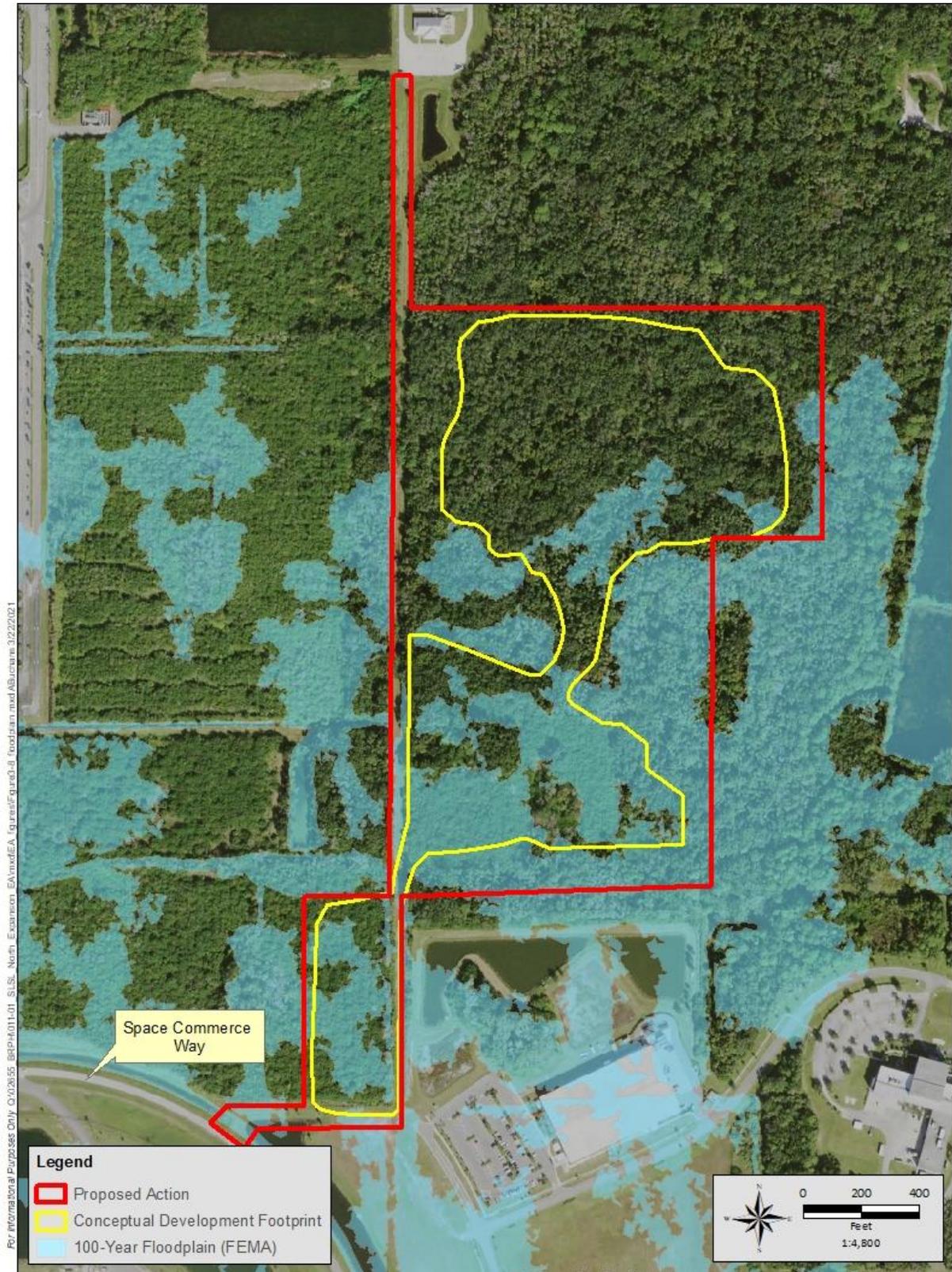


Figure 3-8 Proposed Action Floodplain Map

3.2.7 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. Other large employers in the County are CCSFS, Patrick Air Force Base, the Brevard County School District, and Health First. The highest employment levels at KSC were recorded during the Apollo program, and KSC recorded a peak population of 25,895 employees in 1968 with an estimated 1 of 4 workers in Brevard County employed at KSC. Employment levels dropped precipitously following the Apollo program conclusion 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. In 2010, an 11.6-percent decrease in the contractor work force resulted from downsizing as the Space Shuttle Program came to an end. However, since 2010, KSC began transforming from a program-focused, single-user launch complex to a multi-user spaceport shared by government and commercial partners. Today, KSC has transitioned from a government-only space launch complex to a public-private space gateway that facilitates the largest concentration of space launch operators in the world. In 2019, the multi-user spaceport's workforce totaled 11,170 employees, an increase of 25 percent from the 8,304 jobholders in 2011, with approximately 3,333 private sector positions, compared to only 564 in 2011 (NASA, 2020b). The diverse workforce has resulted in a positive economic impact to the local communities and Brevard County.

3.2.7.1 No Action Alternative

Under the No-Action Alternative, the Proposed Action would not be implemented, and the area would remain undeveloped. No construction would occur, and no jobs would be generated by the construction nor operation of the Proposed Action, and thus, a **minor negative impact** on socioeconomics would occur.

3.2.7.2 Proposed Action

Construction: The Proposed Action would support the local economy since the construction phase of this project is expected to generate jobs for the local workforce with an expected positive impact on the local economy. Although a slight increase to the local population from the construction of the Proposed Action may occur, the growth rate as a result of construction would be temporary and would not be significant. Construction of the Proposed Action would not significantly affect the local housing market and would not negatively affect the local economy. Therefore, construction of the Proposed Action would generate **no adverse socioeconomic impacts** on the region and may generate a temporary **minor beneficial impact**.

Operation: Operation of the Proposed Action will provide employment for an estimated 150 staff by 2027. Staff positions will range from maintenance services to highly skilled astronaut training and medical staff. Although a slight increase to the local population from the Proposed Action may occur, the growth rate would not be significant. The Proposed Action would not significantly affect the local housing market and would not negatively affect the local economy. Therefore, the Proposed Action would generate **no adverse socioeconomic impacts** on the region and may generate a **minor beneficial impact** as a result of permanent job creation.

4.0 CUMULATIVE IMPACTS

4.1 Definition of Cumulative Impacts

The approach taken in the analysis of cumulative impacts in this document follows the objectives of NEPA, CEQ regulations, and CEQ guidance. For the purposes of this EA, and consistent with 40 CFR 1508.1(g), cumulative impacts are considered changes to the human environment that occur at the same time and place as the Proposed Action or alternatives, as well as changes that occur at a later time or geographically distanced from the Proposed Action or alternatives. Cumulative impacts require more than a “but for” causal relationship. Consistent with CEQ regulations, projects that are remote in time, geographically remote, or the product of a lengthy causal chain are not considered. Furthermore, cumulative impacts do not include those from projects that NASA has no ability to prevent due to its limited statutory authority or would occur regardless of the Proposed Action.

Actions overlapping with or close to the Proposed Action would be expected to have more potential for a relationship than those more geographically separated. Similarly, relatively concurrent actions would tend to offer a higher potential for cumulative impacts. To identify cumulative impacts, the analysis needs to address the following three fundamental questions:

1. Does a relationship exist such that impacts to affected resource areas by the Proposed Action might interact with the impacts to resources of past, present, or reasonably foreseeable actions?
2. If so, what would the combined impact be?
3. Are there any potential significant impacts not identified when the Proposed Action is considered alone?

4.2 Actions Affecting Resources of Concern

The overall geographic scope of analysis consists of the entirety of KSC, including the undeveloped 60-acre (24-ha) area north of Exploration Park Phase I, and near the intersection of NASA Causeway and Kennedy Parkway. The time frame for the analysis must include the past, present, and future. For most resource areas, the period within the last 5 years at KSC marks the past temporal boundary for the cumulative impact analysis. The future temporal boundary includes the construction period (i.e., 2021 through 2022) and other reasonably foreseeable actions associated with continued operation of the Astronaut Training Facility that are located within close proximity to the Proposed Action site. The temporal boundary for the present is defined by actions in detailed planning, under construction, or that have been recently initiated that could reasonably result in a cumulative interaction with the resources analyzed in this EA.

4.3 Cumulative Impacts Analysis

4.3.1 No Action Alternative

Under the No Action Alternative, an Astronaut Training Facility would not be constructed, and baseline environmental conditions would remain. Therefore, no cumulative impacts would occur.

4.3.2 Proposed Action

For the purposes of this EA, the Proposed Action was found to result in no or negligible impacts to the following resource areas: utilities (with exception of waste water), threatened and endangered species, cultural resources, and socioeconomics. Therefore, these resource areas are not carried forward in the cumulative impact analysis.

Impacts to socioeconomics would be considered minor-beneficial during construction and negligible during operation of the Astronaut Training Facility. Since construction is expected to be temporary, occurring over a 1-year period, the local area, which handles surges in tourist visits on a regular basis is expected to be able to accommodate additional demand on services. Therefore, socioeconomics is not carried forward in the cumulative impact analysis.

In addition, the Proposed Action was found to potentially result in minor direct/indirect impacts to the following resource areas: transportation (construction and operation), wastewater (operation), wetland vegetation (construction), wildlife (construction), and floodplains (construction). Therefore, these resources are carried forward for cumulative impacts analysis. Table 4-1 lists the other past, present, and reasonably foreseeable actions that could influence the resource areas carried forward for further analysis. The cumulative impacts analysis considers other actions, their temporal and geographic extent, their direct and indirect effects, and their relative contribution to cumulative impacts on the specific resource.

Actions overlapping with or close to the Proposed Action are expected to have more potential for a relationship than those actions occurring remotely in time and distance. As summarized in Table 4-1, only the FPL Solar Energy Center, Blue Origin Orbital Launch Site, and SLF projects have the potential for a relationship that might result in a cumulative impact to wetlands and/or floodplains. With regard to any impacts to wetlands and wetland vegetation, there are 36,183 acres (14,642 ha) of wetlands found on KSC. Under the Proposed Action, up to 6.6 acres (2.7 ha) of low-quality wetlands and 11.3 acres (4.6 ha) of medium-quality wetlands would be impacted. Impacts resulting from implementation of the Proposed Action, as well as the FPL Solar Energy Center, Blue Origin Orbital Launch Site, and SLF projects would be mitigated through the use of BMPs to minimize erosion and sedimentation during construction activities. These practices include minimizing the length of time bare soil is exposed, along with timely reseeding and mulching. In addition, construction and maintenance of the stormwater treatment pond would further reduce the potential for erosion and sedimentation. Before conducting any construction activities, NASA would obtain an ERP from SJRWMD and a Federal Dredge and Fill Permit from the FDEP. These required permits would result in compensation for unavoidable wetland loss. Compensation could include purchase of credits from a wetland mitigation bank, a monetary compensation for wetland loss, or wetland restoration or preservation. Therefore, given the Proposed Action would not impact high-quality wetlands, the overall abundance of wetlands found on KSC, and the mitigation measures that would be taken, the Proposed Action would not result in a significant cumulative impact to wetlands or wetland vegetation.

With regards to impacts to floodplains, the Proposed Action would impact approximately 12.5 acres (5.1 ha) of Zone AE floodplain as will the FPL Solar Energy Center, Blue Origin Orbital Launch Site, and SLF projects; however, much of KSC west of Kennedy Parkway is located within a floodplain due to KSC's close proximity to the coast and flood mitigation is not

required. In addition, construction of the Proposed Action would include protection of structures from flood damage, and no short- or long-term impacts to water resources, wildlife habitat, or increase in the risk of future risk of flood damage is expected from implementation of the Proposed Action when considered cumulatively with other past, present, and reasonably foreseeable projects.

In addition, as summarized in the cumulative impacts analysis in Table 4-1, there are no construction-related actions overlapping with or in close proximity to the Proposed Action that would have the potential for cumulative impacts to transportation or wildlife. Specifically, any construction-related impacts are expected to be temporary in nature, and it is expected that there would be adequate time for the respective resource in the areas near the Proposed Action site to recover prior to being minorly impacted from construction of the Proposed Action.

As summarized in the cumulative impacts analysis in Table 4-1, there would be a long-term increase in traffic from the operation of the Proposed Action when combined with additional other past, present, and reasonably foreseeable actions. The Proposed Action would be accessed via Exploration Parkway off of SCW at Exploration Park Phase 1. Once completed, the Proposed Action would employ up to 50 permanent staff, host up to 30 astronaut trainees, and up to 180 café and restaurant patrons at any given time. At this time, it is expected that the astronaut trainees would arrive without a vehicle and be escorted to and from area airports. Furthermore, it is expected that café and restaurant patrons would largely be associated with employees located at nearby commercial aerospace facilities. As part of a launch, access from the manufacturing facility to the launch complexes is from SCW to NASA Parkway to KSC Gate 3. Since transported loads require a slower-than-posted speed, transportation generally are scheduled to avoid peak flow periods in the morning and afternoon. Plans to expand SCW to four lanes SCW is currently underway, which would provide additional roadway capacity. Therefore, no significant cumulative impacts to transportation is expected from implementation of the Proposed Action.

There would also be long-term increases to wastewater demand as KSC is developed. To address capacity issues, KSC is undergoing a wastewater study and will complete a master plan process for utilities. The findings of the study would be used to ensure future development is planned in a manner that provides adequate wastewater capacity for existing and future initiatives. Therefore, no significant cumulative impacts to wastewater is expected from implementation of the Proposed Action.

Therefore, **no significant cumulative impacts** would occur to wetlands, vegetation, wildlife, floodplain, transportation, and wastewater utilities from implementation of the Proposed Action.

Table 4-1 Past, Present, and Reasonably Foreseeable Actions Considered

Project	Project Description	Cumulative Impacts Analysis
<p>Blue Origin Manufacturing Facility North Campus</p>	<p>Constructed a rocket manufacturing facility on 139 acres (56 ha) on the west side of SCW in support of the development of reusable launch vehicles using rocket-powered Vertical Take-off and Vertical Landing systems.</p> <p>The facility was fully operational in 2018, and the New Glenn rockets are expected to launch in 2021.</p>	<p>Impacts from construction were temporary and do not overlap with the Proposed Action.</p> <p>Operationally, any direct or indirect impacts are considered as part of this EA (i.e., affected environment) since the manufacturing facility has been operational since 2018.</p>
<p>Blue Origin Manufacturing South Campus Expansion</p>	<p>Constructed an approximate 90-acre (36-ha) warehouse and manufacturing support facility in support of Blue Origin’s New Glenn program. The site includes a warehouse, roads, parking, landscaping, and lighting improvements.</p> <p>Facility was fully operational in 2019.</p>	<p>Impacts from construction were temporary, and do not overlap with the Proposed Action.</p>
<p>Blue Origin Manufacturing South Campus Expansion – “Deep South” Site</p>	<p>Construct an approximate 65-acre (36-ha) warehouse and manufacturing support facility in support of Blue Origin’s New Glenn program. The site would include a warehouse, roads, parking, landscaping, and lighting improvements.</p> <p>Construction is expected to begin in 2021.</p>	<p>Impacts from construction will be temporary, and do not overlap with the Proposed Action.</p>
<p>Blue Origin Orbital Launch Site at LC-11 and LC-36</p>	<p>Construct and operate an Orbital Launch Site at the combined areas of LC-11 and LC-36 at Cape Canaveral Air Force Station.</p> <p>No significant impacts to 16 resources analyzed, and no effect on historic properties would occur from implementation of this project. Specific to this EA, primary wetlands would be impacted.</p> <p>First launch from LC-36 is expected to occur in 2021.</p>	<p>With exception of wetland and floodplain impacts, any impacts associated with construction would be temporary and would not overlap with the Proposed Action. Specific to wetland impacts, construction of the Orbital Launch Site and the Proposed Action would result in unavoidable impacts to wetlands. Impacts would be mitigated through compensation. In addition, BMPs would be implemented as part of the Proposed Action to minimize erosion and sedimentation during construction activities, and all necessary permits would be obtained before commencement of any construction activities. Therefore, no significant cumulative impacts would occur.</p> <p>Impacts from launch operations are considered short in duration and would not result in a</p>

Table 4-1 Past, Present, and Reasonably Foreseeable Actions Considered

Project	Project Description	Cumulative Impacts Analysis
		potential for a cumulative impact due to the geographical distance between LC-11 and LC-36 and the Proposed Action location.
Exploration Park Phase 1	<p>Develop and operate a 60-acre (24-ha) parcel of land on SCW near the Space Life Science Lab to be used as a mixed use technology and commerce park. Phase 1 included constructing eight buildings and associated parking.</p> <p>Impacts to air quality, climate, biological resources, threatened and endangered species, cultural resources, geology and soils, noise, surface water quality, groundwater quality, socioeconomics and land use were analyzed. No significant impacts were expected.</p>	<p>No impacts from construction are expected due to no overlap with the Proposed Action.</p> <p>Operationally, the Exploration Park Phase 1 EA expected 2,555 average daily trips would be generated once Exploration Park was fully developed. The widening of SCW would provide additional capacity.</p> <p>Specific to waste water, Exploration Park Phase 1 was connected to the KSC sewage system. Based on projects, waste water demand was expected to be 18,000 GPD (68,137 LPD). Long-term impacts to waste water are expected as additional personnel are added.</p>
Firefly Aerospace Manufacturing Facility	<p>Construct a 180,000 ft² (16,723 m²) factory in Exploration Park capable of producing 24 Alpha vehicles per year.</p> <p>The manufacturing facility was previously addressed in a 2008 NASA EA, and subsequently issued a REC.</p> <p>A construction start date has not been announced.</p>	No construction information is available; however, impacts associated with construction would be temporary and would not overlap with the Proposed Action.

Table 4-1 Past, Present, and Reasonably Foreseeable Actions Considered

Project	Project Description	Cumulative Impacts Analysis
FPL Solar Energy Center	<p>Construct a 74.5-MW solar photovoltaic facility on a 504-acre (204 ha) area that would maximize the use of existing infrastructure and assist KSC with their goal to increase on-site generation of renewable energy. The proposed facility would be north of the Proposed Action.</p> <p>No impact to minor impacts to the 13 resources analyzed would occur from implementation of this project. The USFWS issued an opinion in December 2018 noting the project, “is not likely to jeopardize the continued existence of the eastern indigo snake or the Florida scrub-jay and will not result in destruction or adverse modification of designated critical habitat.” In addition, FPL intends to purchase federal mitigation bank credits from a private commercial wetland mitigation bank to compensate for any loss of wetlands.</p> <p>Construction of the site is underway.</p>	<p>The FPL Solar Energy Center project and the Proposed Action would result in unavoidable impacts to wetlands and wetland vegetation. These impacts would be mitigated through compensation. In addition, BMPs would be implemented as part of the Proposed Action to minimize erosion and sedimentation during construction activities, and all necessary permits would be obtained before commencement of any construction activities. Therefore, no significant cumulative impacts would occur.</p>
FPL Saturn Electric Distribution Substation	<p>Construct a new electric distribution substation on a 4-acre (1.6-ha) site just south of the existing C-5 substation along the west side of Kennedy Parkway and adjacent to an existing transmission line. The C-5 substation serves LC-39.</p> <p>A REC was completed in April 2020.</p>	<p>Impacts from construction would be temporary in duration, and construction and operation activities would not overlap with the Proposed Action.</p>
Galaxy Way and Space Commerce Way Intersection Improvements	<p>Provide a dedicated visitor entrance to the KSC VC off of SCW and intersection improvements for public access and to accommodate transportation of Blue Origin’s New Glenn rocket from the manufacturing facility to LC-11 and LC-36.</p>	<p>Impacts from construction were temporary in duration and would not overlap with the Proposed Action.</p> <p>Operationally, any impacts to transportation from implementation of the Proposed Action would be offset by the new, four-lane road.</p>
Gateway to Space Exhibit	<p>Design and construct a new Gateway to Space Exhibit at the northwest side of the KSC VC and south of NASA Parkway West.</p> <p>No impacts to minor impacts to the 11 resources analyzed would occur from implementation of this project.</p> <p>Design and permitting is expected to be completed by March 2021 and construction is expected to be completed in 2021.</p>	<p>Impacts from construction would be temporary and would not overlap with the Proposed Action.</p>

Table 4-1 Past, Present, and Reasonably Foreseeable Actions Considered

Project	Project Description	Cumulative Impacts Analysis
MINWR Visitor Complex	<p>Replace the existing Visitor Complex at Merritt Island National Wildlife Refuge (MINWR) with a new, 8,100-ft² (753-m²) Community Conservation Education Center, interactive outdoor exhibits, and road and parking infrastructure.</p> <p>No significant impacts to 10 resources analyzed would occur from implementation of this project.</p> <p>Construction is expected to begin in 2021.</p>	<p>Impacts from construction would be temporary and would not overlap in time and space with the Proposed Action.</p> <p>Operationally, any impacts associated with increased visitors would not result in a potential for a cumulative impact due to the geographical distance between the MINWR Visitor Complex and the Proposed Action.</p>
OneWeb – Manufacturing Facility at Exploration Park	<p>Construct a 100,000-ft² (9,290-m²) satellite spacecraft integration facility at Exploration Park to support various federal and private commercial aerospace missions.</p> <p>The facility was fully operational in 2018.</p>	<p>Impacts from construction were temporary, and do not overlap with the Proposed Action.</p> <p>Operationally, any direct or indirect impacts are considered as part of this EA since the manufacturing facility has been operational since 2018.</p>
Shuttle Landing Facility (SLF) Blocks 2 through 6 Development	<p>This 15,000-foot (4.6-km) long runway is one of the longest in the world. Presently, the FAA is evaluating Space Florida’s proposal to operate a commercial space reentry site. If approved, Space Florida would support up to 17 reentries over a 5-year period (i.e., 2021 through 2025).</p> <p>NASA is currently assessing the potential environmental impacts associated with the design, construction, and build-out of the SLF Developable Land Blocks 2 through 6 at Cape Canaveral Spaceport. The proposed action would develop and construct infrastructure, including facilities and utilities at SLF, to support the Horizontal Take-Off and Landing capabilities for orbital and suborbital launch vehicles and services.</p> <p>The EA considered potential impacts to fish and wildlife; plants; floodplains; historical, architectural, archeological, and cultural resources; water quality; and wetlands. Specific to this EA, unavoidable impacts to floodplains and wetlands would occur.</p>	<p>The SLF project and the Proposed Action would result in unavoidable impacts to wetlands. These impacts would be mitigated through compensation. In addition, BMPs would be implemented as part of the Proposed Action to minimize erosion and sedimentation during construction activities, and all necessary permits would be obtained before commencement of any construction activities. Therefore, no significant cumulative impacts would occur.</p> <p>Operationally, any impacts would not result in a potential for a cumulative impact due to the geographical distance between the SLF and the Proposed Action.</p>
Space Coast Trail	<p>Construct a multi-use trail from Parrish Park at the entrance to the MINWR to Parking Area No. 1 within the CANA and following Kennedy Parkway from Beach Road (CR 402) to US 1.</p>	<p>Presently, design is expected to occur in FY 2022 and no construction date has been identified.</p> <p>Operationally, approximately 66 percent of the</p>

Table 4-1 Past, Present, and Reasonably Foreseeable Actions Considered

Project	Project Description	Cumulative Impacts Analysis
	<p>Adverse effects are expected to be minimal or negligible, and mitigation for unavoidable wetland impacts would occur within the refuge and result in no net loss of wetland function.</p> <p>Design is funded for FY 2022.</p>	<p>lands and waters within the MINWR are owned by NASA for KSC. However, the closest portion of the trail is approximately 8.3 miles (12.9 km) north of the proposed action area. Therefore, no potential for cumulative impacts exists.</p>
<p>SpaceX Hangar X Construction on Roberts Road</p>	<p>Construction and operation of a SpaceX Operations Area for booster and fairing processing and storage, and a launch and landing control center on a 67-acre (27-ha) site west of SR 3 on Roberts Road and A Avenue. The operations area would include a control center, a 133,000-ft² (12,356-m²) hangar, and a display of historic space vehicles.</p> <p>No significant impacts to 14 resources analyzed and no effect on historic properties would occur from implementation of this project.</p> <p>A construction start date has not been announced.</p>	<p>Impacts from construction would be temporary and would not overlap with the Proposed Action.</p> <p>Operationally, impacts are considered short in duration and would not result in a potential for a cumulative impact due to being geographically remote from the Proposed Action.</p>
<p>Visitor Complex Access Road</p>	<p>Provide a new four-lane, dedicated visitor entrance to the southwest corner of the existing KSC VC parking lot to SCW. Construction would also include the necessary stormwater treatment facilities and multi-use utility corridors.</p> <p>Roadway was completed in 2019.</p>	<p>Impacts from construction were temporary in duration and activities do not overlap with the Proposed Action.</p> <p>Operationally, the widening of SCW would improve transportation on KSC. Therefore, no adverse cumulative impacts would occur.</p>
<p>Vulcan Centaur Program Modifications at LC-41</p>	<p>Modify LC-41, the Vertical Integration Facility, and the Solid Motor Assembly and Readiness Facility and operate the Vulcan Centaur Program.</p> <p>No significant impacts to 16 resources analyzed and no effect on historic properties would occur from implementation of this project.</p> <p>The first planned launch of the Vulcan Centaur Launch Vehicle is expected for 2021.</p>	<p>Impacts from construction would be temporary and would not overlap with the Proposed Action.</p> <p>Impacts from launch operations are considered short in duration and would not result in a potential for a cumulative impact due to the geographical distance between LC-41 and the Proposed Action.</p>

Sources: 45th SW, 2019; Atkinson, 2019; Dean, 2018; FAA, 2017; FAA, 2020; FDOT et al., 2019; Foust, 2019; Gaedcke, 2020; Kelly, 2019; Kraum, 2014; KSC, 2020b; NASA 2008; NASA, 2018a; NASA, 2018b; NASA, 2018c; Space Florida, 2020; Space Florida, 2021; SpaceX and NASA, 2018; USFWS, 2019; and Waymer, 2019.

5.0 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 5-1 List of Individuals Who Prepared This Document

Preparers	Affiliation	Professional Title	Contribution
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Koller, Rich, PE, LEED AP	Jones Edmunds	Managing Director	QA/QC Document Review
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Berry, Stephen	LG2 Environmental Solutions	Vice President of Operations	Cumulative Impacts, QA/QC Document Review
Everson, Chrystal	LG2 Environmental Solutions	Senior NEPA Lead	Cumulative Impacts, QA/QC Document Review
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Dankert, Don	NASA/KSC	KSC NEPA Program Manager	Document Review
Brooks, James	NASA/KSC	KSC NEPA Coordinator	Document Review
Ryba, Jeanne	NASA/KSC	Cultural Resource Manager	Cultural Resources Review
Eggert, Pete	Space Florida	Director, Environmental Health and Safety	Document Review
Robertson, Ryan	Space Florida	Manager of Commercial Space	Document Review
Szabo, Steve, PE	Space Florida	Spaceport Development Program Manager	Document Review
Bontrager, Mark	Space Florida	Vice President, Spaceport Operations	Document Review

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Appendix 1 KSC Record of Environmental Consideration (REC) for
Proposed Action Boundary

Avoid Verbal Orders

TO: Space Florida/Pete Eggert

DATE: 11/24/2020

FROM: SI-E3/Environmental Management Branch

SUBJECT: KSC Record of Environmental Consideration (REC)

REC #: 11255

1. PROJECT INFORMATION

Project Title: Exploration Park Property Expansion

Project Lead: Pete Eggert, Space Florida, 321-266-9020

Project No.: SPFL 02-24-2020 (REV A)

Project Description:

Expansion of property at Exploration Park (north of SLSL/M6-1025) to support development and construction of Astronaut Training Complex.

11/24/2020 Update - Map submitted earlier in support of REC 19407 was preliminary. Proposed development area has been shifted slightly to west and expanded.

EPB Reviewer: LPH

Facility No.: North of M6-1025/SLSL

2. NEPA DETERMINATIONS

a. Categorical Exclusions per 14 CFR Part 1216.304(d)

e. Centerwide EIS

b. Environmental Assessment (EA) Required

f. AF Project on KSC/813

c. Environmental Impact Statement (EIS) Required

g. NASA Project on CCAFS/813

d. Existing FONSI or ROD

3. ENVIRONMENTAL REQUIREMENTS

a. Non-Permit Requirements

YES

NO

b. Permit Requirements

YES

NO

*****ORIGINAL REC ISSUED 02/26/2020*****
*****REC UPDATED 11/24/2020 Section 106 Consultation and archaeological survey required, Updated POC information, Revised T&E species and vegetation burning statements*****

2.b.1. ENVIRONMENTAL ASSESSMENT (EA): This project cannot be categorically excluded (CATEX) from further NEPA review based on information provided with the Environmental Checklist. The project proponent must develop an Environmental Assessment (EA) for development of the Astronaut Training Complex at KSC, in accordance with KDP-P-1726. For additional information, please contact Don Dankert of the NASA Environmental Management Branch (SI-E3, 321-861-1196).

3.a.1. SOLID WASTE MANAGEMENT UNIT (SWMU) SITES: The proposed project location is adjacent to and may overlap the boundary of SWMU #095, GSA Seized Property. This area is being investigated by the NASA Remediation Group under Remediation Project Manager (RPM) (Ryan O'Meara, SI-E2, 861-7719). A Land Use Control Implementation Plan (LUCIP) has been prepared for the SWMU. These controls are necessary to prohibit residential exposure to groundwater present at the site. All workers involved in subsurface/dewatering work must be notified (HAZCOM) of the potential for contamination present and it is recommended that an Industrial Hygienist be consulted for determination of required personal protective equipment (PPE). If any well point dewatering is necessary at these sites, contact the RPM for guidance on proper management of dewatering effluent. Contact your company's Safety and Health Office or NEMCON Industrial Hygiene (IH) for recommendations on personal protective equipment (PPE). NEMCON IH can be contacted at 867-2400 or at KSC-DL-EnvHealth/(KSC-DL-EnvHealth@mail.nasa.gov). Contact the NASA RPM for further guidance regarding handling of groundwater at this location.
The proposed project site is not within LUCIP boundary.

This project may also include work within the boundary of SWMU #097 Agricultural Sheds (Shed 2). This site been deemed a No Further Action site and therefore this project may proceed as proposed. There is no knowledge of any existing environmental contamination at this location.

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3.a.2. HAZARDOUS/NON-HAZARDOUS WASTE: All hazardous and non-hazardous wastes must be properly containerized, stored, labeled, manifested, shipped, and disposed of by Space Florida in full regulatory compliance. Hazardous wastes generated by this activity must be manifested, shipped, and disposed of under Space Florida's Environmental Protection Agency (EPA) identification number for the premises. Space Florida shall maintain copies of waste management records and manifests onsite and make them available for review by NASA upon request. Space Florida is responsible for any spills, releases, or other environmental contamination that occurs as a result of the proposed activities. A KSC Pollution Incident Report (PIR) Form (KSC Form 21-555) must be completed and submitted to the NASA Environmental Assurance Branch (EAB) within three (3) calendar days of the incident at KSC-DL-NASA-Env-Spill@mail.nasa.gov. All releases must be reported immediately by calling 321-867-7911, and then to the NASA EAB by calling 321-867-9005.

3.a.3. HAZARDOUS AND CONTROLLED WASTE (PAINT): This project will involve the application of paint coatings. All practical precautions must be taken to eliminate the possibility of a release of material or waste into the environment (primers/paints) from the paint surface preparation and painting operation. Paint chips, rust, debris, blast media, wastewater, etc. generated during preparation of surfaces will be contained and disposed of according to waste management guidelines given above in item 3.a.2.

There are special handling and waste management requirements for inorganic zinc (IOZ) coatings. When placed in a sealed container, IOZ paint can produce hydrogen and other gases from chemical reactions that occur during the curing process. The gas production builds pressure in the container and can cause the container to bulge and/or rupture thus creating a safety hazard. To meet environmental requirements and mitigate safety concerns, users of IOZ paint must physically separate IOZ paint related waste streams from other waste streams at the job site and manage their IOZ paint related waste streams according to the three categories below:

1) Leftover or unusable IOZ paint

Leftover or unusable IOZ paint must be stored in the original product containers supplied by the manufacturer with a loosely secured lid. Original product containers must then be placed into a larger closed drum or container that meets hazardous waste storage requirements and prevents any possible release to the environment. The larger closed drum or container must have a 5 psi pressure relief vent to avoid potential safety hazards. Cleaning solvents may NOT be placed into these containers.

2) Spent cleaning solvents

Waste cleaning solvent containers must have 5 psi pressure relief vents to avoid potential safety hazards

3) Solids from IOZ paint mixing and painting operations

Includes rags, brushes, rollers, empty cans, empty buckets, liners, stirring sticks, personal protective equipment, masking paper/tape, and any other waste materials that have contacted IOZ paint

- Solid waste containers must have 5 psi pressure relief vents to avoid potential safety hazards

- Empty paint cans and buckets can be disposed as unregulated waste provided that all paint is wiped out of them. The spent rags/wipes used to wipe paint out of the cans or buckets shall be managed as waste under this category.

Contractors are responsible for contacting the KSC Waste Management Office (867-8640) to arrange pickups of leftover/unusable paints, and to remove solvent or regulated paint waste when the containers are full.

Contact Al Gibson (SI-E2, 861-0863) if you have any questions.

3.a.4. PAINT DISTURBANCE/REMOVAL: This project may involve disturbance/removal of paint coatings. Unless known to be non-hazardous, the coatings must be sampled and analyzed for the 8 RCRA hazardous metals (Ag, As, Ba, Cd, Cr, Hg, Pb, and Se) and PCBs. Materials with coatings which contain heavy metals or PCBs must be managed and disposed in accordance with OSHA standards and hazardous waste regulations.

Disposal of painted materials: Painted construction and demolition waste items will be accepted at the KSC Class III Landfill without PCB or TCLP analysis but must be managed according to PCB bulk product waste storage regulations in 40 CFR Part 761 until disposal in the landfill.

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This includes covering the materials and storing them on an impermeable surface for protection against precipitation and prevention of soil contamination. Guidelines for disposal of items at the KSC Class III Landfill are outlined in Kennedy NASA Procedural Requirements (KNPR 8500.1, Chapter 14). Contact Zach Hall (SI-E2, 867-5178) for the current version of these requirements.

3.a.5. STORAGE TANKS: The NASA Environmental Assurance Branch (SI-E2) considers Space Florida or their tenant to be the responsible party to ensure regulatory compliance associated with the proposed installation of the petroleum storage tank system or any petroleum storage tank systems in accordance with the requirements of Florida Administrative Codes 62-761 and 62-762. Due to the size of the petroleum storage tank it will be required to be registered with the State of Florida. The Florida Department of Environmental Protection (FDEP) has contracted the responsibility to ensure registered storage tank compliance in Brevard County to Brevard County Natural Resource Management Department (BCNRMD).

3.a.6. SPILL PREVENTION, CONTROL, AND COUNTERMEASURES (SPCC) PLAN: Owners or operators of a facility that produces, stores, or consumes oil or petroleum products in amounts of 1,320 gallons or greater, and could potentially discharge oil in quantities that may be harmful, are required by the U. S. Environmental Protection Agency to prepare a spill prevention, control, and countermeasures (SPCC) plan. An SPCC plan documents the procedures for the prevention, response, control, and reporting of spills of oil to navigable waters or adjoining shoreline. This plan serves as a guide for personnel and organizations responsible for ensuring that all measures are taken to prevent and contain spills and leaks of oil in accordance with Chapter 40, Code of Federal Regulations (CFR) Part 112. Fuel transfers from the storage tank to mobile refuelers would also require spill prevention procedures and countermeasures, such as spill kits, to be available during fuel transfers. In most cases, a professional engineer is required to prepare and/or amend an SPCC plan. Space Florida or tenant is responsible for the development of their SPCC Plan.

3.a.7. THREATENED AND ENDANGERED/PROTECTED SPECIES: Development of the proposed Astronaut Training Complex site has the potential to impact protected or threatened and endangered wildlife species including the Eastern indigo snake, Florida Scrub-jay, and the gopher tortoise, and in the case of the gopher tortoise, the burrows must be identified and avoided if possible. If identified burrows are within the area of construction, relocation of animal in question will be required. Relocation of gopher tortoises requires a Florida Fish and Wildlife Conservation Commission permit. Additional information on gopher tortoise permits can be found at <http://myfwc.com/license/wildlife/gopher-tortoise-permits/>.

A biological survey will be required to identify potential impacts to habitat within the two weeks immediately preceding start of site work. A biological survey will be required to identify potential impacts to habitat within the two weeks immediately preceding start of site work. After the survey has been performed and if gopher tortoise burrows are observed please contact James Brooks (SI-E3, 867-9081).

Please see the Standard Protection Measures for the Indigo Snake provided with this REC. If any indigo snakes are observed, halt all work until the snake has left the area and please inform James of the sighting. Do not harm or harass the snakes.

3.a.8. SCRUB COMPENSATION: This project may also result in the clearing of areas identified as scrub-jay habitat. Per the KSC scrub-jay Biological Opinion (permit) with the USFWS, the impact may require mitigation to offset scrub habitat loss. Mitigation activities must be coordinated through the NASA EMB (Don Dankert, SI-E3, 861-1196) and be completed within one year of construction start.

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3.a.9. **EXTERIOR LIGHTING:** The installation/modification and use of any lighting that is visible from the exterior of a facility or structure must be in compliance with the requirements in the KSC Exterior Lighting Guidelines in Chapter 24 of KNPR 8500.1 Rev. E, and requirements of the US Fish and Wildlife Service Biological Opinion for KSC regarding dark skies and artificial lighting. Submit the manufacturers cut sheet data and spectral power distribution graphs for the actual lighting to be installed for review by the NASA Environmental Management Branch (EMB). Safety and hazardous operations can apply for a waiver to allow for use of non-compliant lighting; however, justification must be provided to the EMB. Development of a lighting operations manual (LOM) that meets these criteria is required for all new structures or facilities. Please contact Don Dankert (SI-E3, 861-1196) for additional information, and for guidance on development of a LOM or for a copy of the referenced documents.

3.a.10. **HISTORICAL AREA:** The Historic and Archaeological Site Location Predictive Model for KSC prepared in May 2009 reported a historic area containing four structures adjacent and east of Range Road just north of the AOS Manufacturing Facility (M6-1020). In the event that any historical, archaeological, or cultural artifacts or human remains are unearthed, cease all activities at the site and contact the KSC Cultural Resources Manager, immediately. For more information, contact Jeanne Ryba (SI-E3, 867-7824).

11/24/2020 Update: An archaeological survey and Section 106 consultation is required for the proposed expansion of Exploration Park. No Archaeological Resources Protection Act (ARPA) permit is necessary to conduct survey however all laws regarding ARPA must be followed.

3.a.11. **EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICES (BMPs):** Precautions must be made to eliminate or reduce to the greatest extent possible any discharge of sediments outside established project boundaries. This can be accomplished by initiating proactive erosion control BMPs. Installation and maintenance of appropriate erosion/sediment control devices (such as wattles, turbidity screens, silt fences, inlet protectors, floating turbidity booms, etc.) must be completed prior to initial land disturbance where the possibility of sediment discharge could impact surrounding stormwater conveyances and other surface waters. The BMPs must be maintained so they remain functional until such time that the newly exposed soils are stabilized with sod or natural vegetation.

3.a.12. **CONCRETE WASHOUT:** Water used to rinse out concrete trucks and other equipment used for concrete work must not be allowed to discharge to surface waters. Concrete washout water shall be diverted to a settling pond where suspended material will settle out and the water can percolate into the ground. Contact Doug Durham (SI-E2, 867-8429) with any question on this requirement. Remove and dispose of hardened concrete waste consistent with your handling of other construction wastes. After drying/settling, the residue may be disposed of at the Diverted Aggregate Reclamation and Collection Yard (DARCY); and the ground restored. Clean, unstained, unpainted concrete residue is accepted at the DARCY without any sampling and analysis. Contact Zach Hall (SI-E2, 867-5178) with any questions on this requirement.

3.a.13. **RECYCLING:** The contractor must make every practical effort to reclaim and segregate materials that have the ability to be recycled. All reclaimed concrete (see Item 3.a.14) must be segregated from other wastes and transported to the KSC Landfill (L7-0071) on Schwartz Road. All reclaimed scrap metal, not being recycled by contractor outside of KSC, must be transported to the Reutilization, Recycling and Marketing Facility (RRMF) with a KSC Form 7-49. Please turn these items and the KSC Form 7-49 in to RRMF personnel to ensure the proper disposition of the materials prior to leaving the recycling area. For any other information regarding materials that can be recycled or other general information regarding recycling policies at KSC, please contact the Environmental Management Branch (Annie Williams, SI-E3, 867-8720).

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SUBJECT: KSC Record of Environmental Consideration (REC)

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3.a.14. CONCRETE RECYCLING/DISPOSAL: Clean, unstained, unpainted concrete is accepted at the Diverted Aggregate Reclamation and Collection Yard (DARCY) without any sampling and analysis. Painted concrete must have PCB and Total Metals analyses (limited to Pb, Cd, and Cr) performed to determine whether it will be accepted at the DARCY for reuse. The results of the analysis must show metal concentrations below the residential cleanup level (Pb = 400 ppm, Cd = 82 ppm, Cr = 210 ppm) and PCB levels below 0.5 ppm. If no testing is done or if PCB and/or Total Metals concentrations are above residential cleanup levels, coated concrete goes to the landfill as construction/demolition debris. When feasible, painted concrete should be segregated from unpainted concrete for placement in the DARCY. No oil-stained concrete will be accepted at the DARCY. Due to the potential for PCB contamination, all removed concrete associated with oil-containing electrical equipment must be disposed through the KSC Waste Management Office as regulated PCB waste. To coordinate or for more information, contact Zach Hall (SI-E2, 867-5178).

3.a.15. GREEN PURCHASING/SUSTAINABLE ACQUISITION: Federal agencies and their contractors are required to purchase products made from recycled or recovered materials and other environmentally preferable products whenever possible. The Green Compilation Tool found at <https://sftool.gov/greenprocurement> provides information and useful links and tools to identify applicable green/sustainable acquisition requirements for products and services (Ref. FAR subpart 23.1 and NPR 8530.1). A Request for Waiver Form (KSC 28-825 NS) must be submitted when a product or service meets the green/sustainable requirements but is not procured. Please contact Annie Williams (SI-E3, 867-8720) with any questions on this requirement.

3.b.1. EXCAVATION PERMIT: A KSC Excavation Permit will be required for any digging proposed by this project. Please contact the Utility Locate/Excavation Permit Request Customer Helpline at 867-2406 or go to website at <http://epr.ksc.nasa.gov/Home/> for an underground utility scan and dig permit. NOTE: If a trench or pit is to be left open all day or overnight, the trench/pit must be checked for trapped animals at the beginning and end of each work shift. If an animal is observed trapped, contact Becky Bolt (NEM-022, 867-7330) or the Duty Office (861-5050, email KSC-BOSS-DutyOffice@mail.nasa.gov) to arrange removal/release. Do not handle the animal(s).

3.b.2. ENVIRONMENTAL RESOURCE PERMIT (ERP) - STORMWATER: An ERP stormwater permit will be required for changes (increase or decrease) in ground cover, stormwater flow patterns, or impervious area. Space Florida shall prepare all permit applications and pay any application fees. The NASA Environmental Assurance Branch (EAB) will sign the permit application as the landowner if legally required. Space Florida shall submit courtesy copies of all applications to the NASA EAB within five (5) working days after submission to the SJRWMD. Space Florida shall submit courtesy copies of the permit to the NASA EAB within five (5) working days after receipt from the SJRWMD and shall ensure that all operations, activities, equipment, and facilities are in full compliance with all permit conditions. Space Florida shall maintain copies of all records required to demonstrate compliance with the permit onsite and make them available for review by NASA upon request. No work can be performed until the permit process is completed. Please contact Doug Durham (SI-E2, 867-8429) for more information.

3.b.3. ENVIRONMENTAL RESOURCE PERMIT (ERP) and ACOE Permit: Wetland permits from the St. Johns River Water Management District (SJRWMD) and US Army Corp of Engineers (ACOE) may be required for the proposed development of the Astronaut Training Complex. Space Florida shall prepare all permit applications and pay any application fees. Application forms with supporting material such as maps and engineering drawings must be submitted to the EMB (Jeff Collins, SI-E3, 861-6554) for review and NASA signature as the landowner if legally required. Space Florida shall submit courtesy copies of all applications to the NASA EAB within five (5) working days after submission to the SJRWMD and ACOE. Space Florida shall submit courtesy copies of the permit to the NASA EAB within five (5) working days after receipt from the SJRWMD and ACOE, and shall ensure that all operations, activities, equipment, and facilities are in full compliance with all permit conditions. Space Florida shall maintain copies of all records required to demonstrate compliance with the permit onsite and make them available for review by NASA upon request. No work can be performed until the permit process is completed.

Avoid Verbal Orders

TO: Space Florida/Pete Eggert

DATE: 11/24/2020

FROM: SI-E3/Environmental Management Branch

SUBJECT: KSC Record of Environmental Consideration (REC)

REC #: 11255

3.b.4. FDEP NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) CONSTRUCTION ACTIVITY PERMIT: This project may require an NPDES Phase II construction permit. If 1 acre or more of land will be disturbed, a NPDES Construction Activity Permit from the Florida Department of Environmental Protection (FDEP) is required under F.A.C. 62-621.300(4), Notice of Intent to Use Generic Permit for Stormwater Discharge from Large (If over 5 Acres) and Small (1 Acre To 5 Acres) Construction Activities. http://www.dep.state.fl.us/water/stormwater/npdes/forms/cgp_noi.pdf. This includes construction activity which will disturb less than one acre of land area that is part of a larger common plan of development that will ultimately disturb equal to or greater than one acre of land. Construction activity does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of the site. A condition of this permit is to provide a Stormwater Pollution Prevention Plan (SWPPP) detailing erosion and turbidity controls for the site. Information on completing the permit application and development of the SWPPP can be obtained by contacting Doug Durham (SI-E2, 867-8429).

3.b.5. DEWATERING: Construction dewatering is exempted from permitting under conditions of Rule 40C-2.051 (7) providing the conditions of exemption are met including: limiting withdrawal methods, limiting withdrawal to less than 300,000 gpd and limiting withdrawal to 30 days. Additional limitations are placed on discharge of produced water to prevent harm to the environment. If conditions of the exemption cannot be met, a construction dewatering general permit is required from SJRWMD using Form 40C-2.900(12). No dewatering may begin until 10 days after submittal of the complete form. If the dewatering activity does not qualify for a general permit by rule under Rule 40C-2.042(9), F.A.C., you must complete and submit a SJRWMD application for an individual Consumptive Use Permit pursuant to Rule 40C-2.041, F.A.C. Approval of the application must be obtained before starting the dewatering activity. If produced water discharge will reach surface waters, an FDEP permit may be required under Rule 62-621.300-2. Contact Doug Durham (SI-E2, 867-8429) with questions related to these requirements.

3.b.6. WATER RESOURCE PERMITTING (Domestic Wastewater): Proposed activities may require a permit from FDEP for the alteration or installation of utilities for transport of domestic wastewater. The organization responsible for the work will ensure that best engineering practices, codes, specifications and standards are followed. Additional flow to the sanitary sewer system will require coordination and approval from the KSC domestic wastewater collection/transmission system operator and the Cape Canaveral Air Force Station domestic wastewater treatment plant operator. Upgrades to the KSC and Cape Canaveral Air Force Station (CCAFS) infrastructure, beyond the Space Florida domestic wastewater collection/transmission system, may be required for connection to the KSC sanitary sewer system. These upgrades may include increasing the ability of the KSC domestic wastewater collection/transmission system to transmit, store, and equalize the flow to the CCAFS plant.

Space Florida shall obtain all required environmental permits, prepare application, and pay application fees. The proposed connection to the wastewater collection and transmission system must be coordinated with the KSC wastewater system operator. The NASA EAB will sign permit application as landowner or utility system owner if legally required. Contact Doug Durham (SI-E2, 867-8429) for assistance. Space Florida shall submit courtesy copies of all applications to the NASA EAB within five (5) working days after submission to FDEP. and shall submit courtesy copies of the permit to the NASA EAB within five(5) working days after receipt from FDEP.

3.b.7. INDUSTRIAL WASTEWATER: The proposed project may generate industrial wastewater. State of Florida regulations define industrial wastewater as any wastewater that is not classified as domestic wastewater. An Industrial Wastewater Permit may be required for discharge. The initiating organization or contractor shall follow FDEP's Guide to Permitting Wastewater Facilities or Activities under Chapter 62-620 when preparing the application package and submit the draft application package (five copies) to the NASA Environmental Assurance Branch (EAB) for review and comment. The designs, site plans, specifications, drawings, documents, or forms required by FAC 62-620 must be signed and sealed by a P.E. registered in the state of Florida. Permit applications must be submitted to FDEP from NASA EAB at least 180 days before a discharge occurs and at least 90 days prior to commencing construction. Contact Doug Durham (SI-E2, 867-8429) for additional assistance.

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TO: Space Florida/Pete Eggert

DATE: 11/24/2020

FROM: SI-E3/Environmental Management Branch

SUBJECT: KSC Record of Environmental Consideration (REC)

REC #: 11255

3.b.8. WATER RESOURCE PERMITTING (Potable Water): The proposed project may require a permit for the alteration or installation of utilities for transport of potable or FIREX water. Any work done will be per standards and criteria set forth in the permit requirements, and not jeopardize the health and safety of personnel due to effects of the construction/modification on the KSC potable water system (i.e. disinfection and verification prior to use). Upgrades to the KSC infrastructure, may be required for connection of the proposed Astronaut Training Complex to the KSC water system.

Space Florida shall obtain all required environmental permits, prepare application, and pay application fees. The proposed connection to the potable water system must be coordinated with the KSC public water system operator. The NASA EAB will sign permit applications as landowner or utility system owner if legally required contact Doug Durham (SI-E2, 867-8429) for assistance. Space Florida shall submit courtesy copies of all applications to the NASA EAB within five (5) working days after submission to FDEP. Space Florida shall submit courtesy copies of the permit to the NASA EAB within five (5) working days after receipt from FDEP, and ensure that all operations, activities, equipment, and facilities are in full compliance with all permit conditions. Space Florida shall maintain copies of all records required to demonstrate compliance with the permit onsite and make them available for review by NASA upon request.

3.b.9. TRANSFORMERS/GENERATORS: The temporary operation of portable generators during construction is allowed and is not considered a stationary source of air emissions. New generators proposed for permanent use at the facility, and associated air emissions must be reviewed for determination of construction permit and RICE (Reciprocating Internal Combustion Engine) NESHAP (National Emission Standards for Hazardous Air Pollutants) requirements. If a new transformer or generator using a volume of oil equal to or greater than 55 gallons is to be installed, it is subject to SPCC rules.

3.b.10. AIR EMISSIONS (Paint VOCs): Based on the coatings to be applied, this project may emit Volatile Organic Compounds (VOCs) and Hazardous Air Pollutants (HAPs) during painting activities. The emissions are fugitive in nature and no air permitting is required. Contact the Environmental Assurance Branch (Zach Hall, SI-E2, 867-5178) if you have any questions.

3.b.11. ON-SITE BURNING OF CLEARED VEGETATIVE MATERIAL (Only Approved Method Is Air Curtain Burn): Every effort must be made to deliver land-clearing debris to the appropriate disposal area. Combustible vegetative material may be burned within the confines of KSC after obtaining a Burn Permit issued by the KSC Fire Inspector. Burning shall be in accordance with conditions required in the burn permit, as well as, all requirements for conducting an air curtain burn. As such, contractors that clear and burn or solely burn vegetative material must accomplish the following:

As a standard from the Tri-Agency Prescribed Burn agreement, no burns will be conducted:

18 hours prior to a Static Test Fire, Wet Dress Rehearsal, or similar major milestone supporting any of our launching mission partners

24 Hours prior to a launch on Kennedy Space Center or CCAFS

Notify KSC Spaceport Integration (Eric Haberle [Desk (321) 861-6380 / Cell (321) 360-6716] or Greg Gaddis [Desk (321) 861-9556] / Cell (321) 607-2595] three business-days ahead of planned burn for a review of possible operational impacts.

After the site is prepared for burning, notify Tom Penn (US Fish and Wildlife Service, (321) 861-2288, tom_penn@fws.gov of the proposed air curtain burning.

Contact the Florida State Division of Forestry Cocoa Field Office ((321) 690-6465) to notify them of the planned burning of land clearing debris and schedule an inspection to ensure the setbacks, piles, and equipment are set up properly. The Cocoa Office will send inspection paperwork to the Division of Forestry Orlando District Field Unit who will issue a valid burn control number.

Call the Orlando Unit (407-888-8767) every day before burning to receive a Burn Authorization Number.

Call the KSC Duty Office at (321) 861-5050 for a Burn Permit a minimum of 48 hours prior to the burn and daily prior to ignition of burns to ensure there are no spaceport operations planned that require burn constraints. The KSC Fire Inspector will schedule an onsite visit for the day you get the Burn Authorization Number.

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TO: Space Florida/Pete Eggert

DATE: 11/24/2020

FROM: SI-E3/Environmental Management Branch

SUBJECT: KSC Record of Environmental Consideration (REC)

REC #: 11255

No other environmental issues were identified based upon the information provided in the KSC Environmental Checklist. This Record of Environmental Consideration (REC) does not relinquish the project lead from obtaining and complying with any other internal NASA permits or directives necessary to ensure all organizations potentially impacted by this project are notified and concur with the proposed project.

Due to potential changes in regulations, permit requirements and environmental conditions, statements in this REC are valid for 6 months, and subject to review after this period. It is the responsibility of the project lead to submit current project information for a REC update prior to project commencement if REC is older than 6 months; and also to notify the Environmental Management Branch (SI-E3) if the scope of the project changes at any time after the REC is issued.

P. Eggert/Space Florida

cc:

J. Ryba/SI-E3

J. Collins/SI-E3

D. Durham/SI-E2

R. O'Meara/SI-E2

4. Upon evaluation of the subject project, the above determinations have been made and identified. Contact the Environmental Management Branch (SI-E3) at 861-1196 for re-evaluation should there be any modifications to the scope of work.



Jeffrey Collins

11/24/2020 15:18

Date

Appendix 2 BRPH Exploration Park North; Preliminary Site Evaluation Report. October 2020.
Report to Space Florida



Board of Architecture License No. AA C000149
Certificate of Authorization – Engineering 1439

Prepared for:
Space Florida
505 Odyssey Way, Suite 300
Exploration Park, FL 32953

Prepared by:
BRPH Architects-Engineers, Inc.
5700 North Harbor City Blvd., Suite 400
Melbourne, FL 32940

Exploration Park North: Preliminary Site Evaluation

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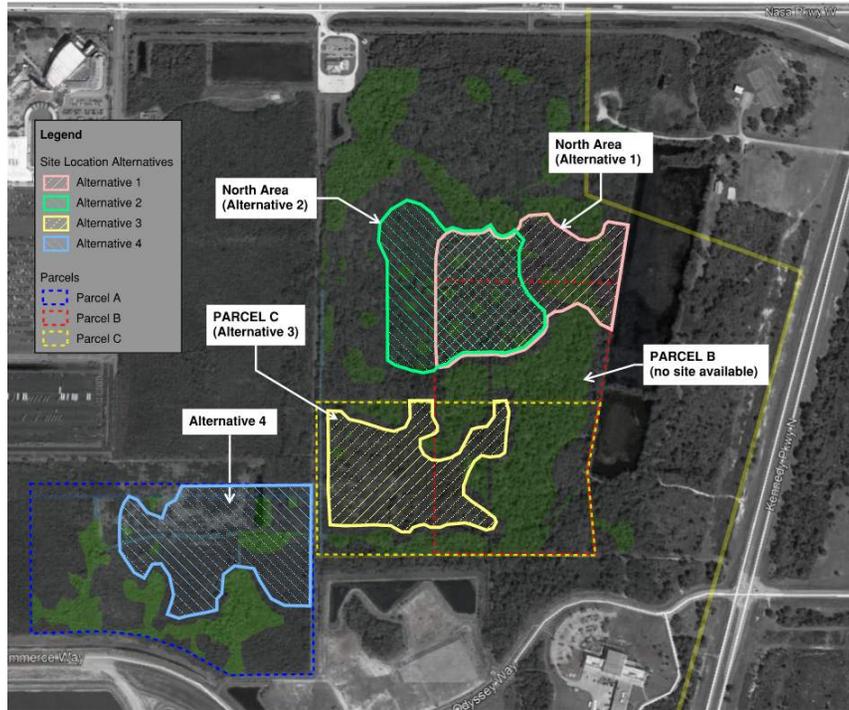
Executive Summary

NASA and Space Florida are considering locations to the north of the existing Exploration Park Phase I to provide a site for a future customer. The customer plans to build a facility to provide commercial astronaut training to private users, in addition to onsite accommodations for astronaut trainees. Three pre-identified parcels (roughly 35-40 acres each) to the north of the Exploration Park Phase I and the surrounding areas were presented as candidate parcels for evaluation. Land cover and wetlands, floodplains and topography, listed species, proximity to utilities and access, and readily developable area to support the customer's program were considered in the analysis.

Four alternative site locations/development areas were identified to support the program. Alternatives 1 and 2 are located north and northwest of Parcel B respectively, while Alternatives 3 and 4 utilize Parcel C and A respectively (see Summary Exhibit 1). While the pre-identified parcel boundaries may have tracts that are viable for development, the area to the north presents greater development potential and fewer environmental impacts. These options have also been evaluated to address visibility and security restrictions. The ranked comparison of each area with respect to the elements evaluated is summarized below (see Summary Exhibit 3). Based on site constraints and the customer's envisioned facility program, BRPH recommends Alternative 2 as the optimal site to focus the proposed development, with auxiliary and future support areas in the Alternative 3 and 4 areas.

To accommodate future development and supporting site access roads and auxiliary structures, the customer proposes the following approximately 60-acre parcel for land transfer and NEPA analysis (see Summary Exhibit 2). This concept is a hybrid of several development scenarios and accommodates the program requirements not only of the initial phase, but also provides space for buffers and future expansion, reduces environmental impacts and development costs, and meets the customer's long-term objectives.

EXPLORATION PARK NORTH: PRELIMINARY SITE EVALUATION



Summary Exhibit 1: Alternative Areas Evaluated



Summary Exhibit 2: Proposed Parcel and Conceptual Layout

Category Weight	Land Cover		Wetlands		Floodplains		Listed Species		Topography (Fill Cost)		Soils		Security		Utilities & Access		Developable Area		Weighted Avg
	1	3	2	5	2	2	1	3	2	3	2	3	2	3	3	3			
North Area Alternative 2	4	Most Desirable	4	2.5 ac	5	Least impact	5	N/A	4	\$1.8 M	3	C/D	3	Least Desirable	2		5	16.5 ac	3.9
PARCEL C (Alternative 3)	2		5	0.3 ac	1	Most impact	5	N/A	3	\$2.0 M	3	C/D	5		4		2	13 ac	3.5
PARCEL A (Alternative 4)	3		2	1.3 ac	3		5	N/A	2	\$2.1 M	4	B/D	5	Most Desirable	5	Most Accessible	3	15.4 ac	3.5
North Area Alternative 1	3		2	2.6 ac	4		5	N/A	3	\$2.0 M	3	C/D	4		1	Least Accessible	5	16.6 ac	3.4
PARCEL B	1	Least Desirable	1	6.3 ac	2		5	N/A	1	\$2.3 M	3	C/D	4		3		1	7.5 ac	2.3

Summary Exhibit 3: Development Alternative Rankings

EXPLORATION PARK NORTH ENVIRONMENTAL ASSESSMENT PRELIMINARY SITE EVALUATION

NASA and Space Florida are considering locations to the north of the existing Exploration Park Phase I to provide a site for a future customer. The customer plans to build a facility to provide commercial astronaut training to private users, in addition to onsite accommodations for astronaut trainees.

NASA has identified three potential parcels (approx. 35 to 40-ac each) as candidates for this development. The BRPH team has been tasked to evaluate the development potential for the proposed facilities in this area with the aim of defining the approximate limits of the proposed parcel. Adjacent areas outside of the three pre-identified parcels were also investigated to identify the best potential alternative to minimize environmental impacts and development costs.

1.0 PROJECT DESCRIPTION

The proposed facilities include an Astronaut Training Facility, Astronaut Accommodations, and Auxiliary and Support Facilities. The customer also plans to provide a reception area located outside of the proposed parcel, within the previously graded Exploration Park Phase I area, as well as a covered parking area adjacent to this reception facility equipped with a 1MW solar farm via roof panels. Future phases of the program may include additional training or accommodations facilities. To host this program, the selected parcel requires at least 40 acres, with at least 15 contiguous acres available for development of buildings, internal roads, and parking facilities for each phase of development. The three pre-identified potential parcels are located north of Space Commerce Way and Odyssey Way in Exploration Park (see Figure 1).

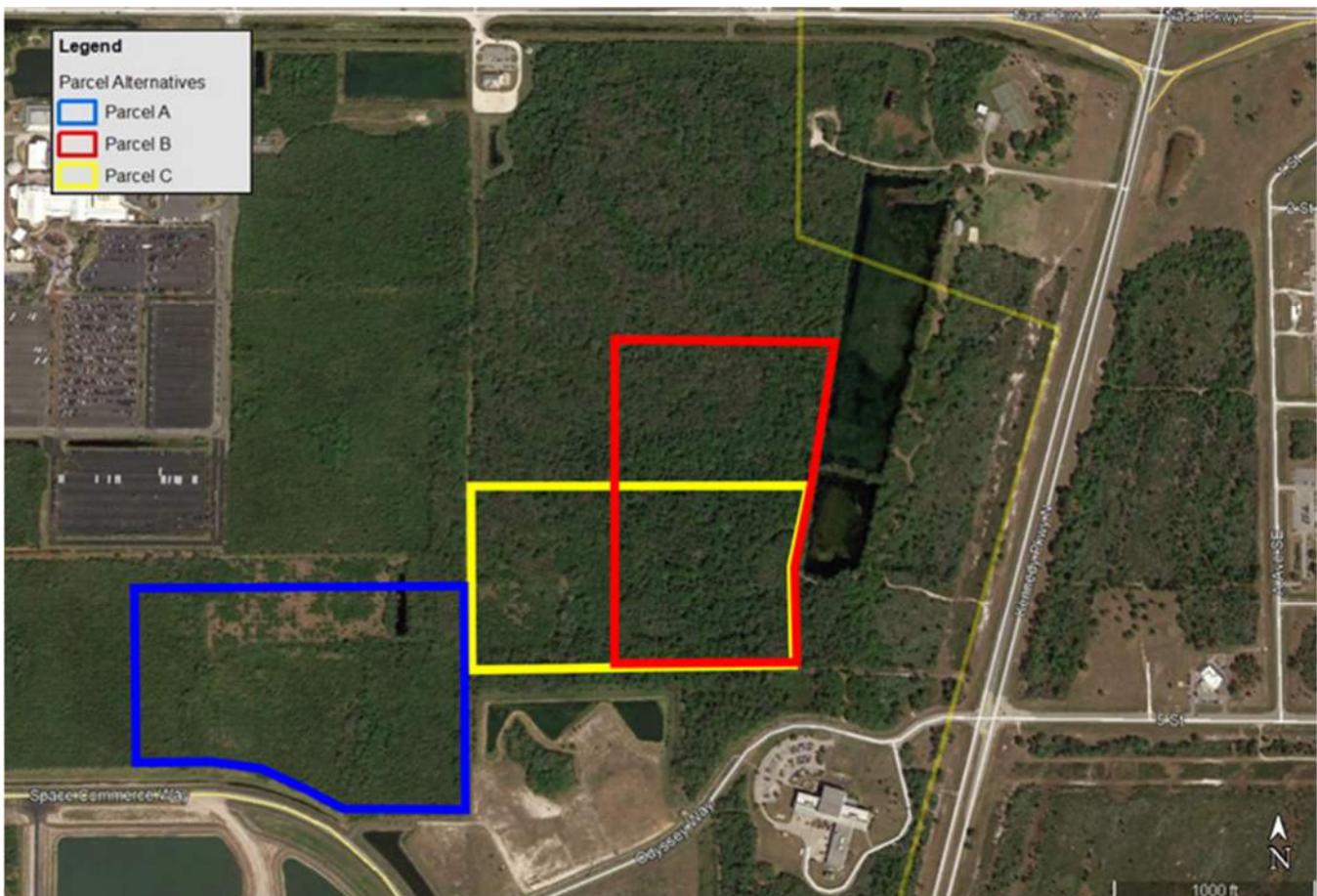


Figure 1: Area and Parcel Areas of Interest

2.0 EXISTING SITE CONDITIONS

2.1 LAND COVER

In mid-June 2020, Jones Edmunds scientists conducted a preliminary site assessment to evaluate, characterize, and estimate the limits of upland and wetland vegetation communities in the three pre-identified parcels. In addition, the potential occurrence or presence of suitable habitat for listed wildlife species at each of the three parcels was assessed. The onsite vegetative communities within the project vicinity (to include the three parcels and additional area to the north) were categorized using the 1999 Florida Land Use, Cover, and Classification System (FLUCCS) developed by the Florida Department of Transportation. Results of this assessment are provided below and in Section 2.6.

Parcel	Parcel Acreage	Wetland Acreage and Surface Water Acreage	Upland Acreage
A	38	11	27
B	40	20	20
C	37	14	23

Table 2-1: Upland and Wetland Acreage Summary

2.1.1 Parcel A

Parcel A is former citrus grove and is now dominated by very large and dense Brazilian pepper, an exotic invasive shrub. Parcel A is composed of one upland community, one surface water community, and one wetland community (Figure 2). Each onsite community is described below.



Figure 2: Wetland and Surface Water Map

Uplands

Of the approximately 38-acre site, the non-highlighted uplands characterized as Abandoned Citrus Groves (FLUCCS Code 2210) comprise approximately 27- acres (Figure 2, Table 2-1). The Abandoned Citrus Grove community consists of previously cleared areas that were planted with citrus. This low-quality community is dominated by varying densities of Brazilian pepper (*Schinus terebinthifolius*) and guinea grass (*Panicum maximum*). Scattered native species include sabal palm (*Sabal palmetto*), beautyberry (*Callicarpa Americana*), wild coffee (*Psychotria nervosa*), shortleaf wild coffee (*Psychotria sulzneri*), marlberry (*Ardisia escallonioides*), and caesarweed (*Urena lobata*). The upland communities exhibit no indication of hydrology near the surface and soils lack hydric indicators within 6 inches of the soil surface.

Surface Waters

The Surface Water community (FLUCCS Code 5100) comprises approximately 1-acre (Figure 2, Table 2-1) and consists of upland cut canals and ditches that were dug to drain the land for citrus production. Vegetation is dominated by herbaceous species such as bluestem (*Andropogon glomeratus* and *virginicus*), arrowhead (*Sagittaria latifolia*), marsh pennywort (*Hydrocotyl umbellata*), and cattail (*Typha* sp.). These features drain the parcel to the west and then south under Space Commerce Way via a large north/south canal.

Wetlands

On-site wetlands are characterized as Exotic Wetland Hardwoods (FLUCCS Code 6190) and comprise approximately 10-acres (Figure 2, Table 2-1). This vegetation community is very low quality because it is dominated by Brazilian pepper with little to no native species present. Native species observed in these wetlands include scattered saltbush (*Baccharis halimifolia*), Carolina willow (*Salix caroliniana*), wax myrtle (*Myrica cerifera*), dayflower (*Commelina diffusa*), bluestem (*Andropogon* sp.), and marsh pennywort (*Hydrocotyl umbellata*). Surface water is present within the lower elevations, with hydric soils that support inundation at or above the surface for extended periods.

2.1.2 Parcel B

Parcel B is composed of one upland community and one wetland community (Figure 2). Each onsite community is described below.

Uplands

Of the approximately 40-acre site, uplands characterized as Temperate Hardwood (FLUCCS Code 4250) comprise approximately 20-acres (Figure 2, Table 2-1). The Temperate Hardwood community is medium to high quality and dominated by cabbage palm, live oak (*Quercus virginiana*), laurel oak (*Q. laurifolia*), myrsine (*Myrsine guianensis*), strawberry guava (*Psidium cattleianum*), wild coffee (*Psychotria* spp.), beautyberry (*Callicarpa americana*), wild coffee (*Psychotria nervosa*), shortleaf wild coffee (*Psychotria sulzneri*), marlberry (*Ardisia escallonioides*), and caesarweed. There is lower quality upland habitat in the southwest region of the parcel that was former citrus grove and is dominated by the same Parcel A species.

Wetlands

On-site wetlands are characterized as Mixed Wetland Hardwoods (FLUCCS Code 6170) and comprise approximately 20-acres (Figure 2, Table 2-1). These medium to high quality wetlands are dominated by red maple (*Acer rubrum*), sabal palm, American elm (*Ulmus americana*), laurel oak, buttonbush (*Cephalanthus occidentalis*), Brazilian pepper, saltbush (*Baccharis glomerulifolia*), swamp dogwood (*Cornus foemina*), sword fern (*Blechnum serrulatum*), Virginia chain fern (*Woodwardia virginica*), poison

ivy (*Toxicodendron radicans*), grapevine (*Vitis rotundifolia*), blackberry (*Rubus argutus*), and royal fern (*Osmunda regalis*).

2.1.3 Parcel C

Parcel C is composed primarily of one upland community, one surface water community, and one wetland community (Figure 2). Each onsite community is described below.

Uplands

Of the approximately 37-acre site, uplands characterized as Temperate Hardwood (FLUCCS Code 4250) comprise approximately 23-acres (Figure 2, Table 2-1). The Temperate Hardwood community is medium to high quality and dominated by cabbage palm, live oak, laurel oak, myrsine, strawberry guava, beautyberry, wild coffee, shortleaf wild coffee, marlberry, air potato (*Dioscorea bulbifera*), poison ivy, blackberry, grapevine, and caesarweed. There is lower quality upland habitat in the southwest region of the parcel that was former citrus grove in and is dominated by the same Parcel A species.

Surface Waters

The Surface Water community (FLUCCS Code 5100) comprises 0.5- acre and consists of upland cut canal on the east side of Range Road (Figure 2, Table 2-1). Vegetation is dominated by herbaceous species such as arrowhead, marsh pennywort, and cattail.

Wetlands

On-site wetlands are characterized as Mixed Wetland Hardwoods (FLUCCS Code 6170) and comprise approximately 13.5-acres (Figure 2, Table 2-1). These medium to high quality wetlands are dominated by red maple, sabal palm, American elm, laurel oak, buttonbush, Brazilian pepper, saltbush, swamp dogwood, sword fern, blackberry Virginia chain fern, and royal fern.

2.1.4 Wetland Jurisdiction, Impacts, and Mitigation

Effective June 2020, a new rule called the Navigable Waters Protection Rule (NWPR) was implemented by the U.S. Army Corps of Engineers (USACE). This rule determines what surface waters and wetlands fall under federal jurisdiction and are thus regulated by the USACE. Based on wetland jurisdictional determination requirements under the NWPR and preliminary field investigations, there is the potential that the wetlands in this region are not USACE jurisdictional. However, all isolated or non-isolated wetlands greater than 0.5-acres in size are regulated by the State of Florida.

Any impacts to wetlands and also likely surface waters will require the developer to mitigate for impacts. Impacts are mitigated by either buying wetland mitigation credits from a private wetland mitigation bank or permittee sponsored mitigation. If the on-site wetlands are considered USACE jurisdictional, then joint (Federal and State) wetland mitigation credits will need to be purchased. If the wetlands are determined to not be USACE jurisdictional, then only State credits will need to be purchased.

Permittee sponsored mitigation entails the developer/permit applicant identifying a mitigation site within the mitigation watershed basin within which impacts occur, then designing, permitting, and implementing the wetland mitigation project. A wetland mitigation project could consist of wetland enhancement, wetland restoration, or wetland creation. The wetland mitigation project must consider the type (forested or herbaceous) of wetlands that are impacted. Wetlands in Parcel A would be considered herbaceous and wetlands in Parcel B and C would be forested. The type of wetland affects the amount of mitigation that the applicant must conduct. For example, an applicant typically needs to create 2-2.5 acres of herbaceous wetlands for every 1-acre of herbaceous wetland impact and 3-acres of forested wetland for every 1-acre of forested wetland impact. Additionally, forested wetland creation is substantially more risky than

herbaceous wetland creation due to the challenge of getting container grown trees to become established and flourish.

There are two private mitigation banks that currently serve or will serve KSC in the future; (1) Neoverde Mitigation Bank and (2) Pine Island Mitigation Bank; however, the Neoverde Mitigation Bank is sold out of Federal credits and Pine Island Mitigation Bank has not been issued its USACE permit and it is unknown when and if they will be issued this permit. As of July 2020, the Neoverde Mitigation Bank was selling a joint credit for \$220,000 and a State-only credit for \$200,000. One credit will mitigate for approximately 1.5-acres of wetlands in Parcel A and 1.0-1.2-acres of wetlands in Parcels B and C due to the difference in quality. If the on-site wetlands are not USACE jurisdictional, then the developer could purchase State-only credits from Neoverde as mitigation for impacts. Purchasing credits from Neoverde will expedite the time required to obtain State permits, reduce mitigation costs, and reduce long-term mitigation related risk associated with permittee sponsored mitigation.

If private wetland mitigation bank credits are not available at the time of permitting, then the developer will need to identify a wetland mitigation site on KSC. Identifying a wetland enhancement or restoration area onsite will be extremely challenging; therefore, wetland creation at a KSC approved location will likely be the primary wetland mitigation option if bank credits are not available. ***Rough order of magnitude opinion of probable construction cost for wetland creation range from \$250,000 to \$300,000 per acre of high quality (Parcel B and C) and per 1.5-ac of low-quality wetland (Parcel A) impact.*** This cost does not include 5-year compliance monitoring and reporting and exotic invasive vegetation maintenance. These costs range widely based on wetland creation area acreage.

2.2 FLOODPLAINS

Due to existing low site elevations and proximity to bodies of water, much of Parcels A, B, and C and the surrounding land is within the 100-yr FEMA floodplain (Figure 3). Development in a floodplain may require compensatory storage design to be included in the National Flood Insurance Program (NFIP), unless otherwise exempt from this criterion. Additionally, the existing elevations in these areas are lower and will require additional fill material to raise the site to suitable development elevations.

Parcels A, C, and the south area of Parcel B are heavily encumbered with areas below the 100-year FEMA floodplain. The land to the north and northwest of these parcels appear to have a lesser extent of floodplains and may be more suitable for development. To avoid floodplain impacts (such as adding fill material) that may require compensation, areas within these boundaries may be suitable pond locations. Siting ponds in these areas utilizes existing low points in the natural topography and does not diminish floodplain storage capacity.



Figure 3: FEMA Floodplain Map

2.3 TOPOGRAPHY

The map below (Figure 4) represents existing topographic contours and elevations and is derived from Florida Department of Emergency Management (FDEM) LiDAR data. While this information does not provide design-level topographic survey data, this provides a valuable tool for analysis to determine existing drainage patterns and approximate elevations. The information shown is consistent with data gathered from the FEMA floodplain map and the wetland locations shown in the previous figures.

This topographic information shows that there are elevated tracts of land to the north and west of parcels B & C (average elevations at roughly 3'-4' NAVD88), whereas the eastern/southern portions of parcels B & C tend to have lower elevations (average elevations at roughly 2'-3' NAVD88). Parcel A ranges from roughly 2'-4' in upland areas, but contains numerous surface waters and depressions with lower elevations.

Import fill costs can vary widely depending on the availability and proximity of offsite material; however, recent project data for this area indicates roughly \$30 per cubic yard of import fill, compacted and rough graded on the site. This equates to approximately \$50,000 to raise one acre of land by 1 foot. This metric will be used to determine estimated earthwork costs for each of the alternatives proposed.

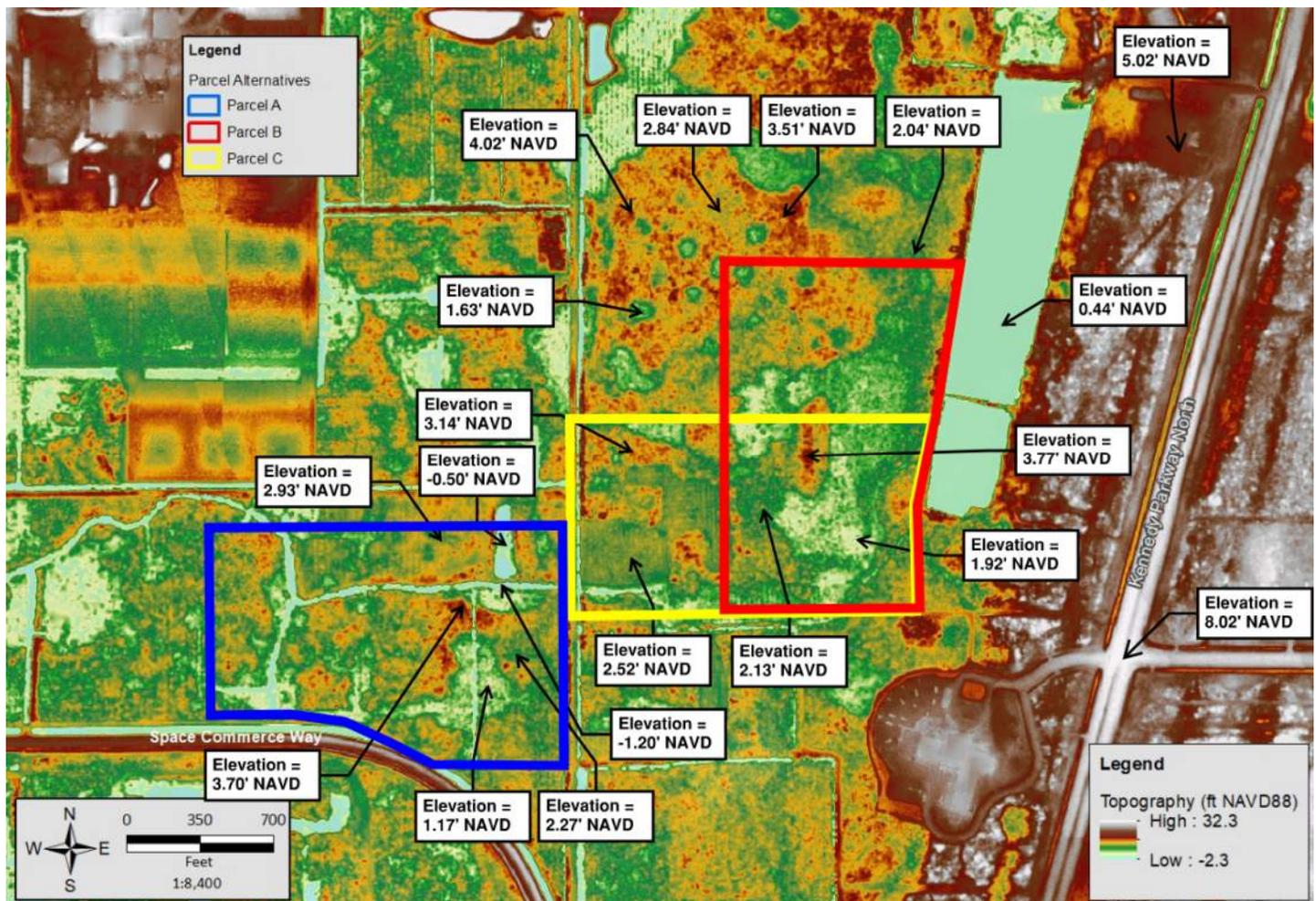


Figure 4: LiDAR Topographic Data

2.4 SOILS

According to the USDA NRCS Web Soil Survey, all three considered parcels are comprised of soils that fall within either the B/D or C/D hydrologic soil group. The following is a general description of hydrologic soil groups B, C, and D:

- **Soil Group B:** Soils having a moderate infiltration rate when thoroughly wet and having a moderate rate of water transmission.
- **Soil Group C:** Soils having a slow infiltration rate when thoroughly wet and having a slow rate of water transmission. These consist primarily of soils having a layer that impedes the downward movement of water, or soils of moderately fine texture or fine texture.
- **Soil Group D:** Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet and having a very slow rate of water transmission. These consist primarily of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only soils that in their natural condition are in group D are assigned to dual classes. Consistent with other observations regarding floodplains, topography, and wetlands, these areas soils are largely undrained, with nearby water table elevations between 2'-5' below existing grade; however, these soils are likely to still be suitable for reuse as fill material onsite. It is recommended that a geotechnical evaluation be obtained at the time of design to confirm soil suitability.

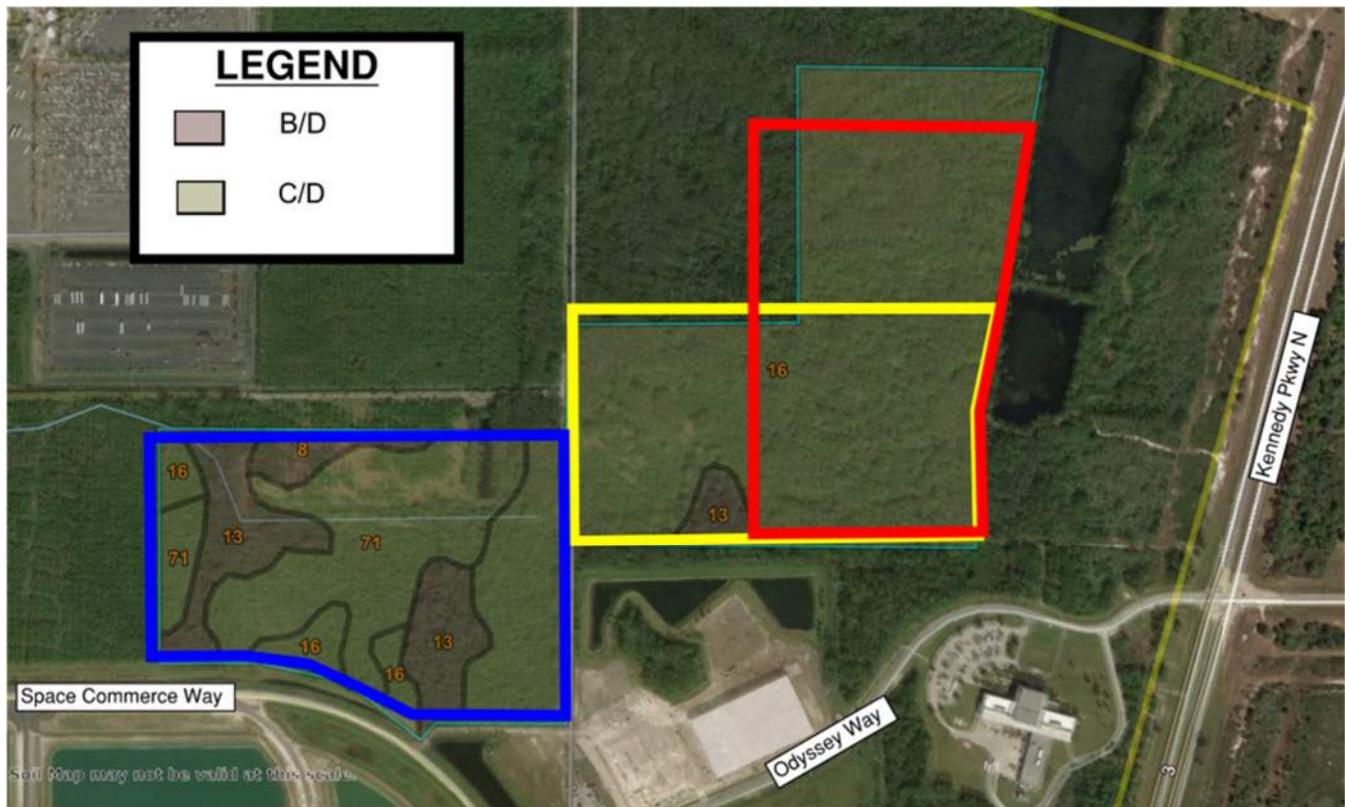


Figure 5: USDA Soils Map

2.5 UTILITIES

As shown on the Existing Utilities Map (Figure 6), based on information provided by Space Florida, there are numerous utilities in the vicinity of the three parcels. Most existing utilities are available from NASA Parkway, Kennedy Parkway, and Odyssey Way. These utilities include water, sanitary sewer, electrical, communications, and some commodity gases. There is existing communications infrastructure along Range Road, which is the road extending north-south between Parcels A and C that connects the KSC Visitor Badging Office and Exploration Park. Range Road is currently unpaved and was historically used as a haul road/maintenance access road for Exploration Park with a utility berm, but may provide an opportunity for new looped utilities from Exploration Park Phase 1 and NASA Parkway to the north. Due to proximity to the badging station to the north, it is unlikely that this road would be paved for routine access from the north; however, this corridor could also be used for emergency access, if NASA requires.

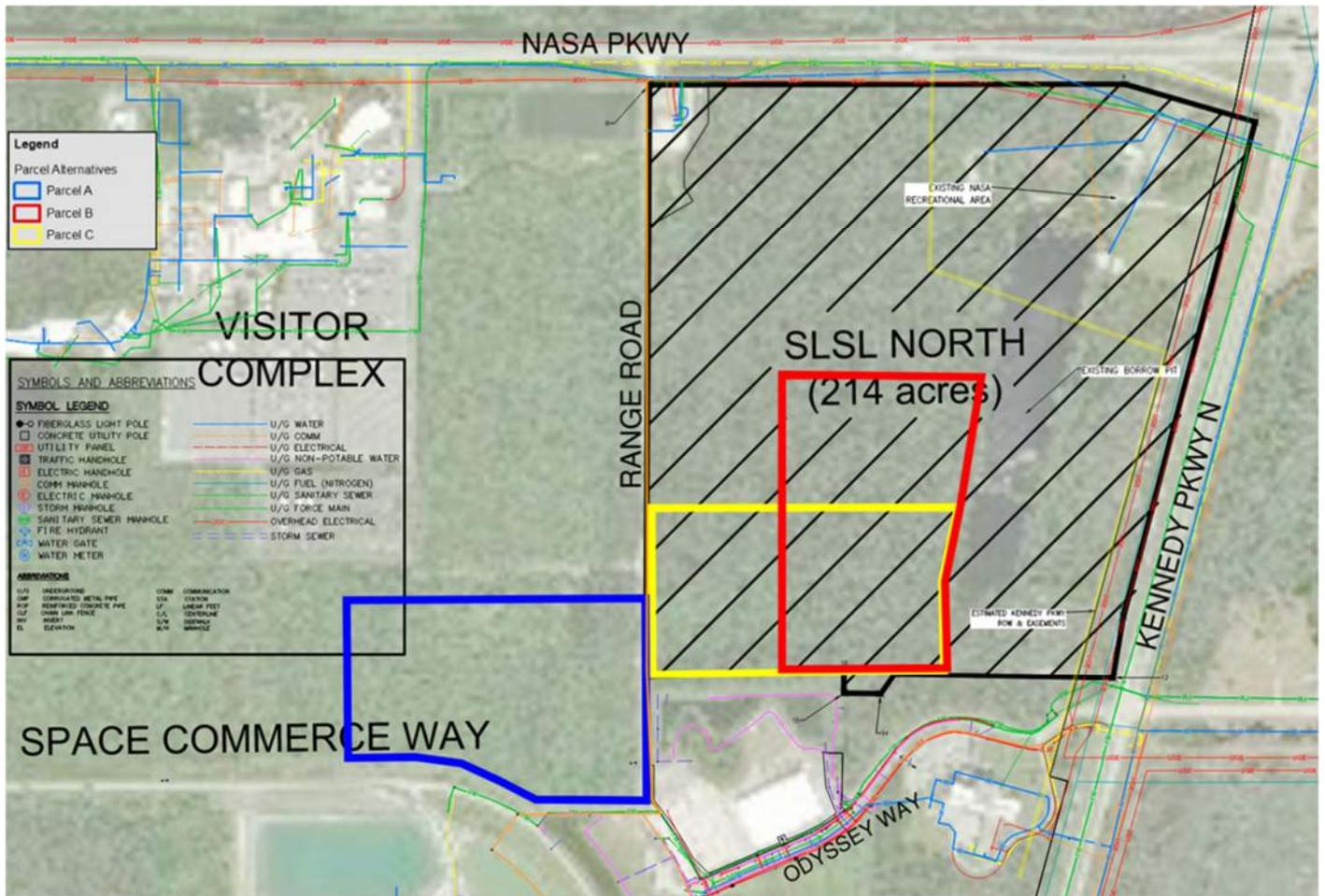


Figure 6: Existing Utilities Map

2.6 LISTED WILDLIFE SPECIES

Numerous State of Florida and Federally listed wildlife species are located at KSC. The following is a preliminary assessment of the primary federally listed species of concern that will need to be addressed in the Environmental Assessment.

2.6.1 Florida Scrub-Jay

KSC and CCAFS together support one of the largest remaining populations of Florida scrub-jay (*Aphelocoma coerulescens*), which is federally listed as Threatened and can only be found in Florida. Habitats occupied by Florida scrub-jays are typically Oak Scrub, Oak/Palmetto, and Coastal Scrub as well as disturbed areas in coastal regions. Suitable habitat is further to the east and has been documented by KSC staff (Figure 7).

Parcel A has been significantly impacted by past citrus grove activities, is dominated by Brazilian pepper and other invasive exotic vegetation and contains no native habitat. Parcels B and C are dominated by mesic upland and wetland hardwood forests which do not provide suitable habitat for Florida scrub-jay. As such, Parcels A, B, and C do not provide suitable habitat for Florida scrubs-jays and thus impacts to the Florida scrub-jay are not anticipated as a result of this project. Note that suitable habitat has been documented by KSC staff southeast of the parcels and is shown in Figure 7 below.

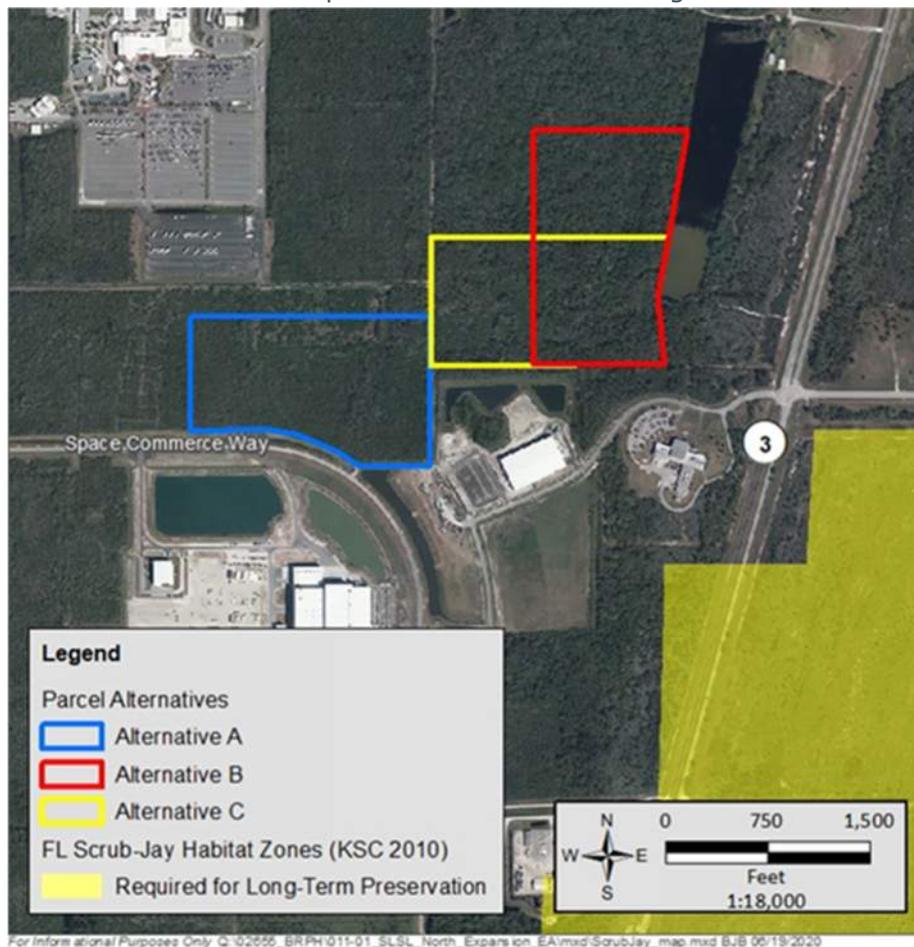


Figure 7: Florida Scrub-Jay Habitat Preservation Zone Location Map

2.6.2 Gopher Tortoise

The gopher tortoise (*Gopherus polyphemus*) is not federally listed but is listed by Florida as Threatened. The gopher tortoise is common throughout KSC. The gopher tortoise inhabits a diversity of upland habitats, typically well-drained, where it excavates burrows for shelter from climate, weather, fires, and predators. Canopy openings and an open understory are also required for gopher tortoises to thermoregulate, which provides herbaceous forage species.

The considered parcels consist of soil series which are poorly drained or very poorly drained, and the parcels are believed to have a very high water table (2'-5' below ground surface elevations). The only area thought to potentially be able to support the gopher tortoise is Range Road, which is mowed by KSC. No gopher tortoise burrows were observed along the southern portion of this road during the preliminary site assessment. As a result, no impacts to this species or commensals are expected as a result of this project.

2.6.3 Eastern Indigo Snake

Eastern indigo snakes (*Drymarchon couperi*) are federally listed as Threatened and have been documented on KSC, although actual population numbers are not available. Eastern indigo snakes have large home ranges and use a variety of habitat types that include uplands, wetlands, hammocks, and disturbed areas.

No eastern indigo snakes were observed during our limited field investigations, although a formal eastern indigo snake survey was not conducted. The eastern indigo snake commonly relies on gopher tortoise burrows for shelter. Based on existing vegetation communities and lack of gopher tortoise burrows, the area is unlikely to be used by eastern indigo snakes. Using the US Fish and Wildlife Service (USFWS) Eastern Indigo Snake Programmatic Effect Determination Key (January 25, 2010; August 13, 2013 Addendum), this project "May Affect but is not Likely to Adversely Affect" due to the following:

- Project is not located in open water or salt marsh,
- Permit will be conditioned for use of the USFWS Standard Protection Measures for the Eastern Indigo (August 12, 2013) during project site preparation and construction, and
- The project will impact less than 25 acres of xeric habitat (scrub, sandhill, or scrubby flatwoods) or less than 25 active and inactive gopher tortoise burrows, and
- Any permit will be conditioned such that all gopher tortoise burrows, active or inactive, will be evacuated prior to site manipulation in the vicinity of the burrows. If an indigo snake is encountered, the snake must be allowed to vacate the area prior to additional site manipulation in the vicinity. Any permit will also be conditioned such that holes, cavities, and snake refugia other than gopher tortoise burrows will be inspected each morning before planned site manipulation of a particular area, and, if occupied by an indigo snake, no work will commence until the snake has vacated the vicinity of proposed work.

2.6.4 Bald Eagle

USFWS removed the bald eagle (*Haliaeetus leucocephalus*) from the list of Endangered and Threatened Wildlife in 2007. Eagles use mature live pines and pine snags within the pine flatwood habitats and will occasionally build nests on man-made towers and structures. Active bald eagle nests can impact project construction schedules when they are within 660 feet of the project site as there are federal restrictions during the nesting season. However, based on KSC data, no bald eagle nests are within a 1-mile radius of the parcel alternatives.

2.6.5 Wood Stork

The project area is within Lake Poinsett – LEO's – CR524 wood stork (*Mycteria americana*) nesting colony core foraging area. A core foraging area consists of a 15-mile radius around the nesting colony. The on-site wetlands that will be impacted are dominated by a mature canopy of Brazilian pepper or mature trees that significantly limits forage opportunities. As a result, no impacts to this species is anticipated as a result of this project.

3.0 PROPOSED PROGRAM AND SITE LOCATION ALTERNATIVES

The initial development program includes an Astronaut Training Facility, Astronaut Accommodations, and Auxiliary and Support Facilities. The customer also plans to provide a reception area located outside of the proposed parcel, within the previously graded Exploration Park Phase I area, as well as a covered parking area adjacent to this reception facility equipped with a 1MW solar farm via roof panels. Future phases of the program may include additional training or accommodations facilities.

To host this program, the selected parcel requires at least 40 acres, with at least 15 contiguous acres available for development of buildings, internal roads, and parking facilities for each phase of development. Each 15-acre development area will consist of roughly 6 acres of building pad-ready area, another 6 acres for site amenities and circulation, and 3 acres for stormwater management. The remainder of the parcel will be used for buffers, greenspace, future expansion area, and undisturbed wetlands. The customer also anticipates potential expansion to this development in future phases, which may include an additional training facility and/or visitor accommodations building. This expansion will add approximately 15-20 acres to the desired parcel area, for a grand total of roughly 45-60 acres. The future phase is under consideration for long-term development, but is unlikely to occur within the next 5 years.

The location and views from the site are critical to the customer's envisioned program. The customer's objective is to create an experience for visitors that is secluded from other developments, incorporates water (either in the form of the existing water features or newly created ponds), and has a clear view of launches from both NASA and CCAFS. While achieving the program and vision of the client, NASA safety and security requirements also must be considered, and as such, the secured entrance gates must not be visible from the proposed buildings.

Within the vicinity of the three pre-identified parcels, BRPH has identified four viable site development areas that may be suitable for the proposed development. These locations have been selected to reduce environmental impacts and optimize development. Parcel B itself was not directly included in the evaluation, as the site is significantly encumbered by large, high quality wetland and floodplain areas, leaving little to no contiguous area available for development.

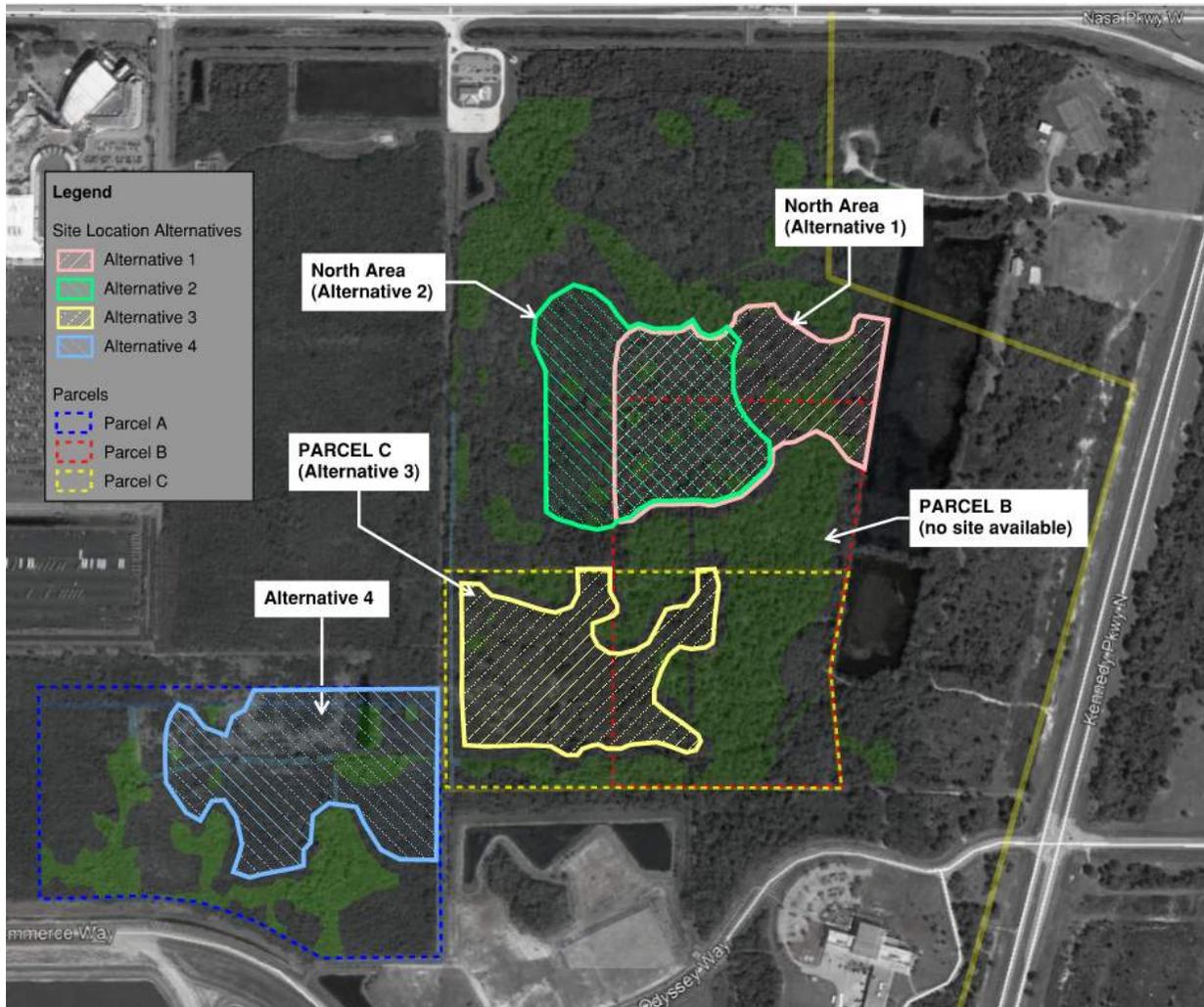


Figure 8: Site Location Alternatives Evaluated

3.1 ALTERNATIVE 1

Alternative 1 is located north of Parcel B, in an area that has fewer wetland and floodplain encumbrances and higher topography (Figure 9). Development in this area would reduce the impacts of development and provide adjacencies to water (existing borrow pit) with prime launch viewing angles. The surrounding wetlands and environmental areas mirror the customer's desire to create a secluded space that is distinctly set apart from Exploration Park. This development area is approximately 16.6 acres in size, not including the borrow pit area that could be utilized for stormwater management.

In Alternative 1, a portion of the borrow pit could be excavated such that the pond frontage could be shaped to interact with the site and building layout. The buildings and other site features will need to be **raised approximately 5.5 feet based** on the topography of the existing area. Using the building pad area and adding an additional 30% for site features and access roads, the **earthwork cost is estimated at \$2.0 million**. The soil from this pond could also be used to elevate the site, which reduces the amount of import fill. Integrating the existing borrow pit into the stormwater system for the site may alleviate onsite space requirements for stormwater attenuation; however, onsite water quality treatment would still be required, and the incorporation of the borrow pit may trigger additional maintenance requirements to address wildlife, water quality, and ecological concerns.

To address KSC Security concerns regarding visibility of the KSC west gate (Gate 3), drone footage acquired by NASA of this area demonstrates that this option does not provide views of the gate or badging station at heights up to 125'. Common use utility infrastructure and access roads and will be needed. Utilities may be extended along the Range Road corridor to minimize additional environmental impacts.



Figure 9: Alternative 1

3.2 ALTERNATIVE 2

Alternative 2 is located northwest of Parcel B, shifted slightly further west than Alternative 1 (Figure 10). This development area is approximately 16.5 acres in size with ample adjacent upland area if additional space is needed. This option allows the greatest minimization of wetland impacts and takes advantage of higher areas on the site as development areas, which optimizes the need for import fill; however, this option may not provide access to the existing site water feature (borrow pit). The majority of wetland impacts in this site location affect the smaller, hydrologically isolated wetlands, which may be less of a functional loss and risk than impacting the larger, high quality connected wetlands to the south, north, and east.

In this option, it is recommended that a separate pond system be created to serve the site independent of the existing borrow pit to minimize impacts to the adjacent wetlands. The buildings and other site features will need to be **raised approximately 5 feet** based on the topography of the existing area. Using the building pad area and adding an additional 30% for site features and access roads, the earthwork cost of this will be an **estimated \$1.8 million**. The soil from this excavated area could be used for elevating or filling the site and for grading purposes, which reduces the amount of import fill. Siting the facility further west would allow for readily accessible utility connections if mains are established along Range Road.

To address KSC Security concerns regarding visibility of the KSC west gate (Gate 3), drone footage acquired by NASA of this area demonstrates that this option does not provide views of the gate or badging station at heights up to 125'. The western areas of the site, closer to Range Road, may provide more visibility of the gate and badging station, and are less desirable locations for the taller accommodations facility. Common use utility infrastructure and access roads and will be needed. Utilities may be extended along the Range Road corridor to minimize additional environmental impacts.

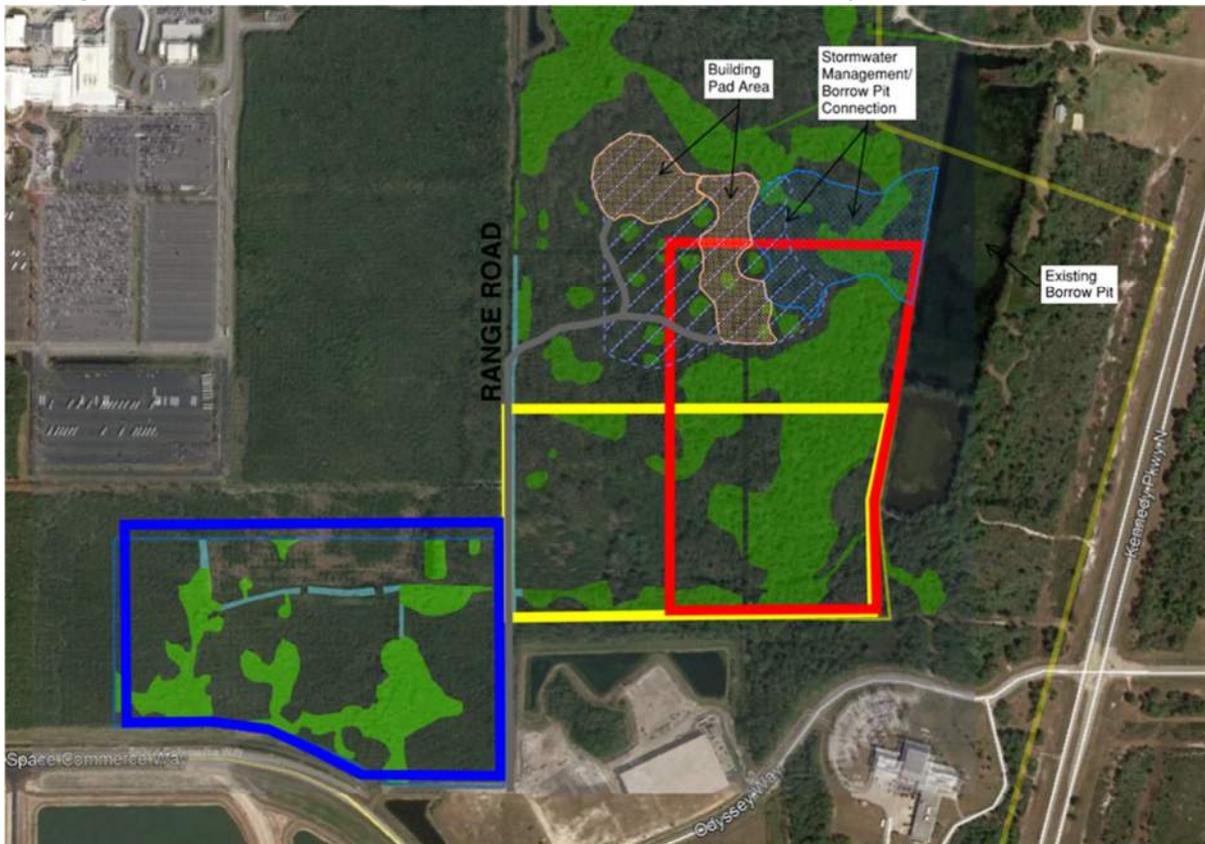


Figure 10: Alternative 2

3.3 ALTERNATIVE 3

Alternative 3 is located within Parcel C (Figure 11). The development area is approximately 13 acres in size. This area will also require onsite ponds, further reducing the available development area. Because of the need for additional onsite stormwater management and the reduced parcel size, the area unencumbered by wetlands shown below is not large enough to accommodate the entirety of the facility program and infrastructure. The area falls largely within a FEMA floodplain, which may require additional compensatory storage requirements. In general, as indicated by the floodplains and topography in this area, this site is lower in elevation and would require additional imported fill material. The buildings and other site features will need to be **raised approximately 5.5 feet** based on the topography of the existing area. Using the building pad area and adding an additional 30% for site features and access roads, the earthwork cost of this will be an **estimated \$2.0 million**.

Due to the southerly location, visibility of the gates and badging station is not anticipated to be a concern in this alternative. Proximity to Exploration Park and Range Road may reduce the need for new infrastructure for utility and access connections; however, this site does not offer the remote location that is desired for the program. Common use utility infrastructure and access roads and will be needed. Utilities may be extended along the Range Road corridor to minimize additional environmental impacts. This location is situated closer to the existing utilities available in Exploration Park.

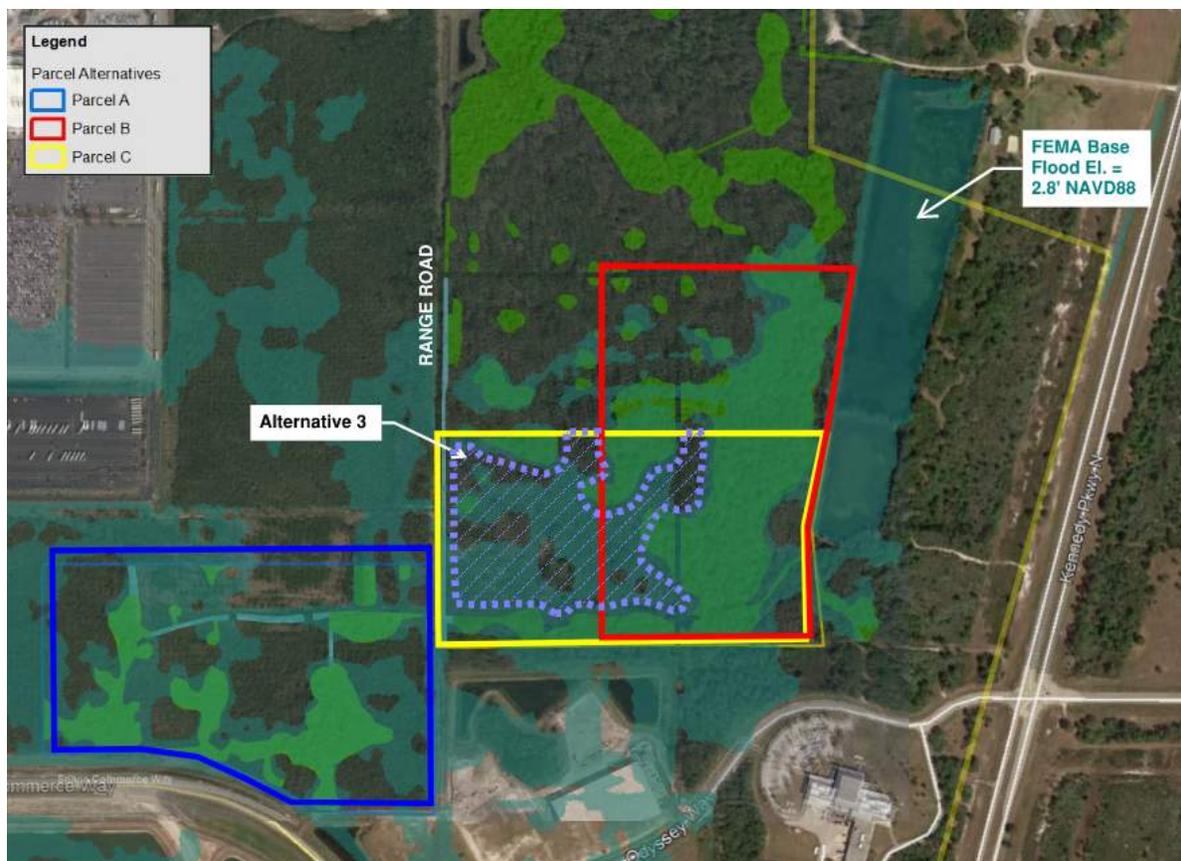


Figure 11: Alternative 3

3.4 ALTERNATIVE 4

Alternative 4 is located within Parcel A (Figure 12). The development area is approximately 15.4 acres in size, however, much of the space is non-contiguous as several ditches and wetlands cross this area. This area will also require onsite ponds, further reducing the available development area. Because of the need for additional onsite stormwater management and the reduced parcel size, the area unencumbered by wetlands shown below is not large enough to accommodate the entirety of the facility program and infrastructure. Portions of the project area fall within a FEMA floodplain and contain some wetlands, which would potentially require additional compensatory storage requirements and mitigation. The buildings and other site features will need to be **raised approximately 5.75 feet** based on the topography of the existing area. Using the building pad area and adding an additional 30% for site features and access roads, the earthwork cost of this will be an **estimated \$2.1 million**. Proximity to Exploration Park and Range Road may offer reduced infrastructure for utility and access connections; however, this site does not offer the remote location that is desired for the program.

Due to the southerly location, visibility of the gates and badging station is not anticipated to be a concern in this alternative. As Parcel A has been historically used as orange grove, with several ditches and swales crossing the site, development on this site will likely impact surface waters. Parts of this area may also be impacted by the expansion of Space Commerce Way and the Visitor Complex. Utilities may be extended along the Range Road corridor to minimize additional environmental impacts. This location is situated closer to the existing utilities available in Exploration Park.



Figure 12: Alternative 4

4.0 CONCLUSION AND RECOMMENDATIONS

While the pre-identified parcel boundaries may have tracts that are viable for development, the area to the north presents greater development potential and fewer environmental impacts. Based on site constraints and the customer’s envisioned facility program, BRPH recommends Alternative 2 as the optimal site to focus the proposed development, with auxiliary and future support areas in the Alternative 3 and 4 areas. The ranked comparison of each area with respect to the elements evaluated is summarized below.

To accommodate future development and supporting site access roads and auxiliary structures, the customer proposes the following approximately 60-acre parcel for land transfer and NEPA analysis (see Figure 13 Summary Exhibit 2). This parcel will encompass the Phase I site, provide space for buffers and future expansion, accommodate the program requirements, reduce environmental impacts and development costs, and meet the customer’s objectives.



Figure 13: Proposed Parcel and Concept Layout

Category Weight	Land Cover		Wetlands		Floodplains		Listed Species		Topography (Fill Cost)		Soils		Security		Utilities & Access		Developable Area		Weighted Avg
	1	3	2	5	2	5	2	1	3	2	3	2	3	3	5				
North Area Alternative 2	4 Most Desirable	4 2.5 ac	5 Least impact	5 N/A	4 \$1.8 M	3 C/D	3 Least Desirable	2	5 16.5 ac	3.9									
PARCEL C (Alternative 3)	2	5 0.3 ac	1 Most impact	5 N/A	3 \$2.0 M	3 C/D	5	4	2 13 ac	3.5									
PARCEL A (Alternative 4)	3	2 1.3 ac	3	5 N/A	2 \$2.1 M	4 B/D	5 Most Desirable	5 Most Accessible	3 15.4 ac	3.5									
North Area Alternative 1	3	2 2.6 ac	4	5 N/A	3 \$2.0 M	3 C/D	4	1 Least Accessible	5 16.6 ac	3.4									
PARCEL B	1 Least Desirable	1 6.3 ac	2	5 N/A	1 \$2.3 M	3 C/D	4	3	1 7.5 ac	2.3									

APPENDIX A – Estimated Earthwork Calculations

Site Alternative	Avg Existing Site Elevation (NAVD)	Proposed Building Area (acres)	Adjustment for Circulation/etc. (+30%)	Avg New Site Elevation (NAVD)	Approx Fill Required (ac-ft)	Import Fill Cost - Delivered, placed, & compacted (\$/ac-ft)	Estimated Cost
1	2.75	5.5	7.2	8.25	39	50000	\$ 1,966,250
2	3.25	5.5	7.2	8.25	36	50000	\$ 1,787,500
3	2.5	5.5	7.2	8	39	50000	\$ 1,966,250
4	2.25	5.5	7.2	8	41	50000	\$ 2,055,625
Parcel B	2	5.5	7.2	8.25	45	50000	\$ 2,234,375

Appendix 3 Cultural Resource Assessment Survey

Draft Report
Phase I Cultural Resources Assessment Survey of
Exploration Park North Expansion EA
Brevard County, Florida

LG²ES Project Number
2020-152

Prepared for:
Kennedy Space Center

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March 2021

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March 2021

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EXECUTIVE SUMMARY

This report presents the results of a Cultural Resources Assessment Survey (CRAS) conducted in support of the proposed Exploration Park North Expansion EA at Kennedy Space Center in Brevard County, Florida. The survey was conducted by LG² Environmental Solutions, Inc. (LG²ES) on behalf of Space Florida, BRPH, and Jones Edmunds to assist Kennedy Space Center in meeting its regulatory obligations under Section 106 of the National Historic Preservation Act (NHPA), as amended. All work was conducted in accordance with the NHPA and in compliance with the Archaeological Resources Protection Act and met or exceeded standards detailed in *Archaeological and Historic Preservation; Secretary of the Interior's Standards and Guidelines* 48FR, Part 44716-42, Vol. 48, No. 190, September 29, 1983 and guidelines developed by the Florida State Historic Preservation Office.

The Archaeological Area of Potential Effects (APE) is located on the *Orsino, Florida* 7.5-minute USGS quadrangle. It is situated within the Merritt Island National Wildlife Refuge in the northern portion of Brevard County. Specific locational information is available in **Appendix C**.

The CRAS was conducted December 7-9, 2020 and consisted of historic background research, pedestrian survey, and the excavation of 31 shovel tests probes (STPs) were excavated, all of which were negative for cultural material, and 13 “no dig” loci were documented across the project APE. “No dig” tests were written off due to inundation. Although all subsurface tests were negative for cultural material structural remains and a surface scatter were documented as 8BR04364, The Granite Rock Homestead, while a historic road documented in the southwestern portion of the Project APE, was recorded as 8BR04367, Howe Grove Road. Neither resource meets the minimum criteria for inclusion on the NRHP and both are recommended not eligible. No further archaeological investigation is suggested.

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LIST OF ACRONYMS

Abbreviation	Description
APE	Area of Potential Effect
ARPA	Archaeological Resource Protection Act
CMBS	Centimeters Below Surface
CRAS	Cultural Resource Assessment Survey
CRM	Cultural Resource Management/Manager
EA	Environmental Assessment
FMSF	Florida Master Site File
FWS	U.S. Fish and Wildlife Service
GIS	Geographic Information System
GPS	Global Positioning System
ICRMP	Integrated Cultural Resource Management Plan
IRL	Indian River Lagoon
KSC	Kennedy Space Center
LG ² ES	LG ² Environmental Solutions, Inc.
LC	Launch Complex
MINWR	Merritt Island National Wildlife Refuge
NAD 27	North American Datum 1927
NAD 83	North American Datum 1983
NASA	National Aeronautics and Space Administration
NHPA	National Historic Preservation Act
NRHP	National Register of Historic Places
SHPO	State Historic Preservation Office
SOP	Standard Operating Procedures
SOW	Scope of Work
SF	Space Florida
STP	Shovel Test Probe
USAF	United States Air Force
UTM	Universal Transverse Mercator

1.0 INTRODUCTION

1.1 Project Description

In December 2020, LG² Environmental Solutions, Inc. (LG²ES) conducted a Phase I Cultural Resource Assessment survey (CRAS) in support of the proposed Exploration Park North Expansion Environmental Assessment (EA) at Kennedy Space Center (KSC) on Merritt Island in Brevard County, Florida. The project area is wholly contained on the *Orsino, Florida* 7.5-minute quadrangle (USGS 1976) (**Figure 1.1**). It was conducted on behalf of Space Florida, BRPH, and Jones Edmunds (SF/BRPH/Jones Edmunds) to assist KSC in meeting its regulatory obligations under Section 106 of the National Historic Preservation Act (NHPA), as amended. Proposed project activities include the expansion of property at Exploration Park to support development and construction of commercial aerospace facilities.

All work was conducted following Section 106 of National Historic Preservation Act (NHPA) as amended; the Archaeological and Historic Preservation Act, as amended; the Advisory Council on Historic Preservation's revised regulations in 36 CFR, Part 800; Section 267.12, Florida Statutes; and Chapter 1A-46 of the Florida Administrative Code. All work was conducted in accordance with the Florida Division of Historical Resources' *Module Three Guidelines for Use by Historic Preservation Professional* and the Florida Division of Historical Resources' Performance Standards. All investigations were performed by professional archaeologists meeting the qualifications established in the Secretary of Interior's Standards and Guidelines.

1.2 Area of Potential Effects

The Area of Potential Effects (APE) for this investigation consists of the entire land transfer boundary from KSC to SF, an approximately 61.3 acres (ac) parcel (**Figure 1.1**). The project APE consists of the entire footprint of the Project's proposed impacts. The APE is relatively level with elevations ranging from 0.3 to 1.2 meters (m) above mean sea level (amsl). Vegetation in the APE primarily consists of Brazilian Pepper, with some dead orange trees in the southern half of the Project APE, while the northern half of the project APE consists of saw palmetto with random live oaks in the northwestern corner, and slash pine and saw palmetto across the rest of the northern portion.

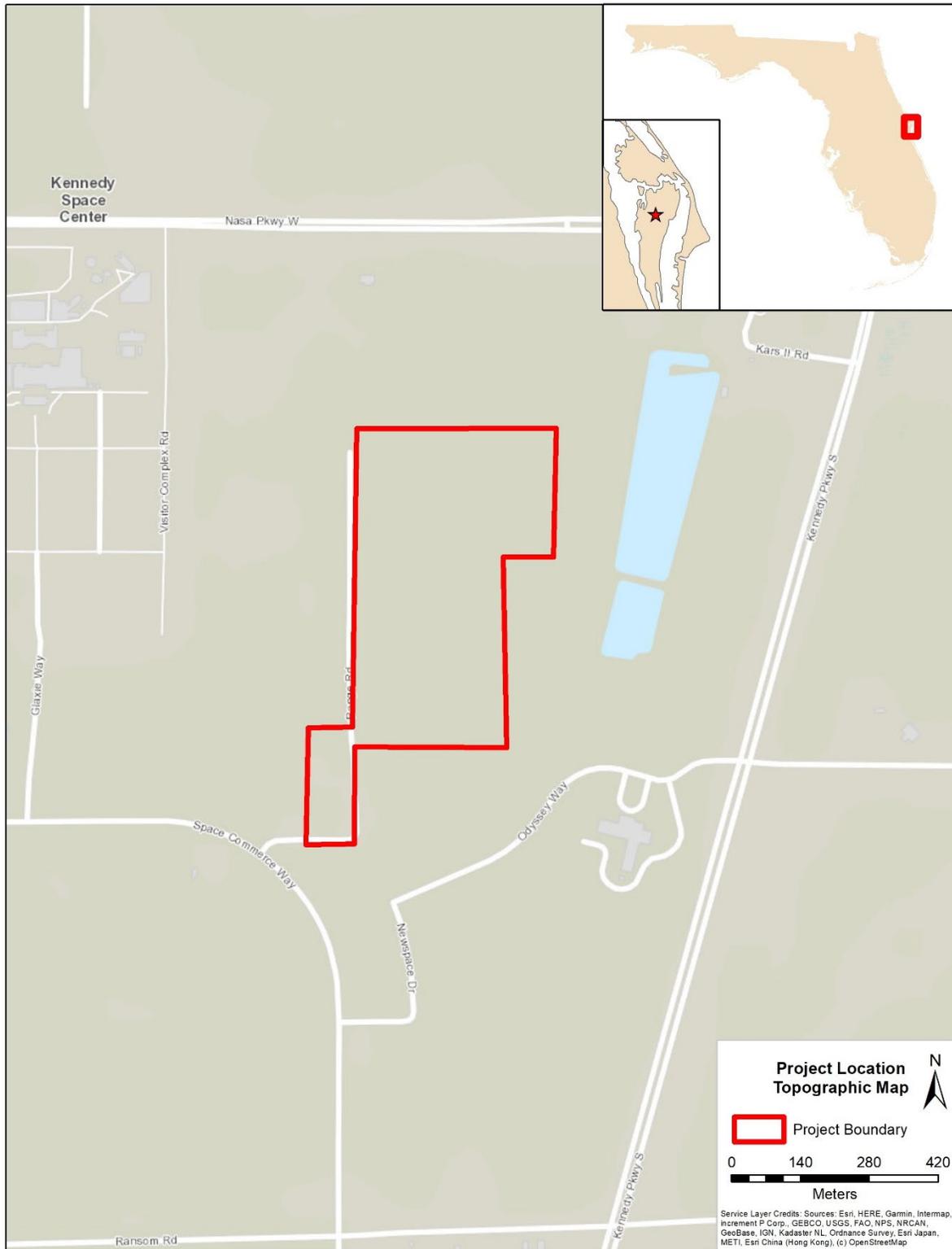


Figure 1.1 Project Area Shown on the Orsino, Florida 7.5-Minute Quadrangle (USGS 1976).

2.0 ENVIRONMENTAL CONTEXT

2.1 Physiographic Setting

Kennedy Space Center (KSC) is located on Merritt Island in Brevard County, Florida. Merritt Island is located within the Southern Coastal Plain region of the Atlantic Coastal Plain physiographic province, as is all of Florida. This portion of Florida is within the Eastern Florida Flatwoods ecoregion, described as nearly level and poorly drained with numerous ponds, lakes, swamps, and sloughs (Huckle et al. 1974; Griffith et al. 1994; Scott 2001; Scott et al. 2001). The physiographic setting of the project area suggests a low probability of encountering cultural resources within the APE.

2.2 Hydrology

KSC is located within the Indian River Lagoon (IRL) watershed. The IRL watershed stretches 251 kilometers (km) from Ponce Inlet in Volusia County to Jupiter Inlet in Martin County and is comprised of the Mosquito Lagoon, the Banana River, and the Indian River (SJRWMD 2016). The IRL watershed is an estuary that receives salt water from the Atlantic Ocean through inlets and fresh water from direct precipitation, groundwater seepage, surface water runoff, and discharges from tributary streams and canals (Penders 2012a). The ridge and swale topography of the barrier island also creates a reservoir for fresh water that could have been easily obtainable by previous occupants of the island (Cantley et al. 1994). In addition to the Banana River, which borders Merritt Island to the east, other surficial water resources include impoundments, drainage canals, borrow pits, freshwater wetlands, mangrove wetlands, and salt marsh wetlands (Penders 2012b).

2.3 Generalized Topography

The following is adapted from the KSC 2015 Environmental Resource Document, Revision F (KSC 2015:144-145). Merritt Island, as well as Cape Canaveral, form a barrier island complex of Pleistocene and recent age. Topography is characterized by a series of ridges and swales created from relict dunes, which were deposited as the barrier islands were formed. The western side of Merritt Island “has been reduced to a nearly level plain (KSC 2015:145). Elevations on Merritt Island range from sea level to approximately 3 m. The island is comprised of saline and freshwater marshes, flatwoods, and scrub. Within the APE, the land cover is characterized as Citrus to Brazilian Pepper (KSC 2015:150).

2.4 Climate

The following is adapted from the KSC 2015 Environmental Resource Document, Revision F (KSC 2015). The climate at KSC is classified as subtropical with short, mild winters and hot, humid summers and no recognizable spring or fall seasons. Summer weather begins in April and is prevalent for approximately nine months of the year. Average temperatures in this part of the year are in the 70s Fahrenheit (F) and temperatures usually rise into the 80s and 90s F during the day. Days are mostly sunny; however, afternoon thunderstorms are common. Although cool days can occur in November, winter weather begins in January and extends through March. Winter weather is marked by windy days and temperatures in the 40s F at night and the 70s during the day. May through October weather is characterized by southeast winds, traveling clockwise around the Bermuda High. These winds bring

“moisture and warm air, which help produce almost daily thundershowers creating a wet season” (KSC 2015:46). The dry season occurs between November and April and is characterized by cold continental air masses which cause uniformly distributed light rain, as opposed to the localized heavy thunderstorms of the wet season (KSC 2015).

2.5 Soils

Three soil types have been identified within the APE (**Table 2.1 and Figure 2.1**). The majority of the area (58.6 ac) contains Copeland-Bradenton-Wabasso complex, limestone substratum. This soil is found on flats and marine terraces and is described as poorly to very poorly drained. Chobee mucky loamy fine sand, depressional, is found in 2.8 ac of the south-central portion of the APE. This soil is found on depressions and marine terraces and described as very poorly drained and hydric. The northwest corner of the APE, approximately 0.5 ac, contains Bradenton fine sand, limestone substratum, described as poorly drained and found on flats and marine terraces.

Table 2.1 Soils within Project Area

NRCS Code	Name	Drainage	Hectares
16	Copeland-Bradenton-Wabasso complex, limestone substratum	Very poorly drained	58.6
13	Chobee mucky loamy fine sand, depressional	Very poorly drained	2.8
8	Bradenton fine sand, limestone substratum	Poorly drained	0.5

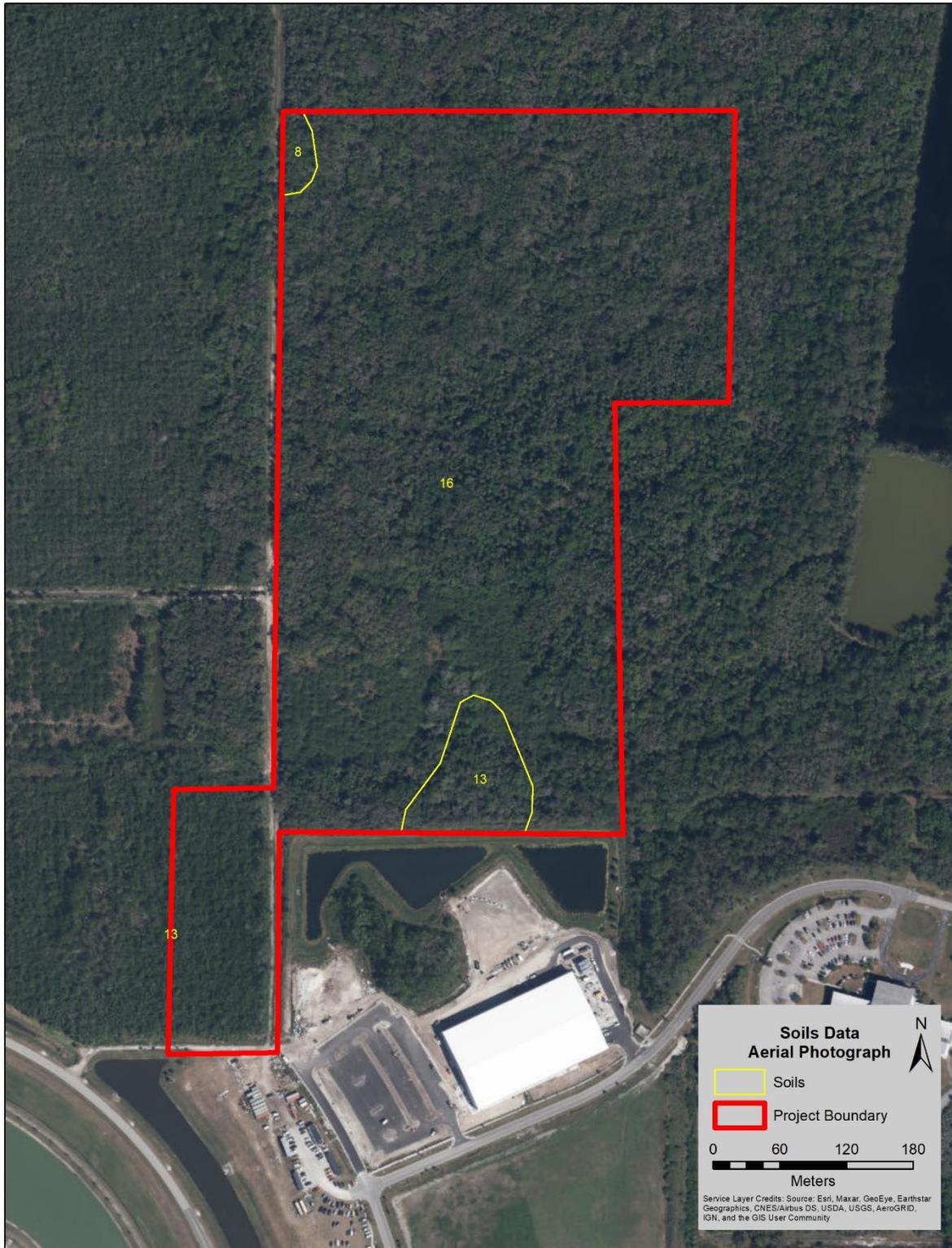


Figure 2.1 Soil Types Mapped within the Exploration Park North Expansion Project APE.

2.6 Vegetation

KSC is wholly contained within the Merritt Island National Wildlife Refuge (MINWR). The APE is situated in the southwestern portion of the refuge. Portions of the APE were once citrus farms and the vegetation throughout suggests prior clearing episodes. The APE is surrounded by development associated with KSC. Areas with established water control measures, such as drainage ditches, were used for citrus, truck crops, and rangeland. Natural vegetation includes slash pine, cabbage palm, live oak, saw palmetto, laurel oak, wax myrtle, chalky bluestem, creeping bluestem, indiagrass, little bluestem, pineland threeawn, southern bayberry, sweetbay magnolia, water oak, sweetgum, and panicums. Vegetation within areas of very poorly drained soils may also include cabbage palmettos, maples, gums with an undergrowth of vines, pineland shrubs, and ferns. Blue flags, rushes, sedges, and lilies are commonly found in depressions.

2.7 Faunal Resources

Numerous species of mammals, birds, and reptiles are found within the MINWR. Mammals living within the refuge include armadillos, bobcats, manatees, river otters, white tailed deer, rabbits, squirrels, raccoons, and opossum. Birds observed within the refuge include birds of prey such as the osprey, red-shouldered hawk, bald eagle, and American kestrel; shorebirds such as the killdeer, lesser yellowlegs, Wilson's snipe, and ring-billed gull; migratory birds such as the blue jay, barn swallow, tufted titmouse, Carolina wren, American robin, and pine warbler; and wading birds and waterfowl such as blue heron, white ibis, great egret, great blue heron, and many species of ducks. Reptiles include the American alligator, lizards such as anoles and skinks, over 40 species of snakes, and numerous turtle species such as Peninsula cooter, chicken turtle, snapping turtle, striped mud turtle, stinkpot, and gopher tortoise. Endangered species within the MINWR include the eastern indigo snake, the Florida scrub-jay, the gopher tortoise, the southeastern beach mouse, the West Indian manatee, and the wood stork (FWS 2020).

3.0 CULTURAL CONTEXT

Cape Canaveral has a long record of human occupation, and this is reflected by the presence of numerous prehistoric and historic sites that are part of the area's rich archaeological heritage. Human occupation at Cape Canaveral spans from the first Native Americans of the Orange Period over 3,000 years ago, the colonizing Spanish, the failed attempts of the colonizing French and their associated survivor camps, Canaveral Town which included the area's only school and post office, the development of the US Space Program and US Air Force Space Wing during the Cold War, through to the present day.

3.1 Prehistoric Chronology

3.1.1 Paleoindian and Early Archaic (14,000 BP – 8,000 BP)

Florida has a rich Paleoindian history extending continuously from the late Pleistocene epoch into the early Holocene epoch (**Figure 3.1**). At early archaeological sites and isolated finds in Florida, there are diagnostic artifacts dating to the late Pleistocene, including the Clovis fluted points and later lanceolate types. Tools of this period were constructed from a variety of natural resources. These tools were made from carefully chipped-stone into bifacial and unifacial tools (Purdy 1981), from ivory into foreshafts (Hemmings 2004), from bone into double-pointed points (Waller 1976), and from wood and other organic materials. However, the Florida Paleoindian occupation lacks good radiocarbon dates.

The projectile point sequence: Clovis to Suwannee/Simpson to Bolen notched points have a bracketed age between 11,000 BP and 10,000 BP (with Clovis being oldest). Stylistically, Clovis and Suwannee/Simpson points are lanceolates (attached to a spear) although Clovis are fluted and Suwannee/Simpsons are not. At the end of the Paleoindian period, smaller notched points, including the Bolen and Greenbrier, replaced lanceolates (Austin 2006; Powell 1990). While Clovis remains as the earliest stylistically secure projectile point, "Pre-Clovis" occupation has been proposed for years at multiple sites in Florida, including Little Salt Spring (Clausen et al. 1979) and Page-Ladson (Dunbar and Hemmings 2004) as well as other sites in the Aucilla River in the Big Bend area (Dunbar 2006, 2007; Hemmings 2004).

There have been several studies in recent years examining genetic samples of modern Native Americans and ancient human skeletons indicating the occupation of the Americas occurred at least 1,500 years prior to the Clovis complex which has been confidently dated to ~13,000 calendar years before present (cal yr BP) (Halligan et al. 2016). However, until now, this interpretation had lacked actual archaeological evidence. The archaeological evidence of pre-Clovis occupation between 14,000 and 15,000 cal yr BP is very limited due to a number of factors but, as researchers have been saying for years, the two most important factors are the recognition and visibility of these sites. It is theorized that most of these sites are located in submerged areas, what underwater archaeologists refer to as drowned terrestrial sites. Recently, one suspected pre-Clovis site was revisited.

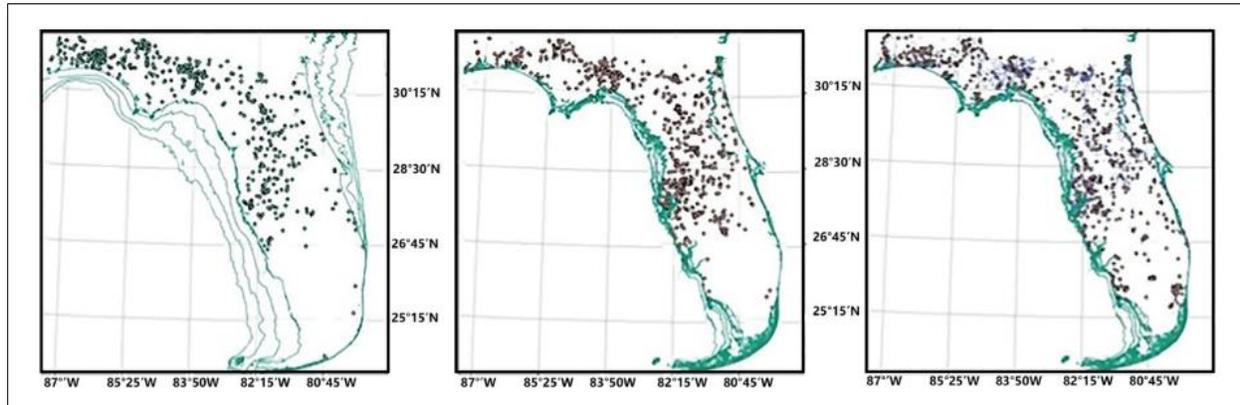


Figure 3.1 Culture Type Designations Queried from the FMSF: Paleoindian and Early Archaic Sites; Sites with Middle Archaic Designations; and Late Archaic with Middle Archaic Sites (Lydecker et al. 2011).

The Page-Ladson site located in the Aucilla River in Florida’s Big Bend region has yielded remarkable findings. Archaeologists from several universities, governmental, and non-governmental organizations have worked together, led by researchers from Florida State University and Texas A&M University, to conduct new excavations at this unique site. This site is located under 9 m of water within a mid-channel sinkhole along a segment of the Aucilla River, about 11 km inland from the Gulf of Mexico. While this site has been suspected to contain a pre-Clovis component since the discovery and recovery of a Mastodon tusk that showed signs of butchering, no direct archaeological evidence had been found (Dunbar and Hemmings 2004). Recent publications have revealed the recovery of a biface knife in direct association with mastodon bones showing signs of blade marks from butchering (Halligan et al. 2016).

“The findings prove that hunter-gatherers, butchered or scavenged a mastodon carcass at the sinkhole’s edge next to a small pond at 14,500 cal yr BP. The record of human habitation of the Americas between ~14,000 and 15,000 cal yr BP is sparse but real. The rarity of these early sites along the Gulf Coastal Plan of North America is largely due to two factors: sediment preservation, and burial and submergence during the late Pleistocene transgression.” (Halligan et al. 2016)

Both Little Salt Spring (8SO18) and Warm Mineral Springs (8SO19) are also unique submerged terrestrial sites located in Sarasota County. These two sites are spring-fed cenotes or sinkholes with anoxic subsurface environments located within 4.8 km of each other. The anoxic environment results in some of the best-preserved artifacts and ecofacts known in the southeast (Wentz and Gifford 2007). Both sites also have suspected pre-Clovis occupations. One such artifact recovered from Little Salt Spring is a fire-hardened wooden stake, which was recovered in the late 1970s by Charles Clausen from the 27 m ledge. This stake was found in situ with an extinct giant ground tortoise in direct association with charcoal of a campfire, which could be radiocarbon dated. Archaeologists have also uncovered artifacts and prehistoric tools never before seen due to the anoxic environment of the spring. One of the oldest artifacts from Little Salt Spring was recovered during excavations within the basin of the spring in 2004. A worked portion of a deer antler was recovered one meter below the sediment-water

interface. Radiocarbon dating of an ecofact directly associated with the object was determined to be Cal BP date of 10,560 to 10,253 (2 sigma; Claib Rev.6) (Gifford and Koski 2011). Investigations of these two sites have only scratched the surface. To date, only about five percent of Little Salt Spring has been excavated.

The transition from lanceolates to smaller notched points represents the end of the Paleoindian period (Austin 2006; Bullen 1975; Powell 1990), while lithic reduction strategies and contiguity from 10,000 BP to 9,000 BP represents a continuation of Paleoindian occupation of Florida (Lydecker et al. 2011:12). Early Archaic tool assemblages associated with Bolen points are well constrained stratigraphically and chronologically (10,000 BP to 9,000 BP) (Faught et al. 2003). However, unlike Clovis and Suwannee/Simpson lanceolates (Dunbar 1991; Thulman 2007), their spatial distributions have not been reconstructed for Florida. Numerous sites show at least semi-permanent occupation during this period (Faught et al. 2003) while other special activity sites and campsites in the Central Florida Highlands were used seasonally or to utilize a specific resource (Milanich 1994; Milanich and Fairbanks 1980).

Windover Pond is an Early Archaic mortuary pond located in Brevard County, Florida. The site has produced a large variety of artifacts including 7,000-year-old human tissue, bone, antler, wood, and fabric made of saw palmetto and sable palm preserved in a peat bog. There is evidence that their dead were buried underneath the peat deposits. The site has provided "unprecedented and dramatic" information about Early Archaic people in Florida (Milanich 1994).

3.1.2 Middle Archaic (8,000 BP – 5,000 BP)

In Florida, the Middle Archaic witnessed increased population growth and reliance on marine resources. Sites were expanded into the St. John's River area, along the Atlantic coastal strand, and along the southwest Florida coast into south Florida (Milanich 1995:20).

During the Middle Archaic, Florida's eastern lakes were settled for the first time and biface points were made with a stem for hafting rather than notching. Many archaic tools appear less carefully crafted and are expedient rather than consistent. New mortuary practices including the preservation of the skeleton in different positions were introduced, and populations grew much like those found at the Windover Pond site (Doran 2002). It was during this time span that the second occupation of Little Salt Spring appears in the evidence uncovered by researchers from the University of Miami. It is estimated somewhere between 100 and 1000 submerged burials are present at Little Salt Spring. While evidence of this burial practice has been seen elsewhere in the world, in North America these archaic mortuary ponds are unique to Florida. It is possible that there are sites of a similar nature to Warm Mineral Springs, Little Salt Spring, and Windover Pond preserved on the submerged paleo-landscape offshore.

Maritime adaptations become increasingly apparent from 7,000 BP. Shellfish resources first appear in the archaeological record during the Middle Archaic. Extensive shell middens along the coast and canal systems connecting mangrove swamps were constructed by humans utilizing the coastal zone. Middle Archaic sites, specifically shell middens, are plentiful and are found in a variety of locations in Florida (Milanich 1994). In at least three sites at Big Bend in Apalachee Bay, the shell middens continue offshore along relic river channels (Faught 1988, 2004).

Ground and pounded shell and limestone were increasingly used as raw materials to make tools during the Middle Archaic. In present-day Florida, evidence of lithic technology is meager during this period and pottery is absent from the record. On the other hand, excavations at the San Marco Island site found wood and plant fibers used for cordage and decorative items. The excellent preservation of these finds is due to unusual anoxic environment in wetland muck. Wood was certainly made into many items of daily use and has been previously found in submerged settings (Lydecker et al. 2011).

Excavated artifacts made from limestone include plummets, grooved pebbles, net sinkers, and hammer stones. Large shellfish, including whelks and conchs (*Busycon*, *Strombus* and *Pleuroploca*) were modified/manufactured to make picks, adzes, celts, chisels, awles, gouges, knives, scrapers, cups, saucers, dippers, and spoons while smaller shellfish are thought to have been used to make net weights, sinkers, and decorative beads (Kozuch 1992).

3.1.3 Late Archaic (5,000 BP – 3,000 BP)

The Late Archaic Period is characterized by greater cultural complexity after 5,000 BP (Milanich 1994). Extensive shell middens dating to the Late Archaic are found along the coast and inland waterways of Florida.

In the Late Archaic Period, middle Archaic assemblages, including the expedient chipped-stone assemblage, continued (Hemmings and Kohler 1974), while new technologies were introduced to the region. The earliest ceramics tempered with plant fibers appear about 4,050 BP (2000 BC). Varying by location in Florida, these ceramics are referred to as Mount Taylor, Norwood, or Orange. The Late Archaic also sees the use of steatite cooking vessels (Milanich 1994; Powell 1990; Sassaman 2003) and shell middens made into circular features known as “shell rings” (Russo 2004).

While appearing first in Middle Archaic assemblages, socketed base points such as Culbreath and Levy are also consistent with Late Archaic settings. Hemmings and Kohler (1974) report these chipped stone assemblages as extensions of the expedient Middle Archaic tool kit. Late Archaic sites indicate that humans were hunting, fishing, processing food, manufacturing marine shell tools, building fires, and living along the developing Everglades tree island landscape more than 5,000 years ago. Several Late Archaic sites overlay pre-existing layers of organic soil, sediment, faunal remains, and cultural material, suggesting an earlier occupation during the Middle Archaic (Schwadron 2010).

Coastal occupation during the Late Archaic is more extensive than previous periods. Features including fish weirs, canals, platforms, ponds, and sluices appear in the archaeological landscape for the first time (Schwadron 2010).

The transition from the Archaic to the Woodland period in Florida is marked by increasing regionalization and the development of specific ceramic styles and variations. To understand these different traditions, Florida has been divided into nine cultural regions by Milanich (1994). Brevard County is located within the East and Central region, in which is further separated into the Indian River Culture Area. This is a region that is centered on the Indian River and stretched from the northern boundary of Brevard County south to St. Lucie Inlet, a distance of some 190 km. From east to west, it extended from the Atlantic seaboard to the upper St. Johns River basin, an average distance of about 50 km (45 SW 2020).

3.1.3.1 Mt. Taylor Period (6,000/5,000 – 4,000 BP)

At the end of the Late Archaic, Milanich (1994) uses the Mt. Taylor Period to differentiate and define the beginnings of identifiable regionalism in east central Florida. In the Indian River Culture Area, the end of the Late Archaic period has been associated with the Mt. Taylor regionalism (Table 3.1). It is heralded by the emergence of steatite vessels and ground stone implements. The presence of these artifacts in this region indicates that a long-distance trading network was established during this time. Mt. Taylor is the final preceramic culture in Central Florida and dates to the Middle and Late Archaic though the exact date is subject to debate (45 SW 2020). The subsistence strategies for people during this time are more closely related to that of the Late Archaic, indicating that it is more closely related to the latter phase, rather than the Middle Archaic (Cantley et al. 1994). Fish was the main food source, along with mammals, reptiles, birds, and amphibians (45 SW 2020).

This period is also identified with the rise of monumental architecture. Previously, it was assumed that shell mounds along the St. Johns River could only have been constructed during the post-Archaic periods and were associated with later cultures which used ceramics. However, recent research at shell mounds have identified purposely constructed shell mounds (some containing burials) that are older than 2,000 BP (45 SW 2020).

Sites representative of the Mt. Taylor Period include the Mt. Taylor Site (8VO19), Max Hoeck Site (8BR205), and Tick Island (8VO24). The Mt. Taylor and Tick Island Sites indicate that these people used charnel houses for preparation and storage of their dead until mass burial plots could be constructed within shell middens (Cantley et al. 1994).

3.1.4 Orange Period (4,000 – 2,500 BP)

The introduction of clay pottery vessels emerges during the end of the Late Archaic Period during the Orange Period (45 SW 2020). This is the first pottery type to emerge in Central Florida and is typified by fiber-tempered pottery (Cantley et al. 1994). There is little evidence of subsistence pattern differences, therefore the period is defined by the changes in pottery technology, decoration, and manufacturing methods. Although the patterns did not change, there was an increase in the use of shallow dwelling fish, snails, and mussels from freshwater marshes (45 SW 2020).

The Orange Period is split into five different phases based upon pottery styles (Orange Period I-V) (Table 3.2). Orange Period I ceramics are characterized by plain, hand-molded, thin-walled, rectangular containers with occasional lug-like appendages. Orange Period II ceramics are very similar to the previous period in the exception that in addition to plain wares, they also began to exhibit exterior decorations, including incised, concentric, vertical diamonds with horizontal lines and spirals with background punctations. Orange Period III ceramics are distinguished by large, straight-sided and round-mouthed vessels with flat bottoms. The thickness varied, but the lips were always simple rounded or flattened. Exterior decorations are similar to the Orange Period II ceramics, with incised straight lines, some parallel and slanting, with occasional punctations or ticks. Orange Period IV ceramics had simple incised motifs, with sand and fiber tempers, constructed with hand molding (Cantley et al. 1994) and the first instances of coiling (45 SW 2020). Orange Period V (which is referred to as the Transitional Period to some researchers) ceramics exhibited both hand molded and coiled manufacturing methods with incised, pinched, and triangular punctated surface decorations. Sand and fiber ware was used as the tempering agents, like the ceramics of the previous Orange Periods. St. Johns chalky pottery is also associated with this phase, as well as Malabar I ware types (Cantley et al. 1994; 45 SW 2020).

Table 3.1 Prehistoric Culture Periods of the Indian River Culture Area (45 SW 2020)

Date BC/AD	Cultural Period	Cultural Traits	Diagnostic Artifacts
12,000-8,000 BC	Paleoindian	Small bands of migratory hunters and gatherers.	Fluted points: Clovis, Folsom, Dalton, Suwannee, and Simpson projectile points
8,000-2,000 BC 8,000 5,000 3,000	Archaic Early Archaic Middle Archaic Late Archaic Mount Taylor	Small groups of migratory hunters and gatherers living within smaller territories. Burials in ponds. Some evidence of aquatic resources exploitation early. Beginning of middens by Middle Archaic. Steatite vessels appear by Mt. Taylor. Regionalism begins.	Archaic stemmed points, steatite vessels
2,000-500 BC	Orange	First appearance of ceramics. Increased sedentism. Exploiting aquatic resources. Middens becoming commonplace.	Fiber-tempered pottery. Increased use of design motifs over time. Appearance of sand and mixed sand and fiber tempering late. Stemmed projectile points
500 BC-AD 900	Malabar I	Conditions similar to present. Continuation of hunter/gatherer/fisher subsistence. Villages with smaller special use camps. Burial mounds.	St. Johns Plan, Sand-Tempered Plan, Glades Plain, Sandy St. Johns, Dunns Creek Red (late)
AD 900-1565	Malabar II	First appearance of check-stamped ceramics. Large populations. Appearance of non-local objects. European artifacts 1513+. Wreck salvaging.	Stamped ceramics, Exotics (galena, copper, quartz crystals, etc.), European goods

Table 3.2 Orange Period Chronology (45 SW 2020)

Date BC	Cultural Period	Ceramic Attributes
2000-1650	Orange I	Hand-molded, flat-based rectangular shaped containers. They were undecorated with then walls and the rim treatment was simple rounded lips.
1650-1450	Orange II	First use of decorations on ceramics. The decorations include concentric vertical diamonds with horizontal lines and some use of incised spirals and punctuations. Vessel forms were similar to Orange I.
1450-1250	Orange III	Large straight wall, rounded vessels with smooth surfaces and flat bottoms. Fewer rectangular vessels are found. Decorations on the ceramics are incised straight lines and some punctuation.
1250-1000	Orange IV	Coiling first appears as a method of manufacturing ceramics. It also signified the end of hand molding. By the end of this period tempering begins to be a mix of sand and fibers (also known as semi-fiber tempered). Decorations on pots are simple incised motifs.
1000-500	Orange V	The end of the semi-fiber tempered ceramics and the appearance of chalky ware, which is typical of the Malabar Period. Also decorations and shapes of vessels are similar to Malabar Period wares.

3.1.5 Malabar Period (2,500 BP – 450 BP)

From the Orange Period, the Malabar Period evolved, which existed up until the arrival of the Spanish. Many researchers believe that several factors separate it from the St. Johns Culture Area to the north (45 SW 2020, Buchner et al. 2008, Cantley et al. 1994). The cultivation of corn is absent and there were differences in the linguistics, social activities, and religious customs (Buchner et al. 2008). The period is marked by an increase of sand-tempered pottery, although spiculate-tempered pottery (St. Johns) was still dominant from Orange Period V.

The prevalence of sand-tempered Glades pottery in the southern portion of the region and St. Johns ceramics in the northern portion indicate that the Indian River Culture Area was a transitional zone (45 SW 2020). Rouse (1951) was the first to describe the pre-Columbian cultures of the transitional Indian River area (Figure 3.2). This Malabar I period is coeval to the St. Johns I period. Malabar II, which is characterized by the appearance of St. Johns Check Stamped pottery, is temporally equivalent with St. Johns II (Penders 2012c).

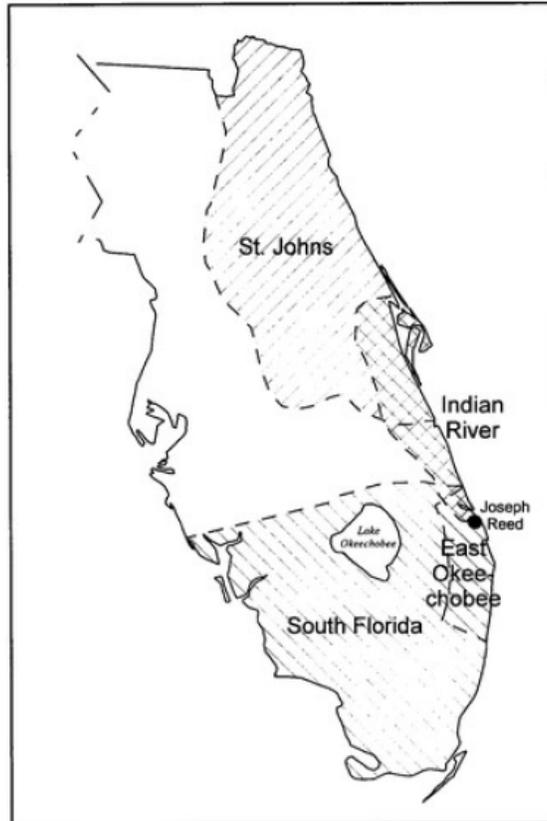


Figure 3.2 East and South Florida Culture Regions (St. Johns after Milanich 1994, Indian River after Rouse 1951, East Okeechobee after Carr and Beriault 1984, South Florida after Widmer) (Russo & Heide 2002:76).

A significant amount of undecorated pottery tempered with quartz sand also appears in the Indian River region. Indian River-region ceramic samples have shown that both the St. Johns and quartz-tempered pottery are made from local clay sources, suggesting that one group made both wares (Milanich 1994).

The Malabar Period is divided into two sub-periods or phases, Malabar I and Malabar II, which are further divided into Ib and IIb respectively (Table 3.3). In the past, the Malabar Period has been seen as temporally equivalent with St. Johns but recently the chronology has been further differentiated by research in the region (45 SW 2020).

3.1.5.1 Malabar I (2,500 BP-1,500 BP)

Malabar I is mainly defined by the presence of chalky, sponge spicule ceramics. Some fiber-tempered wares are present during this phase but is likely transitional from the prior period. The decorative motifs are linear and continue through Malabar II. Climate change from the Roman Warm Period, may have caused an occupancy shift to the Indian River Lagoon area and on the coastal barrier islands (45 SW 2020).

There appears to be some influence from the Weeden Island and Yent complexes, but the degree of influence seems to be minor. Exotic goods resulting from trades with other cultures is rare and comprise of a very small percentage of the archaeological record (45 SW 2020).

Malabar Ib is noted more by the brief presence of Dunns Creek Red ceramics rather than any other cultural identifier. During this short time span (1,500-1,100 BP) the ceramic appeared and disappeared. It is unclear what caused the short-lived pottery, but it is suggested that it may have to do with the climate shift to cooler and drier environments during the Vandal Minimum Period (45 SW 2020).

Table 3.3 Malabar Period Chronology (45 SW 2020)

Date BC/AD	Climatic Period**	Malabar Subperiod	Cultural Traits	Diagnostic Artifacts
500 BC-AD 900	Roman Warm Period (ca. 350 BC-AD500)	Malabar Ia	Conditions similar to present. Continuation of hunter/ gatherer/ fisher subsistence. Villages with smaller special use camps. Burial mounds.	St. Johns Plan, Sand-Tempered Plan, Glades Plain, Sandy St. Johns
AD500-900	Vandal Minimum Period (ca. AD 500-850)	Malabar Ib		Dunns Creek Red
AD900-1050	Medieval Warm Period (ca. AD850-1200)	Malabar IIa	Though check-stamped sherds appear as early as AD750, recent dates suggest a correlation between their widespread use and the start of the Mississippian Period. Large populations. Some non-local artifacts or local copies.	Check-stamped ceramics. Very few exotics (galena, copper, quartz crystals, etc.),
AD1050-1513			Malabar IIb	European artifacts 1513+. Wreck salvaging. Populations were declining due to introduced diseases. Burial customs declined, and burials were placed in old existing mounds.
AD 1513-1565		Little Ice Age (ca. AD 1200-1850)		

*This revised chronology is based on Penders et al. 2009; Penders 2012a.

**The climate periods are from Marquardt and Walker 2012.

3.1.5.2 Malabar II (1,100 BP-450 BP)

Malabar II is indicated by a population growth and an increase in mounds and villages during the earlier portion of the Period. The phase is also hallmarked by the presence of check-stamped ceramics, which appeared in the St. Johns region in AD 750, but did not appear in the Indian River Culture area until 900 AD. This corresponds to the dawning of the Mississippian period and the Medieval Warm Period (45 SW 2020). In many nearby regions, this warmer weather resulted in the further cultivation of corn, but that did not seem to be the case in the IRCA. Instead, there was an increase in the consumption of shallow water fish within freshwater wetlands, which suggests a population increase.

Malabar IIb is largely distinguished archaeologically by the appearance of European goods, acquired either via trade or salvage of shipwrecks. The cooler and drier climate of the Little Ice Age during this time did not seem to have much of an effect on subsistence strategies. By the end of Malabar II, populations were decreasing, possibly due to the introduction of new diseases by the Spanish. By becoming proficient wreckers, the acquisition of European goods changed the socio-political network of the region. It could be speculated that the new trade network established by European goods was more far reaching than those established in the Mississippian Period (45 SW 2020).

3.2 Historic Chronology

3.2.1 Contact Period (CA. 1500 -1565)

The Florida peninsula first appeared in cartography in 1502 on the Cantio map and in 1507 on the Waldseemuller map (Lydecker et al. 2011:19) (**Figure 3.3**). While it is unknown when Europeans first made contact with Florida's native tribes, Juan Ponce de León made the first "authorized discovery" of Florida in 1513 (Griffin 1983:18; Turner 2013). Before that documented voyage, it is virtually certain that Spaniards were using Florida as a staging ground to capture slaves and possibly provision their ships, as had been practiced extensively in the Bahamas for some time. The exact location of Juan Ponce de León's initial landfall remains unknown but judging from the latitude recorded in his log the prior day it would have been somewhere close to present-day Ponte Vedra, north of St. Augustine. He claimed the "island" for Spain and named it La Florida, because it was the season of Pascua Florida ("Flowery Easter") and because much of the vegetation was in bloom. He then explored south along the coast, around the Florida Keys and north up the west coast of the peninsula, before returning to Puerto Rico.

It is likely that Ponce de León, like other conquistadors in the Americas, was looking primarily for gold, Indians to enslave, and land to govern under the Spanish crown. Accounts of the Ponce de Leon voyage describe interactions with the Ais Indians, the tribe occupying the Central East Coast of Florida at the time (Rouse 1951). Ponce de Leon attempted to land at the St. Lucie Inlet where he encountered the Surruque Ais (Davidson 2001). After Juan Ponce de León's journey, a series of increasingly ambitious Spanish expeditions led by Pánfilo de Narváez (1528), Vazquez de Allyon (1526), Hernando de Soto (1539-1540), and finally Tristán de Luna (1559) explored Florida and parts of the southeastern United States (Meide et. al 2010:19).



Figure 3.3 The New World as it First Appeared on the Waldseemüller Map in 1507 (Lydecker et al. 2011).

3.2.2 First Spanish Period (CA. 1565-1763)

By the mid-sixteenth century, Spain emerged as a leading power with its foundation being in trade and plunder from the Americas. The neighboring country of France noticed this rapid rise and sought a thriving empire of its own by setting sail to this new land. On May 1, 1562, an expedition of French protestant Huguenots under Jean Ribault's command found and explored a large deepwater river in northeast Florida. Two years later, the French successfully established Fort Caroline on the River May, present-day St. Johns River, with three hundred settlers under the command of René Goulaine de Laudonnière, establishing a large French presence in Florida (Bennett 2001:19-20; de Bry and Meide 2014).

By this time King Philip of Spain had already felt an acute need to establish a coastal stronghold in the territory he claimed as *La Florida*. This time Spanish forces would attempt to settle the Atlantic rather than the Gulf coast of Florida. A military outpost on the Florida coast could suppress piracy along Spain's Gulf Stream shipping routes while at the same time serve as a base for staging rescue and salvage operations for the increasing number of ships cast away on Florida's dangerous shoals. Don Pedro Menéndez de Avilés was charged with the task of establishing a Spanish foothold on Florida's Atlantic coast, and completely eradicating the French enterprise (Lyon 1976). Menéndez' fleet arrived almost simultaneously with a French re-supply ship led by Ribault, setting the stage for a rapid and bloody encounter between the two colonial powers. Ribault's fleet aimed to strike first but was ravaged by a hurricane which wrecked his ships to the south towards Canaveral. The survivors were put to the sword by Menéndez, who by this time had sacked Fort Caroline and ensured the survival of what would be the first Spanish settlement attempt in the U.S. to persist to this day, St. Augustine (Lyon 1976; Gannon 1983; de Bry and Meide 2014).

After the founding of St. Augustine, Menéndez also explored the west coast of the Florida peninsula, guided by Hernando de Escalante Fontaneda. Fontaneda had, at the age of 13 in 1549, survived a shipwreck on the southwestern coast of Florida. A concerted effort to document the Canaveral area and the Ais groups living there came in 1605, when Spanish soldier Alvaro Mexia traveled through the region with the goal of making allies with the native groups against the Dutch, French, and English (Dubcofsky 2011:34).

During the 1600s and 1700s, the Spanish, French and English continued to fight over territory and religion in Florida. The English, established in South Carolina by 1670 and thereafter in Georgia, attempted to push southward while the French moved eastward along the Gulf Coast from the Mississippi River valley. The Spanish would strengthen their hold in the Gulf with the founding of Pensacola and its fortifications beginning in 1698 but it remained tenuous, as evidenced by the inability of Spain to defend the Apalache mission system which was abandoned when attacked by Governor Moore from South Carolina in 1704 (Hann 1988:264-317). Forts and missions were established throughout La Florida extending in all directions with St. Augustine being the epicenter. (Hann 1988:326-327). However, the Ais's territory near Canaveral is conspicuously void of both forts and missions. The Ais Indians maintained control of the Cape Canaveral area throughout the First Spanish Period, their populations fluctuating throughout the decades.

At the close of the Seven Years War in 1763, in accordance with the Treaty of Paris, Spain ceded her Florida territory to the British and withdrew her garrisons from these remaining outposts along the Gulf of Mexico (Florida Department of State 2020a).

3.2.3 British Period (CA. 1763-1783)

Between 1754 and 1763, war ensued between the major powers of Europe, with the New World colonies of those powers serving as the predominant theaters for the war. The Seven Years' War, also called the French and Indian War in North America, concluded with Great Britain defeating the allied French and Spanish. Peace was signed with the 1763 Treaty of Paris, in which Great Britain gained control of significant land in the New World, including Florida. This transfer of power heralded a shift in the population of Florida, with many Spanish and allied native residents departing and being replaced by British colonists. Britain divided her new territory into two colonies, West Florida with its capital at Pensacola, and East Florida with its capital at St. Augustine (Schafer 2001).

Initially, the British viewed the Floridas as backwater colonies neither self-sufficient nor export-producing. Dismissive of Spanish colonial management, British authorities set out to transform their new possessions into profitable colonies. As successful as this effort was in the regions around St. Augustine and Pensacola, the British made little economic impact at the southern end of the peninsula.

During this time, the Creek Indian tribes of the Carolinas, Georgia and Alabama began to migrate to the Florida peninsula filling the void left when the Spanish were evacuated from Florida to Cuba. The departing Spanish had taken with them most of the original tribes native to La Florida. There is little information in the historical record from those who remained after the Spanish succession. The Creek peoples in Florida would eventually become known as Seminoles and Miccosukee.

The British would make notable efforts to map the region, and one result of this was the Anglicization of place names in the area. One government surveyor, Bernard Romans, conducted extensive surveys of the central and western areas of the peninsula between 1769 and 1772, producing detailed maps (Romans 1999[1775]:88, 338) (Figure 3.4).

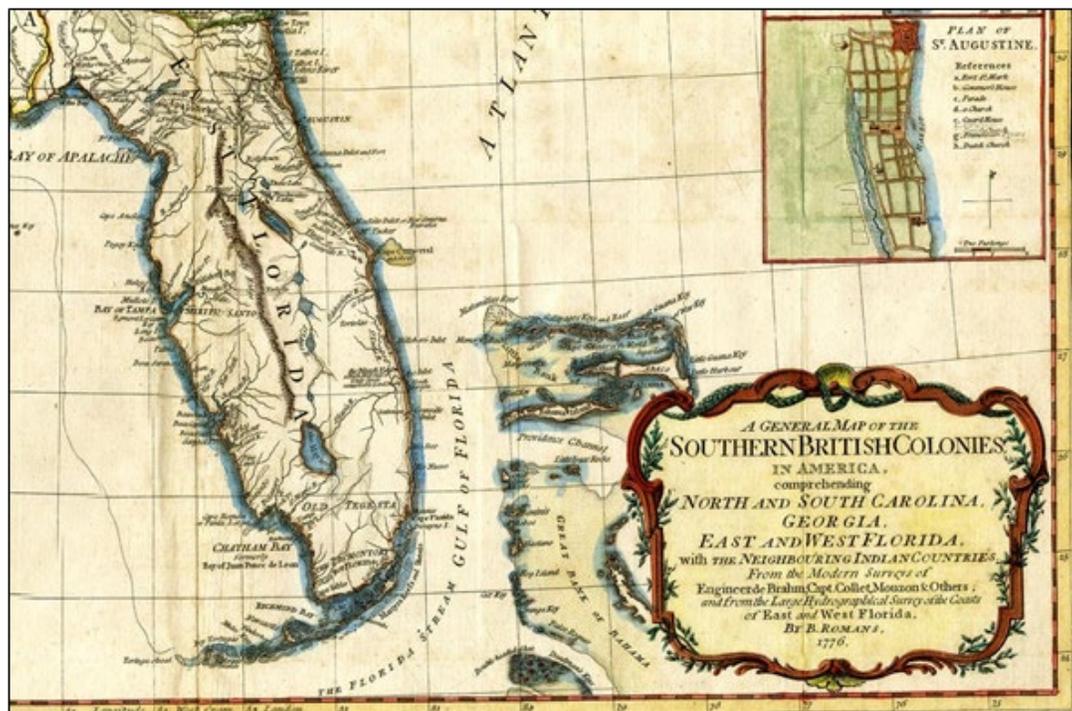


Figure 3.4. Bernard Romans' General Map of the Southern British Colonies (1776) (Note the peninsula labeled as Cape Canaveral on the eastern coast).

British rulers promoted population growth in East Florida with large land grants. The largest British plantation to the project area was granted to Dr. Andrew Turnbull, a Scottish physician. Dr. Turnbull, with a grant of 60,000 acres and over 1,200 colonists from the Mediterranean region, attempted to establish an agricultural colony in 1768 at New Smyrna, at the north end of the Indian River above Cape Canaveral. The colony produced indigo, sugarcane, hemp and rum, but was ultimately unsustainable. Fleeing disease, overwork, and a lack of food, the roughly 600 remaining colonists abandoned New Smyrna for St. Augustine by 1777 (Tebeau 1971).

Realizing that citizens from the British Isles might have difficulty with the heat and humidity in Florida, Turnbull resolved to use Greeks, who were accustomed to such conditions and knew how to cultivate olives, cotton, madder,

and tobacco, as settlers. He had experience with the Greeks as his wife was Greek. He received large grants of land near the Ponce de Leon Inlet (near present day Daytona). His plans called for 500 Greek settlers to cultivate crops that would thrive in the Florida climate. He called his colony New Smyrna after the birthplace of his wife.

Turnbull recruited 1,403 colonists from the Mediterranean region, which included Greeks, Italians, and Minorcans to establish an agricultural town in New Smyrna, at the north end of the Indian River above Cape Canaveral. The group ran into problems almost immediately. A ship carrying supplies wrecked before it reached the colony. A total of 148 settlers died during the voyage from Minorca to New Smyrna. When the colonists finally reached their destination, they were met by mangrove swamps. The land had not been cleared, and food was scarce. The swamps had to be cleared and shelters built for the colonists. Although there was an abundance of food in the area the colonists were not allowed the time to gather, hunt, or fish. These conditions led to a minor revolt by about 300 colonists. They rioted, seized a ship, and sailed south. A British frigate captured the escapees and brought them to St. Augustine. Two of the rebels were executed and the rest were returned to New Smyrna. Life at the colony continued to be difficult. The work was hard, the food continued to be scarce, and malaria was rampant. In the first year of its existence an additional 450 colonists died (Tebeau 1971).

The colonists who were deemed not to be working to their capacity were beaten, confined in stocks, or chained to heavy iron balls. Some were chained to logs in the fields to continue their work. Turnbull used his overseers to enforce his judgements, and often they exceeded their master in severity. Despite this, New Smyrna was the most profitable indigo plantation in North America.

All the colonists had signed letters of indenture with Turnbull. They would work for a set number of years. At the end of that time, they would be released from the indenture and Turnbull would give them a small plot of land for their own. The more skilled such as blacksmiths and carpenters had shorter terms of indenture. As the terms of indenture ended for the more skilled of the colonists, they approached Turnbull for their discharge and land. Invariably they were imprisoned and forced to sign new indentures. Eventually the colonists were afraid to ask for their discharge.

In 1777, a group of Englishmen from St. Augustine came to New Smyrna to examine the colony. A young boy overheard these gentlemen say that if the colonists knew their rights, they would not suffer the slavery in which they found themselves. The boy told his mother, who discussed the matter with other colonists. They decided to see what they could do. On March 25, 1777 three of the men got permission to go to the coast to hunt for turtles. They were granted permission and went to the coast, but they turned north and went to St. Augustine where they sought an audience with Governor Tonyn asking for justice as their terms of indenture had expired. Governor Tonyn promised to protect their rights. Several factors came into play; the conditions at New Smyrna, the need for men to protect Florida because of the outbreak of the American Revolution, and antagonism between Tonyn and Turnbull, led Governor Tonyn to liberate the New Smyrna colonists. During May and June of 1777 most of the colonists migrated to St. Augustine and by July 17, 1777 Turnbull's attorneys had set all the colonists free. In its ten years of existence 964 colonists died at New Smyrna (Ancestry n.d.).

A map surveyed by William de Brahm and drawn by John and Samuel Lewis depicts several smaller land grants between the project area and New Smyrna. These grants of between 10,000 and 20,000 ac, were likely given to the grantees but never occupied. The grantees include Thomas Bradshaw, with 10,000 ac on the west bank of the Indian River, and Samuel Barrington, Captain John Jervis, William Henry Ricketts, and Colonel William Faucitt, each with 20,000 acres (Lewis and Lewis 1769). Bradshaw's grant was the closest to the project area, at a distance of 26.3 km.

Further north, in the vicinity of the present Haulover Canal, two grantees developed their grants into plantations. Robert Bissett received a 300-ac grant in 1768, which he named Mount Plenty. The grant wasn't settled until 1777 and was only inhabited and worked for two years before it was raided by a "Spanish privateer" and abandoned shortly after. The plantation was reported to include a dwelling, a storehouse, a kitchen building, a hen house, and a stable. Bissett also claimed to have enough houses to accommodate 70 slaves. "He claimed to have built three sets of indigo vats and cleared 143 acres" (Parker 2008:30). Bissett's claims made to the British government in hopes to receive compensation for losses suffered by virtue of evacuating the Floridas when Great Britain agreed to cede the Floridas back to Spain at the end of the American Revolution (Siebert 1929).

The second grantee of note in this area was William Elliot. Elliot's plantation was located "a few miles south of the Bissett grant" (Parker 2008:30) and was developed into the first sugar plantation in British Florida. It was, at the time, the "southernmost plantation along the Atlantic coast during the British occupation of Florida" (Parker 2008:30). Elliot hired John Ross, a native of Scotland to travel to Florida and "select and settle tracts of land in Florida." Ross selected a tract on the Halifax River approximately 85 miles south of St. Augustine. The land was called Stobs in honor of the Elliot family land in Great Britain. Elliot also ordered Ross to "purchase enslaved Africans in Georgia for his labor force" (Parker 2008:31). The slaves were to begin by constructing their lodging prior to clearing the land for "provision crops and indigo" (Parker 2008:31). These tasks were completed by the end of 1768. "Five years later, the Kings Road would be completed between St. Augustine and its southern terminus: Stobbs Farm" (Parker 2008:31). Following limited success with indigo, Ross began draining the wetlands at the plantation for the creation of sugar fields, and possibly rice fields. He also created a canal network to irrigate the indigo fields. In 1771, Ross constructed "a complete sugar works: one large mill house, one boiling and curing house and twenty-eight Negro houses" on a previously undeveloped 1,200 ac tract that abutted the western edge of Stobbs and extended to the marshes of the Indian River (Parker 2008:31). This would become the first sugar works in East Florida and the oldest standing sugar processing facility. The plantation was moderately successful throughout the 1770s and produced both sugar and rum for export back to England. As with Bissett's plantation, production ended with the raid of the "Spanish privateer in November 1779 (Parker 2008:31).

Ruins of the plantation, located just beyond the boundary of the Merritt Island National Wildlife Refuge, have been recorded as site 8Vo160. Excavations conducted in 2008 also recorded the Elliot Plantation Complex (8Vo9407), a multi-component archaeological site that includes nine separate sites consisting of the remains of the sugar mill (8Vo160, Ross Hammock Midden (8Vo130), Ross Hammock Indian Mounds (8Vo131), a salt evaporating plant (8Vo213), sugar factory village (8Vo9403), sugar factory canals (8Vo9404), Ross Hammock canals (8Vo9405),

and Plantation Road (8Vo9406). Three of the sites (8Vo130, 131, and 213) are contained in a multiple National Register listing (8Vo2569).

East Florida played a very small role in the American Revolution with the colony still so dependent on oversight and supplies from Great Britain. The last naval battle of the war took place off the coast of Cape Canaveral more than one month following the official end to the conflict.

3.2.4 Second Spanish Period (CA. 1783-1821)

The 1783 Treaty of Paris marked the end of the Revolutionary War and the beginning of the Second Spanish Period in Florida history, with the colony serving as a reward for Spanish efforts in aid of the United States. British loyalists, many of whom recently moved to Florida to escape revolution fervor in other British colonies, now had to leave again. The Spanish government attempted to populate their recovered territory the same way the English had, through land grants, but they could not keep up with the influx of American settlers moving south. During this period, Spanish leadership had some difficulty unifying and exercising control over the diverse groups then living in Florida: Spanish moving back in from other parts of the empire, Americans, Minorcans remaining from the British period, free blacks, and Seminole and Creek Indians, many of whom preferred the trading relationships they had developed with the British (Tebeau 1971).

The new Spanish governor in St. Augustine, Vicente Manuel de Zéspedes y Velasco, wrote that in 1785 Florida “was a province that has just died for England and is in the process of being reborn for Spain” (Lockey and Caughey 1949:728). After overseeing the evacuation of British subjects over an 18-month period (those who decided to leave and forfeit their property rather than stay and swear loyalty to Spain), Zéspedes’ priority was to make Florida a secure, stable, and prosperous settlement. Florida was once again under Spanish control. However, Spain chose to keep the English divisions of the territory in place, leaving the state split into East and West provinces (Tanner 1989; Cusick 2000:173).

In many ways, the Florida colonies were once again a series of military outposts on the fringe of Spain’s New World Empire. Numerous late 18th-century accounts make note of the military and backwater nature of East Florida’s provincial capital, typified by this 1785 description: “All are either in service of the garrison, or live on a small liquor trade or other mercantile business of little consequence” (Lockey and Caughey 1949:481). This early characterization was no doubt to some degree the result of the massive population loss that occurred when the multitude of British subjects left the Floridas for the Bahamas or other British colonies (Poitrineau 1988).

To counter this population and economic loss, the Spanish government enacted a series of policies designed to encourage immigration and settlement of uninhabited areas. Tax exemptions, land grants, and subsidies were used to entice Catholic immigrants, and non-Catholics were for the first time allowed to own land. Many *Floridanos* (persons born in Florida under the first Spanish regime) returned from Cuba to either set up new plantation or acquire lands previously held by the British (Landers 2000a:121). Some new immigrants including the wealthy *Floridano* Francisco Xavier Sánchez, maintained large ranches with herds of cattle (Landers 2000b; Parker 2000). Other settlers who arrived as indentured servants were upwardly integrated into the new Spanish society, most

notably St. Augustine's substantial Minorcan community, who became landowners by investing in farming, fishing, business, and maritime commerce (Griffin 1991; Cusick 1993).

While the slave-based plantation economy was now firmly entrenched in Florida, Spanish authorities until 1790 continued to honor the 17th-century amnesty for runaways from adjacent territories willing to convert to Catholicism. The first to make the transition from slave to free subjects were the Africans brought by British loyalists during the Revolution, who subsequently escaped. Some 250 of these maroons were granted freedom, forming the nucleus of Florida's free black community in the Second Spanish Period. Among them were "skilled carpenters and masons, hostlers, hunters and fishermen, sailors and soldiers, ranch foremen, butchers, shoemakers and tanners, and field hands" (Landers 2000a:122). Florida's planters, laborers, merchants, hunters, and mariners formed a diverse community during the Second Spanish Period, and included Anglo-Americans, Creek or Seminole Indians, Minorcans, Greeks, Italians, Canary Islanders, African Americans, and, after 1800, French, Irish, Scottish, and Americans (Griffin 1983; Cusick 2000:179). Many U.S. citizens took advantage of the situation, pledging oaths of loyalty in order to gain fertile lands in Florida.

Both East and West Florida struggled to become the populated economic centers that the Spanish authorities intended. West Florida settlers enjoyed only limited success with staple crops and exports of tobacco, lumber, indigo, and cotton. One of the most important commodities in West Florida became deerskins. This trade, monopolized by the Panton, Leslie, and Forbes Company, provided various finished goods to the Creek Indians in exchange for the skins from the white-tailed deer, which were highly valued in the overseas market (Meide et al. 2010). Traders provided guns, knives, needles, cloth, liquor, cookware, and other manufactured goods in return for a seemingly endless supply of dressed deer pelts. Although lucrative for the company, this did not result in prosperity for the Floridas as a whole. Most of the Panton, Leslie, and Forbes employees lived as resident traders inside Indian villages and operated under the careful watch of Creek leaders.

Following the 1807 halt of slave importation to the United States, Florida became an unregulated epicenter for illegal trade. The first significant European incursions into modern-day Brevard County occurred during this time, with the Reyes Grant plantation (1804-1835) located on 1,000 acres at the north end of the Indian River and the Delespine Grant of 1817 including 40,000 acres around the Titusville area (45 SW 2020). An 1834 map by Henry Schenck Tanner and an 1845 map by Joseph Meyer (1845) illustrate Mosquito County, marking Delespines Grant inland from Cape Canaveral and Flemings Grant further south, both on the Indian River (**Figures 3.5 and 3.6**).

The United States increased pressure to acquire Florida during this period in several ways and for several reasons. Tensions were growing between American settlers and Seminole Indians along the northern border of the Florida territory. Spain became an ally with Great Britain against France in the Napoleonic Wars, and the fear was that Britain would use Florida to launch attacks against the United States. Slave owners in the southern states disliked having free blacks who owned guns living so close to home. The use of the port at Fernandina for smuggling goods and slaves into the United States was becoming a large problem for trade oversight (45 SW 2020; Tebeau 1971). Gaps in Spanish control of Florida became increasingly apparent through the Patriot War (1812-1814) and the War of 1812.

Following the War of 1812 between the United States and Britain, and the related Creek War (1813-1814) between the U.S. and Creek Indians in Alabama, armed parties of American slave owners began to cross the border into Spanish Florida in search of their runaway African American slaves. These maroons often joined with Creek or Seminole tribes in Spanish Florida, many of whom had fought against the U.S. during the Creek War and became known as Black Seminoles. Armed by British traders, the Seminoles and Black Seminoles continued to commit raids across the American side of the border. The cross-border raids by both sides became increasingly bold, and the United States Army under the command of General Andrew Jackson invaded Spanish Florida on multiple occasions between 1817 and 1818 to fight against the Seminole and their African American allies. Collectively, these battles came to be known as the First Seminole War (1816-1819). With the widespread burning of Creek towns and the capture and occupation of the Spanish Fort San Marcos, and later Fort Barrancas at Pensacola, it became increasingly obvious to Spanish authorities that they could not effectively defend their territories against American incursion. To make the best out of an inevitable outcome, Spain entered negotiations with the U.S. and by 1819 had tentatively agreed to transfer Florida to the United States under the terms of the Adams-Onís Treaty. The treaty was ratified in 1821, and Florida was surrendered to the jurisdiction of the United States (United States Department of State 2020).

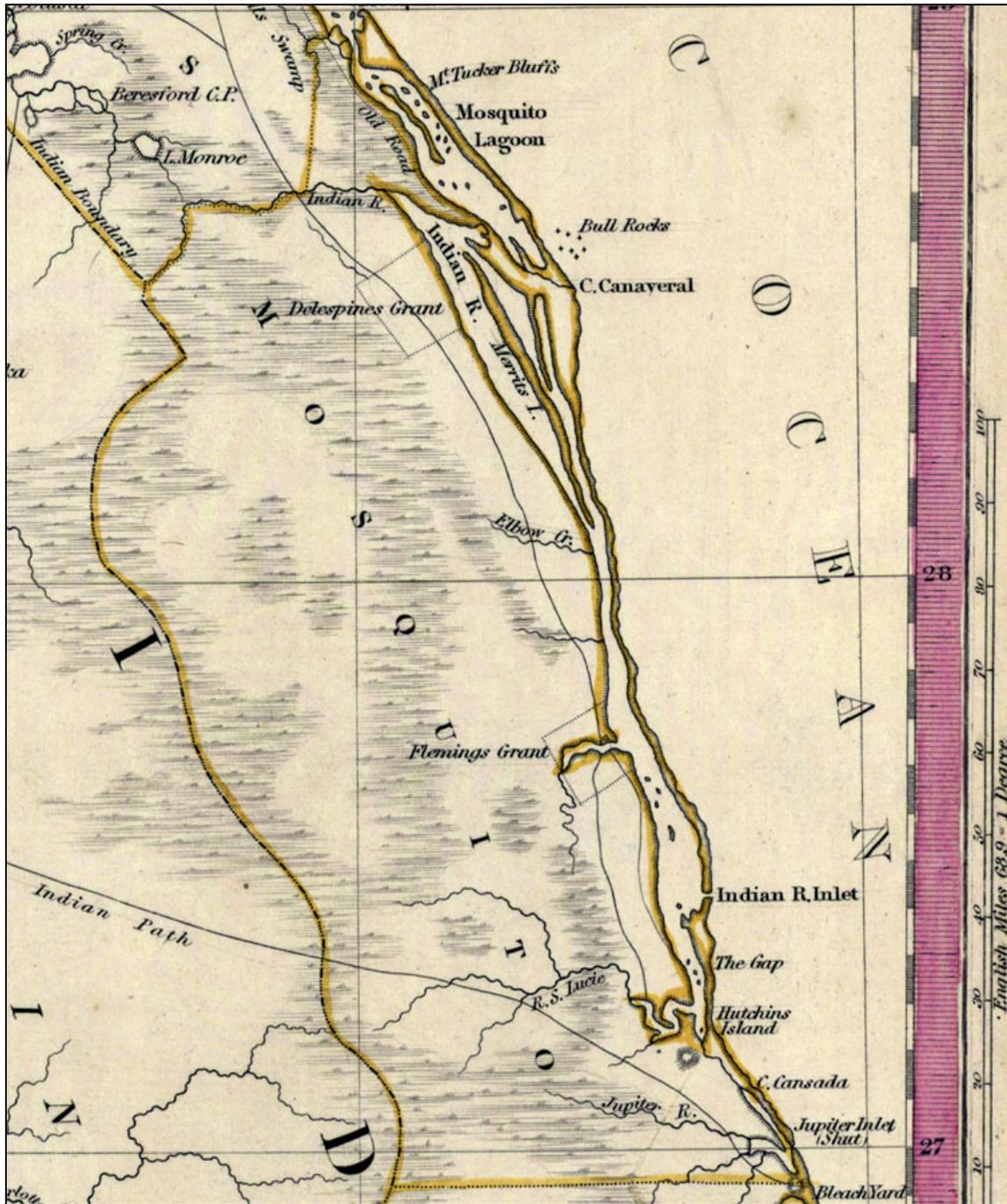


Figure 3.5 1834 Map by Henry Schenck Tanner showing Delespine Grant and Flemings Grant (Map courtesy of the University of South Florida, Special Collections Department).

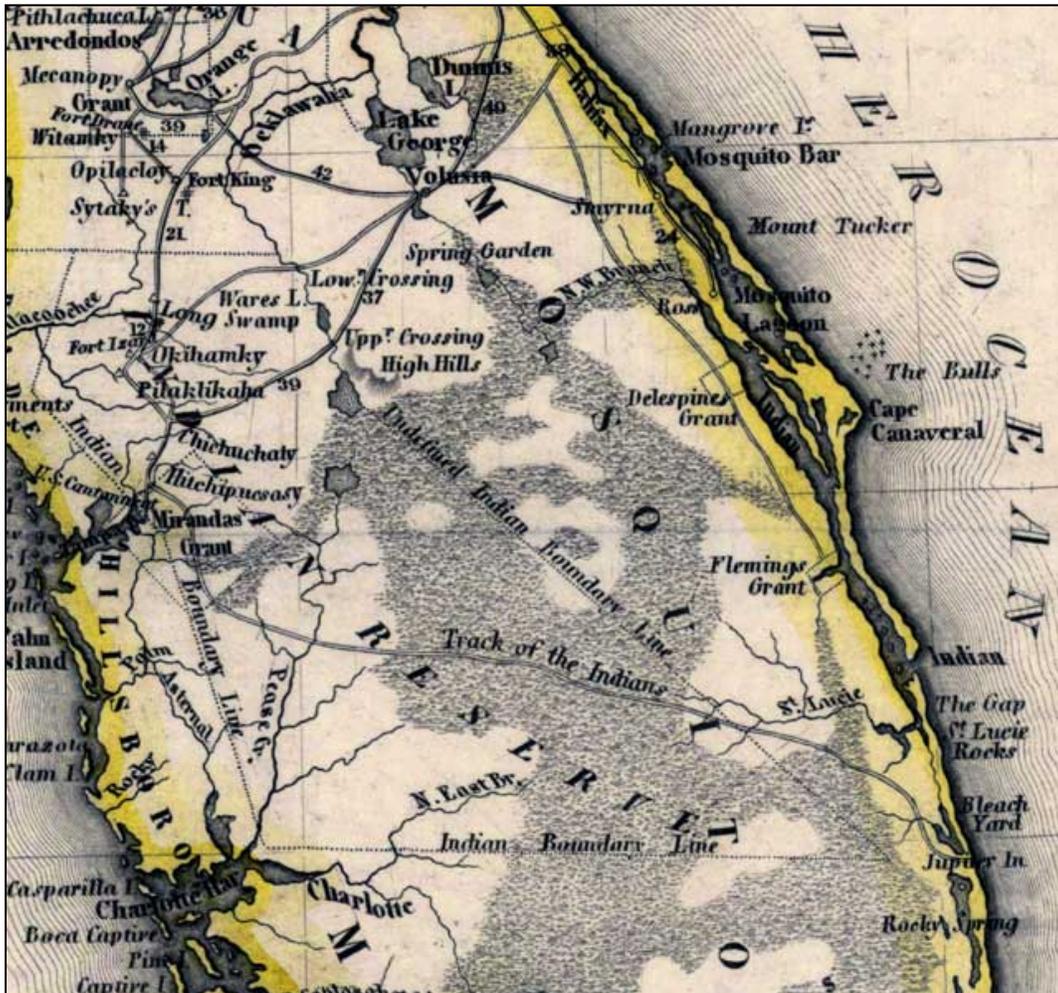


Figure 3.6 1845 Map by Joseph Meyer showing Delespine Grant and Flemings Grant (Map courtesy of the University of South Florida, Special Collections Department).

3.2.5 American Acquisition, and Settlement (CA. 1819 -1845)

Responsibility for establishing Florida's new government was given to Andrew Jackson. Within weeks, he had divided Florida into two counties. The area previously called West Florida became Escambia County, and the former East Florida became St. Johns County. Jackson established county courts and mayors in the former colonial capitals of St. Augustine and Pensacola and were joined with a new capital established at Tallahassee, a location halfway between St. Augustine and Pensacola. Job done, he appointed William Pope DuVal his successor as Florida's governor. Florida became an official territory of the United States on March 30, 1822 (Florida Department of State 2020b; United States Department of State 2020). New county divisions were created across the territory, and in coming decades, the Merritt Island area would go through several county designation changes (St. Johns, Mosquito, Orange, Volusia, and finally Brevard).

Florida's population grew quickly during this period, ballooning from under 8,000 in 1821 to 34,530 by the 1830s. Cotton, lumber, and the naval stores industry emerged as important economic forces in the territory, joining citrus, fishing, and other colonial period agricultural products (Gannon 2003).

Florida joined the Union as the 27th state in 1845, becoming a slave state balanced by the admission of Iowa as a free state. In the years between achieving statehood and joining the Civil War, significant energy in Florida was focused on economic and social development. Large numbers of schools, churches, and newspapers were established and formalized in new and growing cities, and the population of the state doubled between 1845 and 1860, with nearly half of that population being slaves (Gannon 2003).

3.2.6 The Second and Third Seminole Wars (CA. 1835-1865)

Around 5,000 Seminoles were living in Florida when it became a U.S. territory in 1821. The explicit position of the government was that these Indians should be removed to make way for anticipated waves of white settlers into the new territory. Sharing this motivation were politically powerful slave owners who wanted to eliminate the refuge for runaway slaves that the Seminoles provided. The first step was to confine the Seminoles to a 4,000,000-acre reservation taking up much of the central portion of Florida, south of present-day Ocala and east of the project area (Figure 3.8). This was accomplished through the Treaty of Moultrie Creek in 1823, though not all Seminoles complied, as the reservation did not suit the tribes' needs or their accustomed means of subsistence by the sea. Once vacated by the Seminoles, Tallahassee became the new territorial capital (Florida Center for Instructional Technology 2002).

In 1829, Andrew Jackson became President of the United States and pressed to have the Indian Removal Act passed by Congress, which would open the entire eastern U.S. for settlement by Americans and Europeans. It became law in 1830, mandating the forced migration of the Seminoles from Florida to Indian Territory in present-day Oklahoma. Its implementation would lead to the Second Seminole War in 1835 (Mahon 1967). One of the most vocal opponents to Indian Removal policy and a warrior leader of the resistance was Osceola. He plotted the attack known as Dade Battle near Bushnell, which made clear that war was the only means to force the Seminoles from Florida (Florida State Parks 2020).

The war devastated much of Florida, gathering national attention as plantations were burned to the ground amid devastating raids and slave revolts. In February 1836, a Baltimore newspaper lamented that "the whole of the country, south of St. Augustine, has been laid waste during the past week, and not a building of any value left standing. There is not a single house now remaining between this city and Cape Florida, a distance of 250 miles... [A]ll, all, have been burnt to the ground" (Niles Weekly Register 1836). In Mosquito County, which includes present day Brevard County, the area was "sparsely populated with mostly sugar plantations along the rivers near the coast. Seminoles ransacked or burned 16 of these plantations on the northern Mosquito Lagoon by January 1836" (Erickson 1994:36).

Several forts were constructed in Eastern Florida in support of the war. These included Fort Ann, Fort Pierce, Fort Taylor, Fort Christmas, and Fort Bassinger. Fort Ann was constructed in December 1837 at the haulover on the Indian River side of the crossing. "The intent was to erect a fortified depot that would serve as a place to supply

troops continuing down the Indian River” (KSC ICEMP 2014:9-28). At the time of its completion, 900 troops were in place at the haulover. The fort was abandoned in 1838 but used again as a Union camp during the Civil War and as a station for the U.S. Schooner *Beauregard* to prevent trafficking on the inland waterway.

Devastation from the war, along with a postwar hurricane in 1848, caused many people to refrain from building homes or businesses outside the fort (McKay 1924). It was not until after the Civil War that the area saw significant growth again.

As regular army troops and state militias were mobilized and sent into action, the Seminoles were slowly forced to the south, seeking refuge in the swampy wilderness. Several pitched battles were fought in the Everglades region, most notably the Battle of Lake Okeechobee on Christmas Day 1837.

With most of its remaining Seminole inhabitants, perhaps 300-400, restricted to a 2,500,000-acre hunting and farming reserve in southwest Florida, the territory saw the passage by U.S. Congress of the Armed Occupation Act. Designed to stimulate white immigration and pressure the remaining Seminoles to leave the territory, the law provided men willing to settle on the Florida frontier 160 acres of land. Most of those taking the proffered lands engaged in agriculture, such as Robert Gamble who settled on the Manatee River in 1844 to grow sugar cane, and whose holdings eventually grew to 3,500 acres (Schene 1981:69-76). Thereafter economic development progressed rapidly in Florida. The population passed 54,000 by 1840, and soon after the war, on March 3, 1845, Florida’s legislature applied for and was granted entry into the U.S. as the nation’s 27th state. Over the next 15 years, St. Augustine was eclipsed by rapid economic growth in the Gulf Coast, particularly Apalachicola and St. Marks. Devastated by the Seminole War, many of the plantations around St. Augustine would never recover. Complicating the recovery were property claims from the Second Spanish Period while middle Florida (with equally rich agricultural land) benefited from a good infrastructure and readily available land.

With the increase in population, tensions inevitably grew amidst reports of “Indian Rebellions” in South Central Florida. Indian territories continued to be encroached upon and the almost inevitable Third Seminole War broke out in 1855. Also known as the Billy Bowlegs War, this conflict saw Indian troops pushed even further south, and eventually another 200 Indians surrendered and were removed to Oklahoma. Despite the defeat, a small group persisted in the swamps of south Florida, in land impassable for federal troops. The descendants of these unconquered warriors are the modern Seminoles and Miccosukee (Clement 2020).

Haulover Canal

The Haulover Canal is located at a narrow spot of Merritt Island that was used as a boat “Haul over” as early as the 1600s. Boats were moved overland from the Mosquito Lagoon to the Indian River using rollers and skids. The difficulty of this process caused residents and businessmen to discuss a canal and although recommendations for a canal were made as early as 1824, an appropriation was not passed until 1844 and the canal was completed in 1854. The canal was excavated by slave labor provided by a local citrus grower and measured 1/3 mile in length, 10-12 ft in width and 3 ft deep and allowed shallow draft vessels to cross from Mosquito Lagoon into the Indian River (Foster 2013b:18). “Within 15 years, the canal proved to be inadequate because of the shoals that accumulated at each end and the strong current. It was so narrow and shallow in places that only small boats could navigate it.

Waters of the Indian River were usually two or 3 feet higher than the lagoon, with a strong current thus making it difficult for vessels trying to move against it, some slumping occurred, and bigger boats had to be pulled through or ‘hailed over’ on rollers” (Foster 2013b:18). By the 1880s the canal was in disrepair and had shrunk to a length of 1,000 ft, width of 12 ft and a depth of only 18 inches. The Florida Coast Line Canal & Transportation Company attempted to improve the canal through dredging, beginning in 1885. They first had to clear enough area to accommodate the dredges and brought in Italian laborers for this purpose. The dredging project was unsuccessful, and portions of the canal were impassable within two months (Parker 2008:49). In 1888, the Old Haulover Canal was replaced by a new canal at Allenhurst, today’s New Haulover Canal on the Atlantic Intracoastal Waterway (Parker 2008:49).

3.2.7 The Civil War, Reconstruction, and the Late Nineteenth Century (CA. 1865-1899)

Florida joined other Southern states in seceding from the Union on January 10, 1861. Union forces in Florida quickly focused on controlling the coast, taking many of the port towns, while Confederate forces sought to maintain control of the agricultural and cattle-producing interior of the state to supply food to its troops. The Cape Canaveral Lighthouse lamp was dismantled and removed by the Confederacy during the war to prevent benefit to Union naval forces. In addition, cattle, salt (for curing meat), and citrus (for medical treatment) produced in the Cape Canaveral area were important to the war effort (45 SW 2020).

While most Floridians were loyal to the Confederacy, the Union Navy largely controlled the seas. During the war, the interior of Florida remained firmly Confederate while Union forces occupied and controlled the coast. The Union took Fernandina and St. Augustine on the east coast, Tampa, Charlotte Harbor, Cedar Key and Pensacola on the west coast, Ft. Myers on the southwest coast, and held Key West for the duration of the war.

During the Civil War, the Union Navy had patrolled the Florida coastline but for the most part left the interior alone. Confederate soldiers in Florida served in the “cow cavalry,” so named because their main duty was to round up cows. Tens of thousands of cattle roamed the central region of the Florida peninsula in Kissimmee Valley. Confederate army patrols gathered these cattle and drove them north into the heart of the Confederate States to provide troop provisions (FCIT 2009). After the war, soldiers who fought not only in the Civil War but the Second and Third Seminole Wars (and had first-hand knowledge of the southern frontier) remained in the region to settle.

While Florida did not see the major battles and extensive destruction of the Civil War experienced by other southern states, it did undergo many of the same changes as roughly 15,000 troops went off to fight, many of whom did not return unscathed, if at all, and the economic system of slavery responsible for much of the state’s success to that point was abolished. As in the rest of the South, Reconstruction and the final decades of the nineteenth century in Florida would be marred by pervasive racial prejudice. But unlike its neighbors, Florida had few physical scars from the Civil War and adopted a laissez-faire approach to governance, and as a result it experienced significant economic growth and financial investment before the turn of the century (Gannon 2003).

Railroads were a major catalyst for and manifestation of this boom time in Florida. The state held 550 miles of railroad in 1881, and in just twenty years that number grew to 3,500 miles (Gannon 2003). William D. Chipley

constructed a rail line that connected the Florida Panhandle with the East Coast, Henry B. Plant linked the Atlantic and Gulf Coasts with a line between Jacksonville and Tampa, and Henry Flagler created the Florida East Coast Railroad, which ran the full length of Florida to Key West. With the railroads came easily transported building materials, development in previously impenetrable parts of the state, and scores of people seeking land, employment, and recreation.

3.2.8 Twentieth Century (CA. 1900-1999)

The boom of the late 1800s continued into the early 1900s, through hurricanes, citrus crop freezes, yellow fever, and influenza epidemics. Resort hotels anchored railroad hubs, and development promoting the tropical attractions and health benefits of Florida's climate drew tourists and seasonal residents in droves. A new economic force in Florida emerged with the advent of Prohibition in 1919. Florida's extensive and still largely undeveloped coastline, coupled with its proximity to rum distilleries in Cuba and the Bahamas, made it ripe for importing and transporting illegal liquor. A land boom took Florida by storm in the late 1910s, and by the Roaring '20s had grown into a "land delirium" (Gannon 2003).

By 1925, ambitious construction of splendidly furnished mansions and vast neighborhoods of stucco, Mediterranean-style homes gave way to the selling and reselling of vacant, unimproved lots, tied to dreams of future development that were only drawn in brochures. A dramatic bust to end the land boom came in September of 1926, when a devastating hurricane slammed into Miami. A fruit fly infestation crippled the citrus crop in early 1929, making the stock market crash the final nail in a coffin that was already shut. The Great Depression found Florida's economy in ruins.

Floridians found hope and improvement again in FDR's New Deal programs, which acted in the state predominantly through the Civilian Conservation Corps (CCC), the Public Works Administration (PWA), the Federal Emergency Relief Administration (FERA), and the Works Progress Administration (WPA), from 1933 to 1942. New industry came to the area in the form of paper mills, phosphate mining, mechanized factories for cigar making, fruit packing and canning, and sugar refining. Tourism began to pick up again, and by the start of World War II, Florida had new life.

3.2.9 History of Merritt Island and Kennedy Space Center

3.2.9.1 Merritt Island

One of the first settlers on Merritt Island was Douglas Dummitt, who moved to the area in the 1820s from Tomoka where he was the Postmaster and a sugar cane farmer. He began growing oranges on a “narrow strip of high land with abundantly rich soil near the ‘Haulover’” (Foster 2014a:18). Dummitt was the first to “bud” sweet orange trees onto the native sour-orange trees to create a hardier orange tree. “Because the bud union was at least 3 feet off the ground and the trees were budded and not seedlings, the Dummitt trees survived the devastating freeze of 1835, thus establishing the famous Indian River Groves (Foster 2014a:19). Following the Second Seminole War, Dummitt transplanted his crop to Dummitt Grove and by 1859 was harvesting 60,000 oranges per year. “By 1869, his grove was referred to as the largest in Florida, with more than 1,300 bearing trees that produces over 70,000 oranges (Foster 2014a:21). Dummitt contributed to the growth of citrus farming by selling budwood to other growers to start new groves. He died “at his orange grove” in 1873 (FWS 2015; see also Kanaski 2015).

Another early settler of Brevard County was Captain Miles O. Burnham, the first lighthouse keeper on Cape Canaveral. The population of the county grew slowly, the 1850 census recorded a population of 139. Settlers formed communities on the east coast near rivers and the first settlement of any size occurred in 1856 when 30-40 families formed the community of Canaveral, where Cape Canaveral is today. Settlement did not increase until regular steamer service began on the Indian River in the 1880s (Huckle et al. 1974:2).

Merritt Island, while never heavily populated, was home to several small communities of citrus farmers and fishermen, especially along the Haulover Canal. “As recently as 1962, there were approximately 17 towns, settlements, and hamlets scattered across North Merritt Island and Canaveral, comprised of a reported 400 people, mostly farmers and citrus growers (Foster 2013a:20). The northernmost of these towns was Shiloh, located on the north end of Merritt Island and the southern end of Volusia County, at one time the county line ran through the center of town. The town was founded in the early 1880s by George Kuhl, who owned and operated the town store, named the town, and established the post office in 1885. The town eventually became a trade center for the Indian River area (Foster 2015a:18-30).

Clifton was located just south of Shiloh near the Haulover Canal. “The area around the canal was referred to as ‘the Haulover’ and was renamed Clifton in 1889” (Foster 2015b:21). It was populated primarily by citrus growers. This small town was the home of the Clifton Colored School, constructed for the children of two African American families, the Campbells and the Jacksons. The school was constructed in 1890 and 1891. The school operated for approximately 10 years, until the Campbell and Jackson children “were of the age to be out of school” (Foster 2016a:20-27). Foster reports that Clifton did not have electricity until 1928, however, Penders (2008:48) states that Clifton “no longer existed after 1928 and Eugenia Campbell supposedly returned to live in the building in 1924.” The building ruins were overlooked by the US government when the area was purchased what would become the Kennedy Space Center. The schoolhouse was dismantled in 2004 by the North Brevard Heritage Foundation and moved to Titusville. Archaeological investigations conducted by the Indian River Anthropological Society in 2008 recorded the Clifton Schoolhouse Archaeological site (8BR2229) and the New Smyrna to Haulover Canal Road

(8BR2230/8VO8880) (Penders 2008). Additional excavations were recommended at the Clifton Schoolhouse site to determine its eligibility for the NRHP. The New Smyrna to Haulover Canal Road was recommended as eligible for the NRHP, under Criteria A and D.

The town of Allenhurst was founded in 1888 when the New Haulover Canal was opened. It “boasted a hotel, fishing camp and marina, and several homes (Foster 2016b:17). The Allenhurst Fishing Camp and Marina “offered 500 feet of free dock, free water, homemade bread, staple and fancy groceries at city prices, and launch supplies” (Foster 2016b:17). Allenhurst had a hotel, opened in 1913, “was visited by many dignitaries from all over the world” (Foster 2016b:17). The Indian River Company owned and operated the Fishing Camp and Marina and hotel and advertised throughout the eastern half of the United States.

Orsino, located within the current project area, was named for its first postmaster, Orsino Smith. The town had a school, post office, service station, grocery store, and several homes. “The Howes were a prominent family who had aspirations of making their community a modern city with all the latest conveniences—electricity, telephone and telegraphs. Stock was sold in the Orsino Telephone, Telegraph & Power Company in 1925, Walter H. Howe President” (Foster 2016b:27).

Courtenay, located just south of Orsino was settled in the late nineteenth century, primarily through land granted by the 1860 Homestead Act. Courtenay resident Edward Porcher contributed to the success of the citrus industry by founding the Indian River Orange Growers Association in 1891 and the Indian River and Lake Worth Pineapple Growers Association in 1895 (Foster 2017).

Indianola was a small rural community on central Merritt Island founded by the Field brothers of Macon Georgia in 1868. It was reportedly named for the Indian mounds in the area. Samuel Field opened the first post office in 1880 and the town became a shipping center for oranges, due to the narrow-gauge railway that “ran down the center of the dock which was used to transport heavy boxes of oranges from the packing houses to waiting boats (Foster 2017:30).

Several smaller, short-lived towns were also located on Merritt Island. Wilson, or Wilson’s Corners, was located on north Merritt Island and “was known as one of the richest fishing grounds of this part of Florida” (Foster 2016b:23). The town, named for President Woodrow Wilson, was populated by fishermen, farmers, and fruit growers. Two trailer parks were constructed near Wilson in the late 1950s. Danenburg Trailer Park (with a convenience store), built by Coleridge Danenburg on his farm, and the Wallace Trailer Park, “just down the road.” The construction of the trailer parks coincided with the beginning of the Space Center and helped to alleviate the housing shortage caused by the large influx of families employed there.

Other short-lived communities included Wisconsin Village, located approximately one mile south of Route 402, west of Wilson, which was populated by 10 families from Wisconsin. Mortenhurst, located south of Wilson, was established by George W. Morton and “faded away just prior to the turn of the century (Foster 2016b:25). Heath consisted of several homes located in the vicinity of the VAB, and Happy Creek, which consisted of the Happy Creek Hunting and Fishing Lodge, run by the Benecke family. The hunting and fishing lodge was created in the 1940s by a son of the original owners.

Hunting and Fishing Camps of Merritt Island

At the beginning of the twentieth century, following an increase in tourism as the railroad extended into the state, several hunting and fishing camps were established on Merritt Island and the surrounding area. These included the Indian River Haulover and Outing Club and the Canaveral Club. These were popularized by magazines such as Harper's New Monthly Magazine and pamphlets such as A Tourist and Hunter's Guide to Indian River Country, 1889-1890 and Dr. James A. Henshall's Camping and Cruising in Florida. Other camps included the Beacon 42 Fish Camp, which opened in 1939. The camp included 20 cottages, 40 boats, a 60-seat restaurant, an airstrip, and a hotel. Activities included duck hunting and fishing. The Beacon 42 Fish Camp advertised nationally in Fish and Stream and was featured in an article by Charles Elliott in Outdoor Life magazine (Foster 2016b).

3.2.9.2 NASA and Kennedy Space Center

The National Aeronautics and Space Administration (NASA) was established on July 28, 1958 when President Dwight D. Eisenhower signed Public Law 85-568. The first NASA administrator was Dr. T. Keith Glennan, who was sworn in on August 19, 1958, and official operations began on October 1. Operations were initially centered at Cape Canaveral Air Force Station, but additional space was needed to support the Apollo Lunar Landing Program, prompting a search for a new space center. Merritt Island was chosen for the space center due to its proximity to Cape Canaveral and the 9,000-mile tracking network of the Atlantic Missile Range. Other areas under consideration included sites in the Bahamas, White Sands Missile Range in New Mexico, Christmas Island in the south Pacific, Hawaii, Texas, and Georgia (Benson and Faherty 1978:5-4). Merritt Island Launch Area (MILA) was created in 1961. In 1963, Launch Operations Center (LOC), and LILA were renamed the John F. Kennedy Space Center to honor the late President.

The first Master Plan for the space center was completed in September of 1961. This plan included locations for the early Saturn and Nova test rocket launch pads along the eastern shore of the island, a rail transfer system and canals to transport rocket stages, a vehicle assembly area, spacecraft checkout, and launch control areas. The Industrial Area "was placed near the town of Orsino to provide space for a wide variety of industrial and scientific support facilities such as the KSC Headquarters Building, cafeteria, hospital/dispensary, physical plant maintenance, vehicle maintenance, and spacecraft assembly and checkout buildings" (NASA 1972:n.p. in Price 2013a:22).

Once the planning was complete, the acquisition of land could begin. On September 1, 1961, NASA requested appropriations for initial land purchases on Merritt Island. Once the site was chosen, NASA began to purchase what would become 88,000 acres of land on Merritt Island. The agency also requested that the acquisition process be handle by the US Army Corps of Engineers (USACE). In addition to coordinating the purchase of the land, the USACE was also integral in the design and construction of the space center's early buildings and infrastructure. "Whether through direct purchase or condemnation, NASA and the USACE acquired all of the Merritt Island property by 1964, including nearly 1,500 properties containing scattered homes, businesses, and citrus groves" (Benson and Faherty 1978:5-7, 5-11 in Price 2013b:22). Although many people were displaced by the acquisition "three-fourths of the owners were absentee, three-fifths lived outside of Florida" (Benson and Faherty 1978:5-7).

"When MINWR was established, approximately 2,500 acres were managed as commercial citrus groves. Beekeepers were needed to support the citrus industry on the Refuge. However, active grove operations declined after the 1990s and in 2008 all grove leases at KSC expired. The phase out of commercial beekeeping went through extensive public review from 2002-2006 and all commercial beekeepers were notified in 2007 of the decision to phase out operations by Oct. 2016" (NASA Environmental Management Branch). Three private burial grounds with 19 graves were "fenced off by NASA" and visitation was allowed. A Baptist church was relocated, a second church was purchased by NASA and turned into an office and laboratory. Lastly, summer homes along the Atlantic beachfront were purchased and converted into offices and storage (Harris 1970:6). Active grove operations declined after the 1990s and in 2008 all grove leases at KSC expired (KSC-PLN-1911, Revision G:245). Beekeepers are no longer active at KSC.

Construction of launch facilities and support facilities began in 1962. "In the 1962-1963 fiscal year, NASA spent \$162 million on roads, utilities, launch pads, towers, propellant depots, cables, and communication systems" (Price 2013b:22). Construction of the Vehicle Assembly Building, located approximately five miles north of the APE, began on August 20, 1963. This building, at the time the largest in the world was where the Saturn rockets were assembled before being transported to the launch pad. Construction of the Industrial Area, immediately east of the APE, began during this period as well. The major buildings in the Industrial Area were constructed between 1963 and 1966 (**Figure 3.7**) (Grinter 2007).

On August 28, 1963, "the Bureau of Sport Fisheries and Wildlife, later the United States Fish and Wildlife Service (FWS) entered into an interagency agreement with NASA to manage all lands within the KSC that are not currently being used for NASA/KSC operations. These lands, known today as the Merritt Island National Wildlife Refuge, provide habitat for more than 1,500 species of plants and wildlife (FWS 2015).



Figure 3.7 Construction Activity in the Industrial Area ca. 1965 (from Grinter 2007).

3.2.9.3 Land Acquisition within the APE

Much of the land within the APE was purchased by Walter H.J. Howe beginning in 1915 as part of the Three-Year Homestead Act of 1912. Howe had relocated to the Courtenay, Florida area from Poughkeepsie, New York in the 1910s, along with his wife Sara and son Karl. Howe was granted 154.48 acres from the United States Government in 1915. This acreage was comprised of lots 7 and 8-13 and 14 of NW $\frac{1}{4}$ 6-23-37 (BCDB 70/260; BLM 2020). Howe purchased two additional lots within 6-23-37 in 1919, from Ben Trauerman, (BCDB 13/349) and in 1935, from Myra G. Williams, (BCDB 12/472). In the 1920 census, Walter Howe is listed as a farmer on a “general farm.” By 1930, he is listed as an “orange grower.” He remained a citrus farmer until at least 1945 (US Census 1920, 1930, 1940; Florida State Census 1935, 1945). Additionally, Walter H.J. Howe was listed as a Justice of the Peace for District 20, Orsino in 1928 (Secretary of State of the State of Florida 1929: 362). Furthermore, as noted above, Walter Howe reportedly aspired to transform the little community of Orsino into a “modern” town, hoping to establish electricity, telephone, and telegraph lines (Sonnenberg 2020). In fact, Walter H.J. Howe established the ill-fated Orsino Telephone Telegraph & Power Company, however, it does not appear to have been a successful venture (Sonnenberg 2020).

Portions of five parcels are located within the APE (**Figure 3.8**). These parcels were purchased by the United States government between February and September 1963. Agreements for two of the parcels included citrus leases, both ending in June 1968.

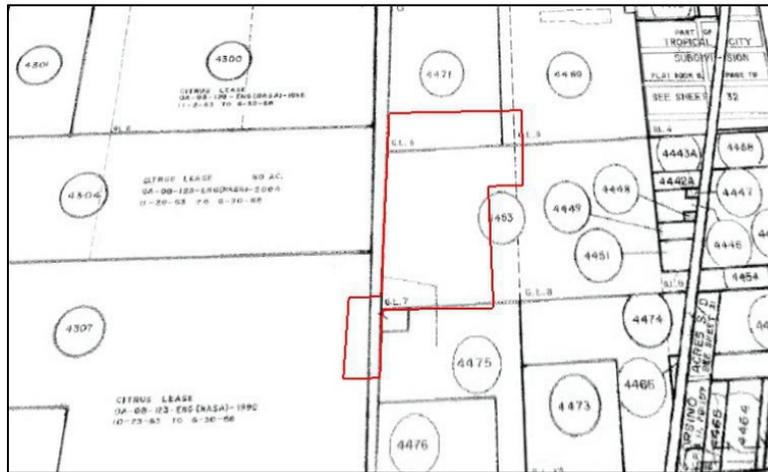


Figure 3.8 USACE Land Acquisition Maps of the Project Area (1967).

Parcel 4307: was owned by Charles F. Meyers, et ux. (and wife). This parcel is located in the extreme southwestern portion of the APE and was purchased by the USACE on July 31, 1963. According to the Final Project Map produced by the USACE in 1971, the parcel was purchased for \$241.75 per acre and included a citrus lease.

Parcel 4453: was owned by Perry Nichols, as Trustee. This parcel is in the northern portion of the APE and was purchased by the USACE on September 19, 1963 for \$78.09 per acre. No citrus lease is noted for this parcel.

Parcel 4475: was owned by Basil L. Bodge and his wife Edna. This parcel is in the southern portion of the APE and was purchased by the USACE on September 19, 1963 for \$21.32 per acre. Born in Sangerville, Maine in 1906, Captain Bodge was a career officer who joined the Army in 1923. After retiring in 1955, Captain Bodge moved to central Florida and purchased a citrus grove near Orlando. They lived there several years until Captain Bodge returned to work as a shift supervisor at the Cape (Orlando Sentinel 1965). This parcel had a citrus lease.

Parcel 4471: was owned by Joyce LaRoche Hensley, Guardian. This parcel is in the extreme northern portion of the APE and was purchased by the USACE on July 18, 1963 for \$40.00 per acre. No citrus lease is shown for this parcel.

Parcel 4469: was owned by Zona Elliott Johnston, Executrix. This parcel is in a small portion of the northeastern corner of the APE and was purchased by the USACE on August 28, 1963 for \$46.69 per acre. No citrus lease is shown for this parcel.

4.0 RESEARCH DESIGN

The purpose of this investigation was to identify and document cultural resources within the project area and to assess their potential for listing in the NRHP based on their historical, archaeological, or architectural value. Project methods generally included the following tasks: 1) background research, 2) field survey, and 3) analysis and documentation.

4.1 Background Research

Archival research began with a search of the Florida Master Site File (FMSF) database maintained by Department of Historic Research (DHR) of the Florida Department of State and a review of the material provided by the KSC Cultural Resources Manager (CRM). The records included in the FMSF provide relevant data regarding previous surveys, recorded archaeological sites, cemeteries, bridges, structures, and resource groups in the Cape Canaveral area. LG²ES also used historic aerial photos (1943 to 1958), topographic maps, and historic maps to analyze the environmental character of the project area and to search for potential historic sites, non-standing historic structures, and historic roads. According to historical aerial photographs, the town of Orsino was located northeast of the APE, which contained orange groves and several structures, as shown on a 1936 map (see **Figure 4.3**). This indicated that historic-era cultural materials may be present in the study area.

The earliest archaeological investigations in Florida began in the late 1800s with Clarence B. Moore's investigation of numerous sites along the Florida Peninsula (Moore 1900). During the Depression era, Matthew W. Sterling conducted excavations at two Cape Canaveral sites (Doran et al. 2014:12). Unfortunately, funding for this project only covered excavation and collection; therefore, little of this data has been studied or published (ibid). In the 1940's, John Goggin and Irving Rouse surveyed the region (Rouse 1951). Rouse's report from this period is the only archaeological survey of the Indian River (Doran et al. 2014:12; Rouse 1951).

Seven cultural resource surveys have been conducted within a one-mile radius of the APE (**Table 4.1**). The earliest was a *Cultural Resource Assessment of Merritt Island National Wildlife Refuge* (Griffin and Miller 1978). While the assessment relocated seven previously identified sites, none of these was located within a one-mile radius of the current APE. Four previously recorded sites (sugar mill ruins, Fort Ann, Old Haulover Canal, and the Dummett homestead) were recommended eligible for the NRHP.

The closest survey, which includes a portion of the current APE, is a 1990 *Archaeological Survey to Establish Zones of Archaeological Potential in the VAB and Industrial Areas of KSC* by Archaeological Consultants, Inc. (Deming and Almy 1990). The survey included several discontinuous parcels throughout the Vehicle Assembly and Industrial Areas. The survey resulted in the relocation of the previously identified site 8BR206 and the identification of site 8BR582. A previously recorded site within the Industrial Area, 8BR207, was destroyed by construction of the Payload Hazardous Facility, located east of the APE. The entire Industrial Area is considered to have a low potential for encountering cultural resources and "It is the opinion of Archaeological Consultants, Inc. that land altering activities within all portions of the Industrial Area will have no adverse impact to significant cultural resources. The need for survey of individual parcels slated for development is not warranted" (Deming and Almy 1990:45-46).

Archaeological Consultants, Inc. conducted an *Archaeological Survey for Established Zones of Archaeological Potential (ZAPs) in the Launch Complex Area (Option 1) of the Kennedy Space Center* (Deming 1991). The survey included several discontinuous areas and resulted in the identification of eight new archaeological sites and the relocation of four previously identified sites. Approximately 5.4 acres of the survey area is located within a one-mile radius of the current APE. None of the previously identified or newly identified sites are located within one mile of the current APE.

An *Archaeological Survey to Establish Zones of Archaeological Potential (ZAPs) in the Shuttle Landing and KSC South Area (Option 2) of the Kennedy Space Center* was conducted by Archaeological Consultants, Inc. in 1991. During this survey, which included several discontinuous areas, one of which extends into the one-mile radius around the current APE, resulted in the identification of one new archaeological site and the relocation of 12 previously identified sites.

In 2012, Archaeological Consultants, Inc. conducted a *Historical Survey and Evaluation of the Jay Jay Bridge, Railroad System, and Locomotives, John F. Kennedy Space Center, Brevard County, Florida* (Berger and Deming 2012). The survey resulted in the recordation of 27 new historic structures.

Three historic structure surveys have been conducted in the vicinity of the APE. The surveys assessed and evaluated structures within KSC (**Table 4.1**).

Table 4.1 Previous surveys within one mile of the APE

Survey Number	Title	Date	Author	Sponsor
16263	Indian and Historic Sites Report, John F. Kennedy Space Center	1967	Long, George A.	NASA
260	Cultural Resource Reconnaissance of Merritt Island National Wildlife Refuge	1978	Griffin, John W. Miller, James J.	IAS
2471	Archaeological Survey to Establish Zones of Archaeological Potential in the VAB and Industrial Areas of Kennedy Space Center	1990	Deming Joan	NASA
2992	Archaeological Survey for Established Zones of Archaeological Potential (ZAPs) in the Launch Complex Area (Option 1) of the Kennedy Space Center	1991	Deming Joan	NASA
3447	Archaeological Survey to Establish Zones of Archaeological Potential (ZAPs) in the Shuttle Landing and KSC South Area (Option 2) of the Kennedy Space Center	1991	Archaeological Consultants, Inc.	NASA
19482	Historical Survey and Evaluation of the Jay Jay Bridge, Railroad System, and Locomotives, John F. Kennedy Space Center	2012	Berger, Christopher, and Joan Deming	NASA
5474	Survey and Evaluation of the Historic Facilities within the Industrial, Launch Complex 39 (LC-39), Vehicle Assembly Building (VAB) and Shuttle Landing Facility (SLF) Areas of the John F. Kennedy Space Center.	1998	Delahaye and Deming	NASA
20744	Architectural Survey and Evaluation of 45 Facilities that have reached the age of 45-50 years, John F. Kennedy Space Center, Brevard County, Florida	2013	Price, David L.	InoMedic Health Applications, LLC

No archaeological sites have been identified within a one-mile radius of the current APE. Few sites have been identified during the previously conducted archaeological surveys within KSC. To examine the potential for encountering archaeological sites within the current APE, the radius was broadened to five miles. Nine archaeological sites have been identified within five miles of the APE (**Table 4.2**). The prehistoric sites are all located west of the APE, near the Indian River. None of the sites has been recommended eligible for the NRHP.

Table 4.2 Archaeological Sites within a 5.0-mile radius of the APE

Site Number	Site Name	Site Description	Distance and Direction from APE	Eligible for NRHP
BR00062	Moore Mound	Prehistoric mound	3.57 mi northwest	Not Evaluated
BR00150	Oyster Creek Prong Mound	Prehistoric mound	2.38 mi northwest	Not Evaluated
BR00161	Cocoa Beach Mound	Prehistoric mound	3.62 mi northwest	Not Evaluated
BR00217	20 th Century Historic Deposit	Historic dump site	1.72 mi southeast	Ineligible
BR00913	Landfill South	Prehistoric campsite	2.90 mi northeast	Not Evaluated
BR01872	Sam's Site	Multicomponent site Prehistoric: village Historic: 2 houses, 3 surface features, and buried cultural deposits	3.82 mi southwest	Not Evaluated
BR01890	Sam's Creek Fossil Site	Prehistoric: Paleoindian, Pleistocene megafauna, St. Johns period	3.56 mi southwest	Not Evaluated
BR 2350	Cross the Line	Multicomponent site Prehistoric: Archaic, Malabar I-II Historic: 1878-2000	3.82 mi southwest	Not Evaluated
BR2351	Murray Parcel	Multicomponent site Prehistoric: Malabar I-II Historic occupation: 1878-2000	4.2 mi southwest	Not Evaluated

Eight historic structures have been recorded within a one-mile radius of the APE (Table 4.3). Only one, the NASA/Kennedy Space Center Railroad System Historic District (BR02932) has been determined eligible for the NRHP. No cemeteries have been recorded within a one-mile radius of the APE.

Table 4.2 Previously recorded historic structures within one mile of the project vicinity

Site ID	Address	Year Built	SHPO Evaluation
BR02932	NASA-Kennedy Space Center Railroad System Historic District	1978-2010	Eligible
BR02998	Spaceport Central	1967	Ineligible
BR02968	Electromagnetic Laboratory	1963	Ineligible
BR02959	Base Operations Building	1965	Ineligible
BR02960	Base Support Building (M & O Building)	1964	Ineligible
BR02964	Support Building	1965	Ineligible
BR02965	Propellants Shop	1966	Ineligible
BR02968	Transportation Storage Building	1966	Ineligible

4.2 Historic Map and Aerial Photograph Review

Historic maps and aerial photographs of the project area were analyzed to gain a better understanding of historic land use and development in the region. Historic maps, U.S. Geological Service (USGS) topographic quadrangles, and U.S. Department of Agriculture aerial photographs were studied to determine potential historic development within the APE. Maps consulted during this analysis include the original 1859 plat map for Section 6 of Township 23 South/Range 37 East and Section 1 of Township 23 South/Range 36 East plat maps, the 1912 Section 6 of Township 23 South/Range 37 East Subdivision map, 1936 Florida State Road Department map of Brevard County, the 1943 Orsino USGS topographic map. US Department of Agriculture (USDA) aerial photographs from 1943 and 1958 were also analyzed.

The earliest historic map to depict the project area is the original 1859 plat map for Section 6 of Township 23 South/Range 37 East and Section 1 of Township 23 South/Range 36. These maps indicate that the Project APE was situated within four parcels in 1859, two in Section 6 of T 23S and R 36E and two in Section 1 of T 23S and R 37E (BLM nd) (**Figure 4.1**). The 1859 survey indicates the lower half of the larger eastern portion of the Project APE was designated as scrub, but no additional notes or features are depicted. In 1912, the General Land Office (GLO) resurveyed Section 6, subdividing the section into 16 tracts (**Figure 4.1, Table 4.4**). The 1912 resurvey includes no additional notes or features. General Land Office records show that the entire APE was within land granted to William H. Howe.

The next historic resource that depicts the project area with some detail is the 1936 Brevard County Florida State Road Department map (FSRD 1936) (**Figure 4.2**). This map illustrates an unimproved, unnamed road, oriented north-south from Orsino (to the north) ran along the Project APEs western boundary. Additionally, the map depicts a building located within the general area of the southern half of the Project APE. The structure is not to scale; however, it provides evidence that a building was present within the Project APE prior to 1936.

In 1943, the USDA utilized aerial photography to document the region. This resource indicates that the region was primarily comprised of orange groves, including the southern half of the Project APE (**Figure 4.3**). There are no structures clearly depicted in the photograph, a driveway or entrance is depicted in the central portion of the western boundary. Just north of the driveway and semi-circular orange grove are two large oak trees, possibly depicting the location of a structure. Furthermore, the 1949 Orsino USGS topographic map depicts a residential structure in the same area and two additional structures within the Project APE (**Figure 4.3**). Two of the structures are depicted as residential structures, while one is depicted as an outbuilding or barn. The Orsino (1949) topographic map also depicts drainage ditches west of the project area, likely facilitating drainage in the area necessary to establish orange lease tracts.

Figure 4.1 Original 1859 (BLM) plat maps (left) and the 1912 (BLM) Resurvey and subdivision of Section 6 (right).

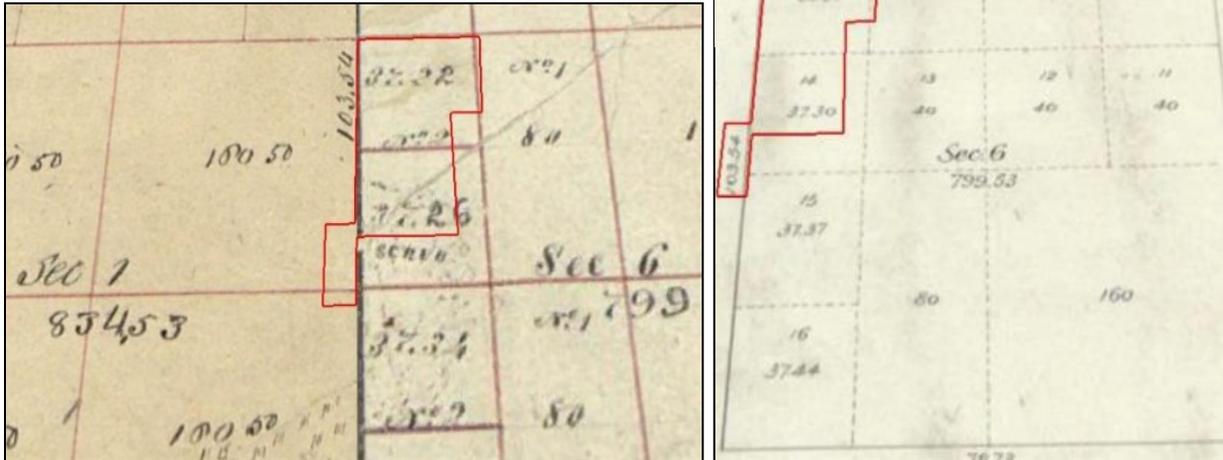


Table 4.4: Land Patentees in Section 6 within the Project Area

Patentee	Date	Acreage	Type of Grant	Location	Within APE
Walter J. Howe	April 5, 1915	154 48/100	Homestead	Lots 7, 8, 13, 14 or the NW ¼ of Section 6	Yes
Orsino T. Smith	Feb. 16, 1917	155 1/100	Homestead	N1/2 SE1/4 of Section 1 and Lot 2 of the SW 1/1 of Section 6	No
William Elliott	March 19, 1919	129 62/100	Homestead	Lots 4,5,6 of Section 6	No
Heinrich Dombrok	Dec. 5, 1921	80	Homestead	Lots 9 and 12 of Section 6	No
Heirs of Lillian Cloud	July 26, 1920	158 83/100	Homestead	NW ¼ NW1/4 Nw1/4, Lot 2 of Section 5 and Lot 10 of Section 6	No
Guido Carboni	Jan 3, 1920	160	Homestead	SE ¼ SW ¼ of Section 5 and SE1/4 SW ¼ Section 6	No
Charles David	Sept. 15, 1926	40 56/100	Homestead	Lot 3 of Section 6	No
Robert Godbey	June 8, 1927	160	Homestead	Lot 11, N1/2 SE ¼ NE1/4 SW1/4 of Section 6	No

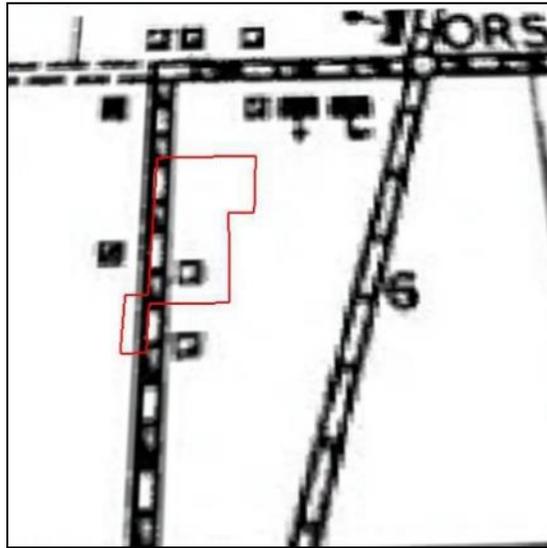


Figure 4.2 1936 Florida State Road Department map showing the Project APE (FSRD 1936).



Figure 4.3 The 1943 USDA aerial of the project area (left) and the 1949 Orsino topographic map depicting the Project APE (right).

The 1958 USDA aerial photograph of the region clearly depicts two buildings just north of the semi-circular orange grove (**Figure 4.4**). Additionally, it depicts a drainage ditch west of the structures, outside the project APE.



Figure 4.4 1958 USDA aerial photograph of the project APE. Inset highlights structures (circled) located north of semi-circular orange grove.

4.3 Archaeological Research Expectations

For this Phase I CRA study, a review of the above information in conjunction with probability modelling based on proximity to natural, prehistoric, and historic resources was completed to determine if archaeological materials may be present. Due to the project area's proximity to previously recorded sites, aquatic environments, and historic roadways and towns, the overall project area is classified as having a low to moderate probability for containing archaeological sites. Nearly all the project area is situated within very poorly drained soils, which indicates the Project APE has a low probability for containing prehistoric cultural resources. Historic maps show structures within the APE, part of the town of Orsino. Based on this evidence, the Project APE has a high probability for encountering historic cultural resources. The Florida Department of Historic Resources' *Module Three* recommends 25 m interval coverage to provide adequate sampling for high probability areas., subsurface testing was conducted at 25 m intervals in the southwest APE.

4.4 Field Survey

The archaeological survey included a systematic inspection of the project area in a manner consistent with The Historic Preservation Compliance Review Program of the Florida Department of State, Division of Historic Resources. All work was performed in compliance with the requirements set forth in the updated Cultural Resources Management Standards Operational Manual (2002) published by the Florida Division of Historical Resources.

Survey areas were determined and located with the use of geospatial information system (GIS) background files depicting the APE boundary overlain with an east/west oriented transect grid. These files were uploaded onto a handheld Trimble Nomad device for reference during fieldwork.

As stated above, most of the APE is located within an area of high probability which requires testing at 25 m intervals. Where permitted, subsurface testing was carried out, and all shovel tests that produced cultural materials were delineated with additional shovel tests at 12.5 m intervals on a grid oriented along cardinal directions (i.e., north, south, east, and west) to define site boundaries. Additional shovel tests were excavated until two consecutive negative tests were encountered in each cardinal direction. As such, every positive test was bound by additional tests in each cardinal direction until at least two negative tests were reached. All shovel test unit locations excavated for purposes of boundary definition were planned and documented using a hand-held GPS unit (as stated above) with a minimum accuracy of three meters.

All shovel tests were excavated to a minimum width of 50 cm and a minimum depth of one meter (100 cm) unless water was reached prior to the planned complete depth. All excavated soil was screened through 1/4-inch mesh for standardized collection of any artifacts present. Shovel test logs were maintained and provide information on the size, depth, soil conditions, and contents of all excavation units. The Munsell Soil Color Chart was used to describe the color of all soil layers. During the shovel test survey, no cultural features or phenomena were identified within the shovel test walls or floors. All shovel test excavations were backfilled after documentation, and all areas were restored to their previous condition to the greatest extent possible.

4.5 Laboratory Analysis

Artifacts were processed in compliance with 36 CFR 79 and KSC CRM. Artifacts were collected and given Field Specimen numbers (FS number) in the field. Collected artifacts were taken from the field to the laboratory at LG²ES in Jacksonville, Florida for cleaning, analysis, conservation, and temporary storage. When necessary, artifacts were hand washed or gently cleaned with a soft-bristled brush. Once dry, each artifact was counted, weighed, given a catalog number, and placed in a 4-mil polyethylene, zipper-seal archive-quality bag. A catalog/inventory of all artifacts by specific provenience number, including all summary information and identification generated during analyses is presented in **Appendix B**. Artifacts will be prepared and include accompanying documentation for in-perpetuity curation at the SEAC facility in Tallahassee, Florida (KSC 2014).

4.6 Procedures to Address Unexpected Discoveries

Although the project area has received a complete cultural resource assessment survey, it is impossible to ensure that all cultural resources have been discovered. This section of the report has been developed as a mechanism for clients and agencies to treat archaeological finds that were not identified and assessed for eligibility for listing in the NRHP during survey on the property.

Unexpected discoveries consist of types of archaeological remains not typically encountered during a project. Examples of such discoveries include human skeletal remains and associated funerary objects (AFOs). If an unexpected discovery is encountered, all work within a 100 m buffer must cease and all reasonable efforts must be made to avoid and minimize the impacts (KSC 2014). If unexpected cultural resources or suspected cultural resources are discovered, the following steps should be taken:

1. All work within 100 m of the discovery should cease and reasonable efforts should be made to avoid and minimize impacts.
2. The KSC CRM must be contacted immediately and should evaluate the nature of the discovery.
3. The KSC CRM will the notify the SHPO, State Archaeologist located at the Florida Bureau of Archaeological Research (BAR) as stated in FS 872.05, and the Seminole and Miccosukee THPOs as stated in NAGPRA
4. Work cannot commence in the area until written permission from the KSC CRM has been received.

If unexpected finds are encountered at any point in construction, the point of contact for KSC is:

Jeanne Ryba – KSC Cultural Resources Manager

4.7 NRHP Site Evaluation Criteria

The archaeological significance of a site is determined using criteria defined in 36 CFR 60.4, in coordination with the State Historic Preservation Office (SHPO). The significance of a site, as established by 36 CFR 60.4, may be in history, architecture, archaeology, engineering, or culture. Districts, sites, buildings, structures, and objects may be eligible for listing in the NRHP if they possess “integrity of location, design, setting, materials, workmanship, feeling, or association” and meet one of the following criteria (from <http://www.gpo.gov>):

- A. Be associated with events that have made a significant contribution to the broad patterns of our history, or
- B. Be associated with the lives of persons significant in our past, or
- C. Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values or that represent a significant and distinguishable entity whose components may lack individual distinction, or
- D. Have yielded or may be likely to yield, information important in prehistory or history.

Under Criterion D, ‘importance’ is based on the likelihood that a site possesses configurations of artifacts, soil strata, structural remains, or other features that allow it to: 1) test a hypothesis about events, groups or processes in the past, 2) support or strengthen currently available information suggesting that a hypothesis is true or false, or 3) reconstruct the known archaeological sequence for an area (National Register Bulletin 1995: 21). While the evaluation of archaeological sites usually fall under Criterion D, historic buildings and structures are typically evaluated for significance under Criteria A, B, and C.

NRHP-eligible districts must possess a significant concentration, linkage, or continuity of sites, buildings, structures, or objects united historically or aesthetically by plan or physical development. NRHP-eligible districts and buildings must also possess historical significance, historical integrity, and historical context.

4.8 Archival Research

Archival research began with a search of the FMSF database maintained by DHR of the Florida Department of State. The site file forms at the FMSF provide relevant survey data from previous surveys at Cape Canaveral and show the location of previously recorded archaeological sites, cemeteries, bridges, structures, and resource groups.

Archival research uses a range of historical and human resources. Previously, LG²ES staff contacted staff at the Florida Historical Society to identify and examine the historical documents for the Artesia Post Office which had been located south of the project area during the early twentieth century. Numerous available historic period resources for the Cape Canaveral area were consulted at the Central Brevard Library and Reference Center, the Genealogy Room at the Brevard Library, the Brevard County Historical Commission, the Florida Historical Society, and the Library of Florida History. In addition, digitized historical resources were consulted through online repositories including the Bureau of Land Management's General Land Office, the Florida Memory Project, the University of Florida Maps and Imagery Library, the University of South Florida's Special Collections Department, and the University of North Florida's Florida History Online.

5.0 RESULTS

Between December 7-9, 2020, LG²ES conducted a Phase I CRAS of an approximately 61.4-acre parcel in support of the proposed Exploration Park North Expansion EA at Kennedy Space Center on Merritt Island in Brevard County, Florida.

5.1 Archaeological Survey

The field survey began with a pedestrian survey to locate a potential historical site based on historic maps and an aerial. Although inundated drainage ditches occur along the southern and western boundaries of the project study area, a potential driveway was observed near the central western portion of the APE. The potential driveway provided access to the project area and was located within a portion of the study area considered to have a moderate probability for encountering cultural resources. Two new archaeological sites were recorded during the Phase I survey. The Granite Rock Homestead site (8BR04364) was identified based on the presence of the remains of two historic buildings and a large historic artifact scatter. The site area is also mapped as a moderate ZAP and Historical Area with four structures on KSC GIS layers. The second site, Howe Grove Road (8BR04367) is a historic road. Subsequently, 31 shovel tests probes (STPs) were excavated, all of which were negative for cultural material, and 13 “no dig” loci were documented across the project APE. The FMSF survey log is included as **Appendix A** and artifact tables are included in **Appendix B**. For specific locational information, see **Appendix C**. Archaeological Site Forms are included in **Appendix D**.

5.2 Current Environmental Conditions

The current environmental conditions documented within the APE is characterized by three patterns of vegetation. The southern and southwestern APE is characterized as an overgrown orange grove with impenetrable Brazilian pepper (*Schinus terebinthifolius*) plants, which accounts for approximately 50 percent of the Project APE; the northwestern corner of the APE is characterized by dense saw palmetto (*Serenoa repens*) with scattered live oaks (*Q. virginiana*), which accounts for approximately 20 percent of the Project APE; and the western and much of the northern APE is characterized as swamp with standing water, heavy vegetation, and several large hog wallows, which accounts for approximately 30 percent of the Project APE (**Figure 5.1**). The areas adjacent to the swamp exhibit a high degree of hog rutting. Overgrown and dead orange trees predominate much of the APE, while a canopy of swamp laurel oaks (*Quercus laurifolia*) covers much of the very poorly drained portions of the study area.



Figure 5.1 Representative Environmental Photographs across the Project APE. (Left to right) the Southern and Southwestern APE; the Northeastern APE and the Western and Northern APE.

Mapped soils within the APE consist entirely of very poorly drained classifications, with Copeland-Bradenton-Wabasso complex, limestone substratum comprising approximately 97 percent of the study area. STPs indicate that soil documented across the Project APE falls within the range of characteristics for Copeland series soils. Copeland series soils exhibit moderate permeability but tend to be frequently flooded due to the water table, which is at or near the surface, and a regolith (R) horizon is generally encountered as a compact limestone bedrock (Soil Survey Staff). The Project APE exhibits two distinct soil profiles based on location. STPs excavated in the northern half of the APE exhibit two strata. Stratum I is described as black (10YR 2/1) muck from 0-10 centimeters below surface (cmbs), while Stratum II is described as black (10YR 2/1) muck and clay. Most STPs in the north and western portions of the APE terminated at the water table, which was generally encountered between 15-30 cmbs. STPs excavated in the southern half of the APE generally exhibit two strata. Stratum I is described as very dark gray (10YR 3/1) muck documented variably between 15-30 cmbs, while stratum II is described as very dark gray (10YR 3/1) clay. Many of these tests exhibit friable limestone within the clay or were terminated at the limestone bedrock (**Figure 5.2**). “No dig” testing locations documented across the APE exhibited standing water and are best characterized as swamp (see **Figure 5.2**).



Figure 5.2 Representative Shovel Test with Limestone Base.

5.3 Archaeological Resources

8BR04364, The Granite Rock Homestead

Setting: Hydric Hammock

Soils/Drainage: Copeland-Bradenton-Wabasso complex, limestone substratum; Very Poorly Drained

Survey Methodology: Shovel testing at 50-meter intervals and pedestrian survey

Site Type: Historic Homestead

Site Size: 7,769 m²

Depth of Deposit: Surface

Cultural Periods: American-20th Century

Discussion: Although the probability for encountering prehistoric cultural resources was considered low across the entire APE, historic aerial photographs (USDA 1943 and 1958) and a historic topographic map (USGS 1949) indicated a moderate probability for encountering historical cultural resources based on the presence of three buildings illustrated on the maps but were not documented during land acquisition sales in the 1960s. As a result of the pedestrian survey, two buildings, one large bottle dump, three smaller bottle dumps, remains of a possible outbuilding, and ornamental vegetation were documented as 8BR04364, The Granite Rock Homestead. Archaeological site 8BR04364 was named “The Granite Rock Homestead” due to the inclusion of a large granite

or marble rock incorporated into the front elevation of the main vernacular block building. Site 8BR04364 represents an early- to mid-twentieth century Florida farmstead.

STPs were excavated at 50 m intervals across the southwestern portion of the Project APE, east of the drainage canal due to a moderate probability for encountering historical cultural resources. A total of nine STPs were excavated within proximity to the structures and bottle dumps, and although a generally large historic scatter was documented during the pedestrian survey, all subsequent STPs were negative for cultural material. A phone call was placed to FL DHR to determine the level of effort required to properly delineate the boundaries 8BR04364. Because all STPs were negative and the general site is situated on a slight elevation change, DHR determined in lieu of reducing the testing interval, site boundaries could be determined using the documented surface scatter and building remains as site boundary. Therefore, the site boundary includes the two historical buildings and the entire historic surface scatter, which generally corresponds to a slight landform situated west of the lower inundated areas in the eastern portion of the Project APE. The site boundary for 8BR04364 is amorphous, measuring approximately 7,769 m².

Soil profiles for STPs excavated within site boundaries consists of two strata. Stratum I is described as very dark gray (10YR 3/1) muck documented variably between 25-35 cmbs, while stratum II is described as very dark gray (10YR 3/1) clay. Excavation was terminated once 10 cm of clay was encountered. Although no positive subsurface tests were encountered during the documentation of 8BR04364, mapped soils across the site are very poorly drained, which likely influenced the decision to construct the house off-grade. Site soils fall within the range of characteristics for Copeland series soils, which tend to be seasonal flooded or inundated for about six months a year (Soil Survey Staff).

Site 8BR04364 consists primarily of four loci: the buildings, the bottle dumps, possible outbuilding, and an area exhibiting ornamental vegetation. The buildings, which includes a house and a smaller outbuilding or workshop, are situated in the western portion of the site in proximity to a driveway that crosses the western drainage ditch. The bottle dumps exhibit concentrations of historic artifacts that primarily consisted of glass bottles, that occur in four general loci north and northeast of the buildings. The third area, the possible outbuilding, was identified by the presence of corrugated metal roofing and a small historic artifacts scatter, located in the northeast portion of the site. The fourth area exhibits ornamental vegetation and was documented in the eastern portion of the site, approximately 100 m east of the buildings and about 50 m south of the possible outbuilding. Each of these four areas will be discussed in further detail below.

The Buildings

The “buildings” consist of two structures located approximately 45 m east of the access road (west of the drainage ditch) (**Figure 5.3**). An earthen driveway over a corrugated metal culvert provided a bridge over the inundated drainage ditch to the front (west side) of the primary building, which seems to be the remains of an off-grade concrete block house. The 1936 State Road Department map and the 1949 Orsino (USGS) topographic map depict a building at the approximate location of The Granite Rock Homestead, indicating that the house predates the mid-1930s. The structures are located on Parcel 4453, which was owned by Perry Nichols, as Trustee, and purchased by the USACE on September 19, 1963 for \$78.09 per acre. The land acquisition documents do not mention buildings, suggesting the house may have been in ruins by the 1960s. Furthermore, the entire Project APE is located with property once owned by Walter H.J. Howe. Howe relocated from Poughkeepsie, New York sometime in the 1910s, and purchased the land within the APE beginning in 1915. An influential member of the community, Walter Howe was the Justice of the Peace for the community of Orsino, and an orange farmer at least until 1940. Although there is no direct evidence, it is likely the structures documented as 8BR04364, The Granite Rock Homestead, are associated with Walter Howe. The 1936 Florida State Road Department road map indicates a structure was present in the mid-1930s, when Walter H.J. Howe, the initial landowner, was listed as an orange farmer. An aerial photograph of the project area from 1958 (USDA) indicates two structures in the approximate area of the structures documented at 8BR04364, and the structures appear to have roofs intact (**Figure 5.4**).

The dimensions of the “house” are approximately 8 m (east-west) by 6 m (north-south), with a porch located on the southwest half of the building measuring 2.5 m (east-west) by 3 m (north-south). The house faces west towards a historic unnamed north-south oriented road that is no longer in use. The structural remains of the house consist of the concrete block walls, an off-grade concrete block front porch with a poured concrete porch floor, the poured concrete floor of the building, and concrete footers, presumably for a side porch or car port.

Evidence indicates that construction of an off-grade building with a poured concrete floor was facilitated by laying a single course of concrete blocks, two blocks in height; then filling the interior of the structure with soil to build-up the ground surface; and then pouring the concrete foundation. Although there is no longer evidence, the roofing system would have been comprised of wood frame rafters and may have had a metal roof. Additionally, asbestos siding fragments indicate that the exterior fabric was likely comprised of asbestos siding, a fibrous light-weight fire-proof material comprised of asbestos and Portland cement. Asbestos siding, introduced just after the turn of the twentieth century, peaked in popularity in the 1940s and although primarily replaced by asphalt-based products in the 1950s due to health risks associated with asbestos fibers, asbestos products, primarily home insulation, were manufactured in the U.S. into the 1980s (NPS 1999; Strahn 2005).

Extant features of the interior of the house include an open floorplan with five windows and three doors. The west elevation has a “front” door ($\approx 90 \times 210$ cm) and a vertical rectangular window ($\approx 90 \times 120$ cm), the north elevation has a vertical rectangular window ($\approx 80 \times 60$ cm) and a door ($\approx 80 \times 210$ cm), the east elevation has a clay wall flue thimble to the left side of a “back” door ($\approx 80 \times 210$ cm) and a horizontal rectangular window ($\approx 100 \times 60$ cm), and the south elevation exhibits two square picture windows ($\approx 130 \times 130$ cm).

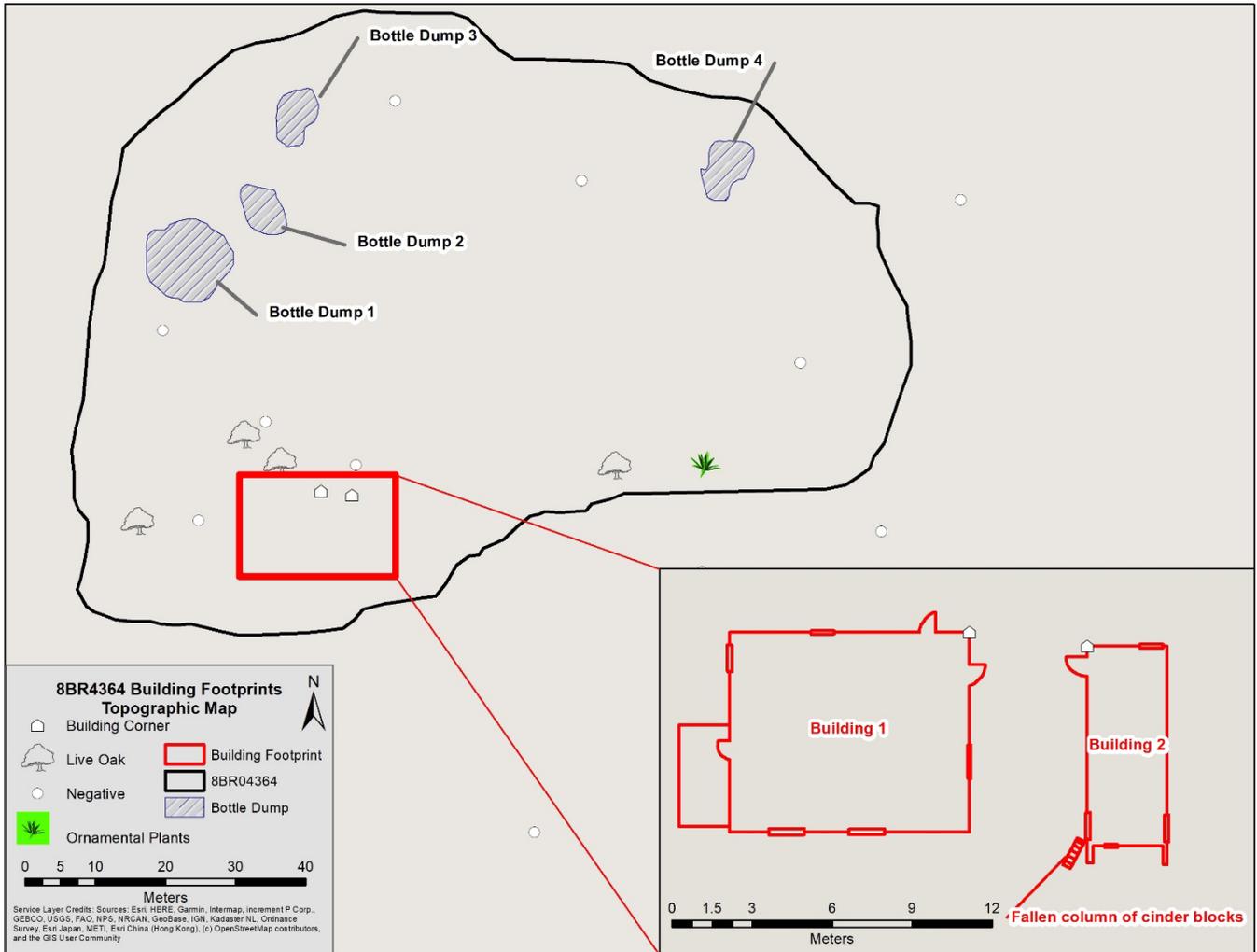
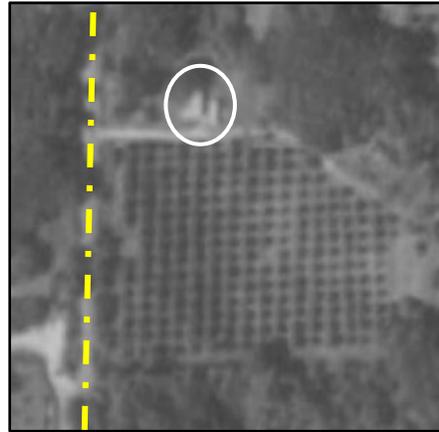


Figure 5.3 Site 8BR4364 Showing the Locations of Features.



**Figure 5.4 1958 USDA Aerial
Depicting the Two Structures
Documented at 8BR04364.**

The most remarkable feature exhibited by the vernacular structural remains is the application of a large granite stone ($\approx 40 \times 20$ cm) incorporated into the front exterior elevation of the house (west side), just left of the main door (**Figures 5.5 and 5.6**). Structurally, it appears a small hole was placed in a concrete block and the granite stone was cemented into the structure, left protruding from the building approximately 25 cm. The granite rock is a nonlocal lithic resource that was likely brought to the site by the owners of the house as a reminder of the home they left behind.

The east side of the house likely represents the kitchen area of the building, based on the presence of a clay wall flue thimble and a metal pipe in the east wall (**Figure 5.7**). Clay wall flue thimbles are commercial construction products designed to accommodate stove pipes for cast iron stoves, which were implemented into the wall of concrete structures to provide a port to the exterior to exhaust smoke. The application of clay wall flues protects the structural fabric from degradation resulting from repeated heating and cooling. The metal pipe observed beneath the window in the east wall likely provided a source of water for the structure.



Figure 5.5 Structural Remains of the House at 8BR04364. (Top row) Front Elevation (north) of House with Off-Grade Porch and Granite Rock (circled) Incorporated into the Structure Near the Front Door; (2nd row) left: North Elevation of the structure, right: Rear (east) elevation; (3rd and 4th rows) Interior Layout.

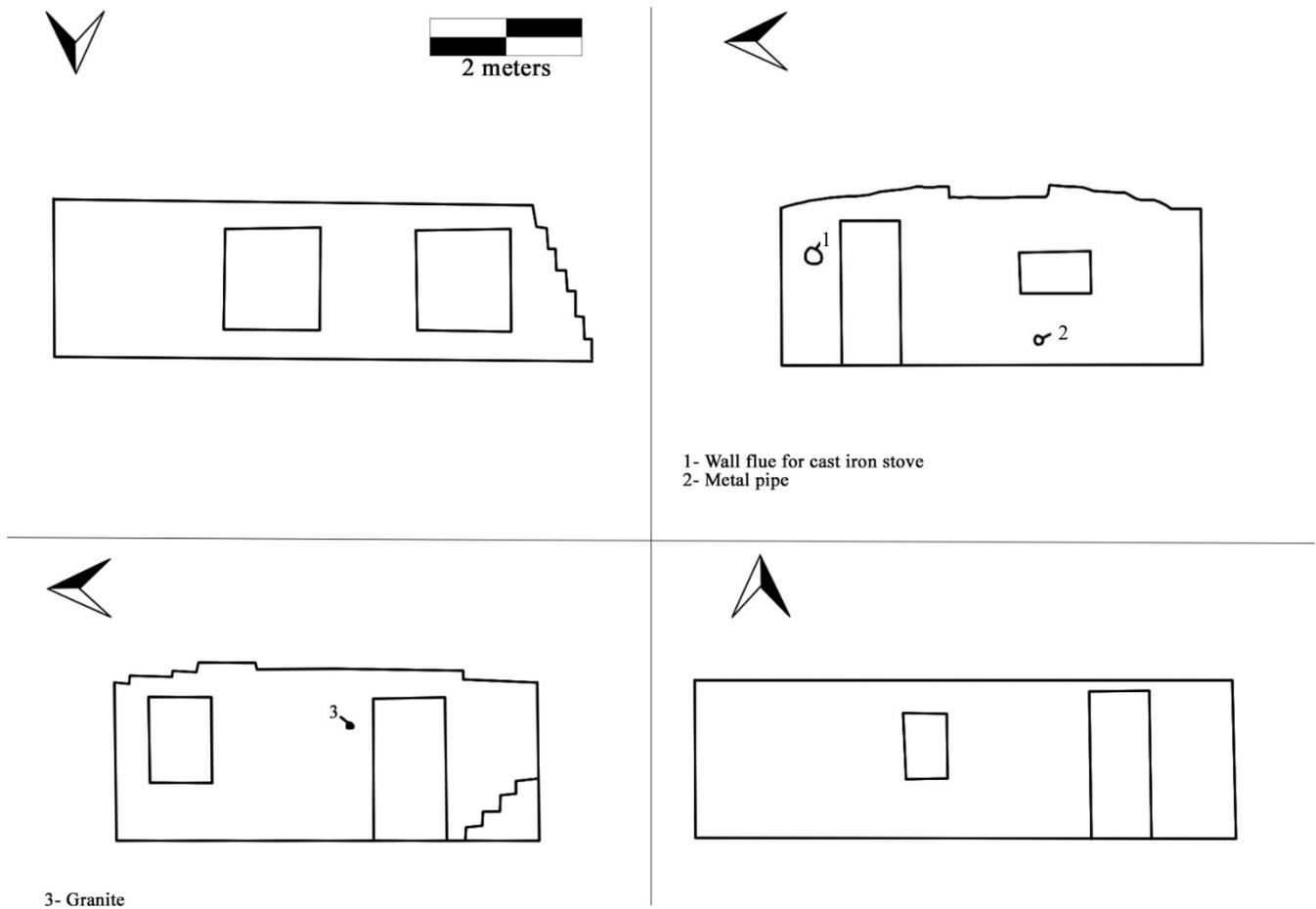


Figure 5.6 Hand-Drawn Building Elevations for the Primary House Structure.



Figure 5.7 Kitchen Area (second photo from left) with a Clay Wall Flue, Thimble for Stove Pipe (left), and Metal Pipe-Interior and Exterior (right).

Poured concrete footers indicate a wooden porch or carport extended from the northeast corner of the building (**Figure 5.8**). Approximately 10 m north of the structures is a patch of Giant Taro plants. Giant Taro (*Alocasia macrorrhiza*), also known as elephant ear, is an ornamental plant intentionally planted during the occupation of the site. Behind the house structure, approximately four m east, is the remains of a small rectangular block building. The block building was built on-grade, unlike the house, and may represent the remains of a small outbuilding or workshop. Building No. 2 measures approximately 6 m (north-south) by 3 m (east-west). Building No. 2 has one door and one window on the west elevation, a small vent or window in the south elevation, one window on the east elevation, and one window on the north elevation. The window on the east elevation of Building No. 2 is the only one onsite that still exhibits a window frame. The frame is a single hung metal frame. Although the small window did not have a window frame, it was covered with metal mesh screen.



Figure 5.8 Poured Concrete Footer for Porch.



Figure 5.9 Post-1929 Radio Part, “Bradleyleak” Radio Grid Leak and Condenser.

Cultural material collected from Building No. 2 and in proximity to the northeast corner of Building No. 1 consists of one intact clear bottle, one clear vial, one capacitor, two UID electrical parts, one UID plastic knob or dial (**Table 5.1**). Cultural material that was observed but not collected includes a segment of a rubber hose for an air compressor and two clear glass canning jars. Most of the collected assemblage in proximity to the structures included radio components or parts. Radios were the primary medium of broadcasting popular entertainment programs before being superseded in many U.S. homes by the television in the 1950s. The capacitor, two UID electrical parts, the UID knob/dial, and the radio gridleak and condenser (**Figure 5.9**) are likely associated with a radio dating to the 1920-1930s (radiomuseum.com n.d.). The Owens-

Illinois clear bottle represents a sample of the bottles observed at the site with the Owens-Illinois makers mark (ca. 1915-1966) (SHA 2020). **Figure 5.10** provides a floorplan drawing of the buildings documented at 8BR04364, while **Figure 5.11** provides overview photographs of the interior and exterior of Building No. 2.

Table 5.1 Artifacts Collected from the Ground Surface near Building Nos. 1 and 2.

Artifact Type	Count	Weight (g)	Comments
Clear, bottle	1	374.1	Square bottle; screw top; Owens-Illinois Glass Co. (ca.1915-1966)
Clear, vial	1	64.0	Threaded collar, no neck, slightly flared base embossed "571-D"
Capacitor	1	42.6	Electric component mostly in audio; Sprague (ca. 1926-1987)
UID electrical part	1	266.7	Cylindrical, dial-shaped; possible radio part; heavily oxidized/rusted; includes iron, lead, and brass components
UID electrical part	1	173.8	Possible autotransformer; Variac General Radio Co. Type 200-C, 115v50-60~5a (ca. 1915-2001)
UID knob/dial	1	45.0	Markings 0 to 180 may be degrees (half a circle); plastic
Radio Gridleak and condenser	1	33.1	Allen Bradley Co, gridleak and condenser (ca.1920s); ceramic

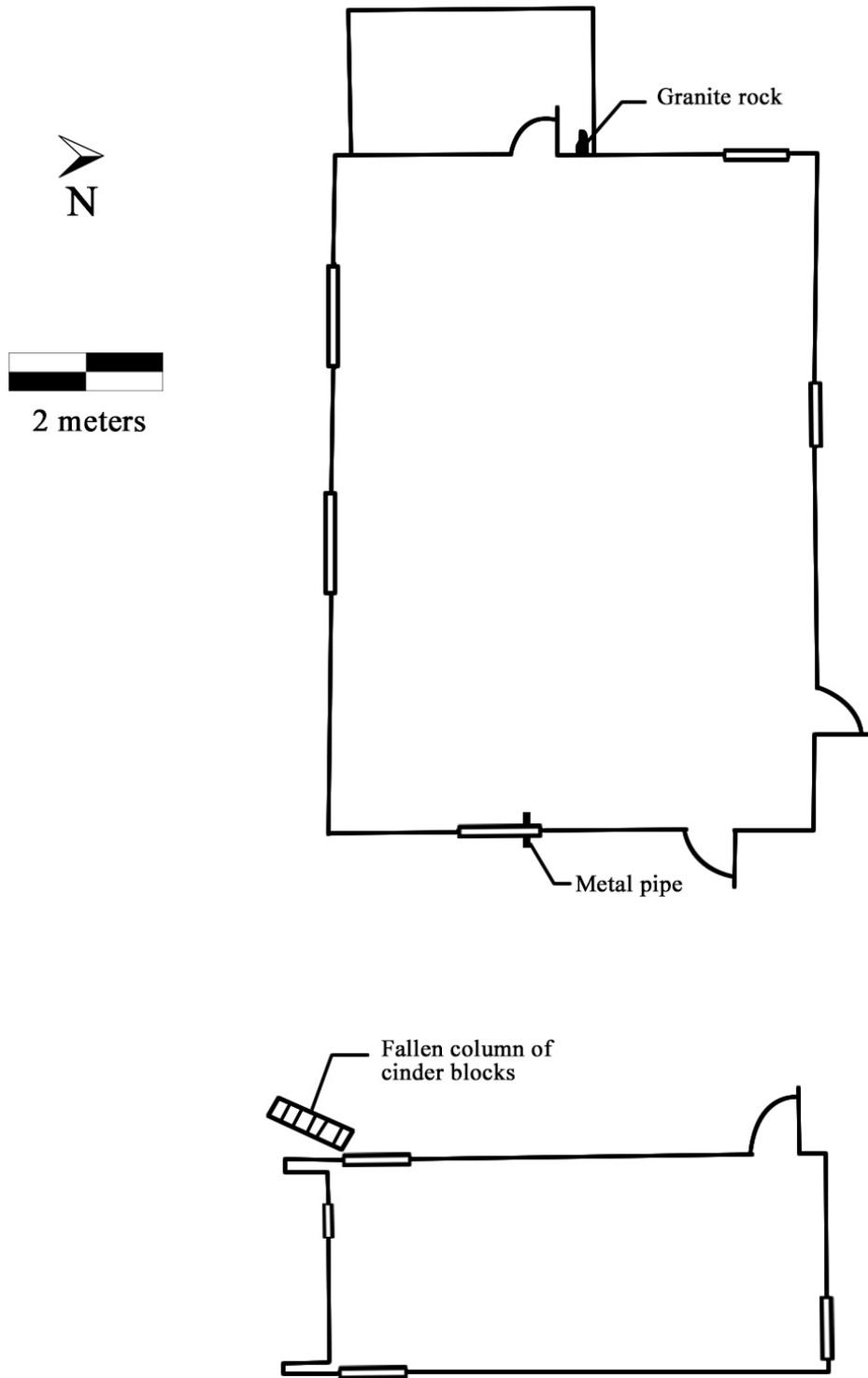


Figure 5.10 Floorplan Drawing of the Building Remains at 8BR04364.



Figure 5.11 Building No. 2 at 8BR04364. (Top left) overview of building, facing southeast; (top right) looking to the house from Building No. 2, facing west; (middle row) Interior of Building No. 2 facing south (left) and north (right); close-up of vent window and single hung metal window frame.

The Bottle Dumps

During the initial pedestrian survey of the southwestern APE, bottle dumps of variable sizes were recorded north of the buildings. In total, four distinct groupings of cultural material were documented as Bottle Dumps Nos. 1-4 within 9BR04364. Cultural material primarily included intact glass bottles, approximately 300-400 bottles in total. Cultural material observed in all four bottle dumps were contemporaneous and consistent, suggesting that the refuse areas were constructed during the same date range. Bottle types primarily included fruit and canning jars, condiment bottles, beverage bottles, medical/chemical bottles, and alcohol bottles. Subsequent STPs excavated in proximity to the bottle dumps were all negative for subsurface cultural material.

Bottle Dump No. 1 was encountered in a low wet area approximately 90 m northwest of the house. This bottle dump measures approximately 15 m (north-south) by 20 m (east-west) and consists almost entirely of intact glass bottles and jars that exhibit external threads or lug style threaded finish (**Figure 5.12**). External threaded bottle finishes



Figure 5.12 Overview of Bottle Dump 1.

generally date to the twentieth century, becoming widely used after 1930 (SHA 2020). In addition to various glass bottles, portions of two galvanized metal pails, two metal buckets, one galvanized metal tub (approximately 30 gallon), several blue transfer-printed whiteware fragments, a portion of a rose-colored Fiesta ware saucer, and three structural clay tiles were documented but not collected. Approximately 170-230 bottles are associated with Bottle Dump No. 1. A sample of artifacts were collected to help determine the approximate age of the bottle dump. A total of seven artifacts were recovered for further analysis at the LG²ES Lab. This material includes one radio tube bulb, one light bulb, two clear glass Tabasco bottles, one lime green (possible) depression glass fragment, and two blue transfer-print whiteware fragments (Table 5.2).

Table 5.2 Artifacts Collected from the Ground Surface at Bottle Dump No. 1.

Artifact Type	Count	Weight (g)	Comments
Radio tube "bulb"	1	36.8	E.T. Cunningham, Inc., Harrison, New Jersey (CX112A) (ca. 1915-1920)
Light bulb	1	32.6	General Electric; 60w 120v; possibly modern
Tabasco dashing bottle	2	152.8	McIlhenny Co, Tabasco, New Iberia, Owens-Illinois Glass Co. (ca. 1915-1966)
Green dessert bowl	1	45.1	possibly depression glass; dessert or nut bowl; lime green
Whiteware, blue transfer-print	2	35.1	Willow pattern transfer-print

The sample of collected material consisted of a radio tube “bulb” manufactured by E.T. Cunningham, Inc. between 1915-1920; two clear glass Tabasco “dashing” bottles manufactured by Owens-Illinois Glass Co. for McIlhenny Co, between 1915-1966; and a lime green glass fragment that is likely Depression glass, which generally dates to between 1929-1939 (SHA 2020; radiomuseum.org n.d.). Diagnostic cultural material identified in Bottle Dump No. 1 (**Figure 5.13**), but not collected, includes: A rose-colored Fiestaware saucer fragment, which is no longer in production; however, according to the factory website the rose (pink) plates were manufactured during two production runs, 1951-1959 and 1986-2005 (Fiesta n.d.); numerous clear one-pint whiskey flasks embossed with “FEDERAL LAW FORBIDS SALE OR RE-USE OF THIS BOTTLE”, which, with few exceptions, date between 1935 and 1964 (SHA 2020); several distinct glass bottles represent Joy dish washing soap, which was packed in these bottles from introduction in 1949 to 1956, when the packaging was changed to an aluminum can (Joysuds.com n.d.).

Additionally, many of the bottles exhibited an early Owens-Illinois mark with a superimposed “O” that extends beyond the top and bottom of the diamond, which date between 1931-1954 (SHA 2020). Cylindrical milk bottles, which generally date between 1880-the early-1950s when rectangular bottle forms increase in popularity (SHA 2020). Tall, narrow, wide-mouth styles predominated olive bottle styles between 1900 to the early 1930s, furthermore, lug type external threads (exhibited on the olive jars) were introduced in 1906 but proliferated in use after 1930 (SHA 2020). Several Heinz ketchup bottles with the distinctive octagonal body were identified in the scatter; however, Heinz began production of the bottles in 1895 and are still produced. Embossed numbers on the bottle corresponding to maker’s codes can be diagnostic, but no numbers were recorded in the field, so the Heinz ketchup bottles in the scatter are not diagnostic to a particular time period.



Figure 5.13 Diagnostic material documented at Bottle Dump 1. (Left) Joy dish soap and Fiestaware plate fragment; (middle) cylindrical milk bottles; (right) wide-mouth style olive bottle.



Figure 5.14 Overview of Bottle Dump 2.

Bottle Dump No. 2 is a moderate-density bottle scatter that was documented approximately 30 m northeast of Bottle Dump No. 1. This bottle dump measures approximately 10 m (north-south) by 5 m (east-west) and consists almost entirely of intact glass bottles and jars (**Figure 5.14**). Bottle types primarily include fruit and canning jars, condiment bottles, beverage bottles, and medical/chemical bottles. Bottle types are like those documented at Bottle Dump No. 1, so no samples were collected from Bottle Dump No. 2. Approximately 50-60 bottles are associated with Bottle Dump No. 2.

Dump No. 3 is a moderate-density bottle scatter that was documented approximately 40 m north-northeast of Bottle Dump No. 2. This bottle dump measures approximately 7 m (north-south) by 5 m (east-west) and consists primarily of intact glass bottles and jars; however, additional cultural material included a radial tire with no visible sidewall markings, a fragment of a large stoneware crock, an unidentifiable (UID) radio component, blue on white transfer-printed ceramic fragments, two metal (rusted) 5-gallon buckets, a galvanized metal pail, and a 3-tier high voltage ceramic electric insulator (**Figure 5.15**).



Figure 5.15 Overview of Bottle Dump 3. Inset shows 3-tier high voltage ceramic insulator, and the photograph on the right shows large stoneware crock fragment, unmarked radial tire, and ceramic sherd.

Bottle types primarily include alcohol/spirits bottles and beverage bottles, but also include fruit and canning jars, condiment bottles, and medical/chemical bottles. Bottle types are like those documented at Bottle Dump No. 1, so no samples were collected from Bottle Dump No. 3. Approximately 60-80 bottles are associated with Bottle Dump No. 3.

Dump No. 4 is a low- to moderate-density bottle scatter that was documented approximately 195 m east of Bottle Dump No. 2. This bottle dump measures approximately 5 m (north-south) by 7 m (east-west) and consists entirely of glass bottles and jars (**Figure 5.16**). Bottle types primarily include fruit and canning jars and alcohol and/or spirits bottles, but also includes beverage bottles, and medical/chemical bottles. A sample of bottles with diagnostic elements was collected to help determine the approximate age of the bottle dump. A total of five artifacts were recovered for further analysis at the LG²ES Lab. This material includes one clear glass vial, one clear glass cleaning bottle, one clear citrate magnesium bottle, and one aluminum threaded bottle cap (**Table 5.3**).



**Figure 5.16 Overview of
Bottle Dump 4.**

Table 5.3 Artifacts Collected from the Ground Surface at Bottle Dump No. 4.

Artifact Type	Count	Weight (g)	Comments
Clear, vial	1	115.3	Threaded collar with no neck Owens-Illinois Glass Co. (Makers Mark: A-S(above) 12(left) 7(right) 3(below) (ca. 1954-1980)
Clear, cleaning supplies bottle	1	277	"Texize" embossed on shoulder, threaded finish (ca. 1940s-1950s)
Clear, whiskey bottle	1	252	Owens-Illinois Glass Co. upside down horseshoe embossing; probable Schenley Reserve, half pint (ca. 1954-1964)
Clear, citrate magnesium bottle	1	341.4	Embossed with decorative patterns; Makers mark: National Magnesia Co Inc. (ca. 1920s?)
Threaded bottle cap	1	1.1	Aluminum

Diagnostic cultural material includes a clear vial with an Owens-Illinois Glass Company maker's mark and embossed bottle codes that indicate the bottle was manufactured and used between 1954 and 1980; a half pint whiskey bottle with an upside-down horseshoe embossing, probably Schenley Reserve, with an Owens-Illinois Glass Co. maker's mark that indicates the bottle was manufactured and used between circa 1954-1964; clear cleaning supplies bottle embossed with the word "Texize" dating to between the 1940s and 1950s; and a clear glass citrate magnesium medicine bottle with a National Magnesia Company Inc. maker's mark dating to the 1920s (SHA 2020). The bottle types observed and collected at Bottle Dump No. 4 are similar in type and brand as bottles observed at Bottle Dumps No. 1-3. Approximately 20-30 bottles are associated with Bottle Dump No. 4.

Possible Outbuilding

During systematic subsurface testing in the northeast portion of the moderate probability area, the possible remains of an agricultural structure or outbuilding was encountered. Initially identified by the presence of corrugated metal roofing at the base of a large oak tree, a small historic artifact scatter was documented approximately 1-2 m north of the metal roofing (Figure 5.17). A subsequent STP placed within the artifact scatter was negative for cultural material. Due to the low-density nature of the artifact scatter, a sample of diagnostic cultural material was collected. Recovered artifacts include one



Figure 5.17 Corrugated metal roofing in northeast corner of 8BR04364.

aqua-colored glass pony insulator and an oxidized beer can with two triangular holes in the top (Table 5.4). Beer cans required a can opener with an angled triangular point, referred colloquially as a “church key”.

Table 5.4 Artifacts Collected from the Ground Surface at the Possible Outbuilding

Artifact Type	Count	Weight (g)	Comments
Aqua pony insulator	1	185	Hemingray Glass Co. (Makers mark: Hemingray-9) (ca.1950s-1960s)
Aluminum beer can	1	82.7	Oxidized/rusted; two triangle holes in top from can opener; ca. 1935-1967

Glass “pony” insulators were generally utilized on low-voltage telephone lines. The one recovered near the Possible Outbuilding was manufactured by Hemingray Glass Company circa 1950s-1960s (Hemingray n.d.). Aluminum beer cans that required a can opener were introduced in 1935 and utilized primarily until 1967 (rustycans.com n.d.). In addition to the possible structural remains and artifact scatter, a large, hardened pile of resin was identified approximately 3 m southeast of the corrugated roofing, further suggesting this area is associated with an outbuilding rather than a domestic structure. No structures or features were indicated in this area of the Project APE on historic topographic maps or aerial photographs, suggesting the structural elements were redeposited from another location. It is likely the corrugated metal roofing is associated with the outbuilding depicted on the 1949 Orsino USGS topographic map, which illustrated a barn or outbuilding approximately 50-meters to the south.

Ornamental Vegetation

During systematic subsurface testing in the northeast portion of the moderate probability area, a patch of Turk’s Cap hibiscus (*Malvaviscus penduliflorus*) was encountered approximately 50 m south of the possible outbuilding and about 100 m east of the buildings (Figure 5.18). Turk’s Cap hibiscus is a non-native ornamental plant originating in Mexico, with downward pointing red pendant flowers about 2.5 in (6.35 cm) long (UF IFAS). The

Turk's Cap hibiscus was planted approximately 10 m east-northeast of a large oak tree and approximately 5 m southwest of a stand of five cabbage palm trees (*Sabal palmetto*). Although a pedestrian survey of the area yielded no evidence of a structure, the location of the Turk's Cap hibiscus roughly corresponds to the location of a building depicted on the 1949 aerial of the Project APE. Shovel tests conducted



Figure 5.18 A Patch of Non-Native Turk's Cap Hibiscus Northeast Corner of 8BR04364.

within the area were negative for cultural material, and a pedestrian inspection of the ground surface, conducted within a 50 m diameter of the structure's mapped location, yielded no evidence of a structure or artifact scatter.

Interpretation: Site 8BR04364 represents an early- to mid-twentieth century Florida homestead. The concrete block buildings are located on Parcel 4453, which was owned by Perry Nichols, a Trustee, in 1963 and purchased by the USACE on September 19 of that year for \$78.09 per acre. The land acquisition documents do not mention buildings, suggesting the concrete block structures were in ruins by then. It is likely the block structures represent the remains of the Walter H.J. Howe residence; however, it is uncertain when the buildings were constructed. Walter Howe began purchasing property in the Project APE in 1915, and in the 1940 US Census he was listed as an orange grower. Furthermore, 1936 road map indicates two structures located east of the unnamed north-south oriented road from Orsino; however, the structures are not to scale and merely suggest the possibility for a structure located in the southern half of the project APE prior to 1936 (FSRD 1936). A general temporal range for the occupation of the structure is between 1915, based on the earliest date that Howe began purchasing the property and, 1963 when the property was acquired by the federal government. Laboratory analysis of a sample of artifacts collected from across the site suggest an occupation dating between the 1920s and mid- to late-1950s. Bottle types primarily included fruit and canning jars, condiment bottles, beverage bottles, medical/chemical bottles, and alcohol bottles, which are indicative of a domestic occupation.

Based on the distance between the Turk's Cap hibiscus and the Granite Rock House, it is likely the ornamental vegetation, documented approximately 100-meters west of the buildings, was associated with another residential structure depicted on the 1949 topographic map (USGS 1949). The ornamental vegetation appears to be the only evidence left of this unknown historical occupation. Subsequent testing in the area in conjunction with a pedestrian survey was made difficult due to dense Brazilian Pepper. Based on the location of the mapped structure in relation to the main road, approximately 120-meters to the west, and due to evidence, that suggests both residential structures depicted on the 1949 Orsino USGS map used the same driveway to cross the drainage ditch (east of the road), it is likely the structure associated with the ornamental vegetation was occupied by an orange grove laborer.

Evaluation: Site 8BR04364 represents an early- to mid-twentieth century Florida farmstead. This site consists of two concrete block structures, four bottle dumps, possible remains of a barn or outbuilding, and ornamental vegetation. This site lacks integrity and is not associated with important events or influential people and therefore does not meet the minimum requirements for inclusion on the NRHP. Therefore, LG²ES recommends 8BR04364 not eligible for the NRHP, and no further archaeological consideration is suggested.

8BR04367, Howe Grove Road

Setting: Hydric Hammock

Soils/Drainage: Copeland-Bradenton-Wabasso complex, limestone substratum; Very Poorly Drained

Survey Methodology: Pedestrian survey

Site Type: Linear Resource

Site Size: 1.1 km (0.68-mi) (15 x 1,100 m)

Depth of Deposit: Surface

Cultural Periods: American-20th Century

Discussion: 8BR04367, now known as Range Road, was an unimproved, unnamed road located along the western boundary and intersecting the project study area in the southwestern corner of the Project APE. Howe Grove Road was selected as the resources name based on sources indicating that Walter J. H. Howe, who settled in the region around the turn of the twentieth century, began purchasing property within the Project APE in 1915, eventually becoming an orange farmer. The earliest depiction of this road is on the 1936 Florida State Road Department map, which indicated that the road was unimproved (**Figure 5.19**). The road was north-south oriented and ran along the borders between Sections 1 and 12 and Section 6 and 7 of T 23S-R 36E and T 23S-R 37E, respectively. Howe Grove Road connected State Road 219 (Courtenay Parkway) in the south and Orsino Road, present-day NASA Parkway West to the north.

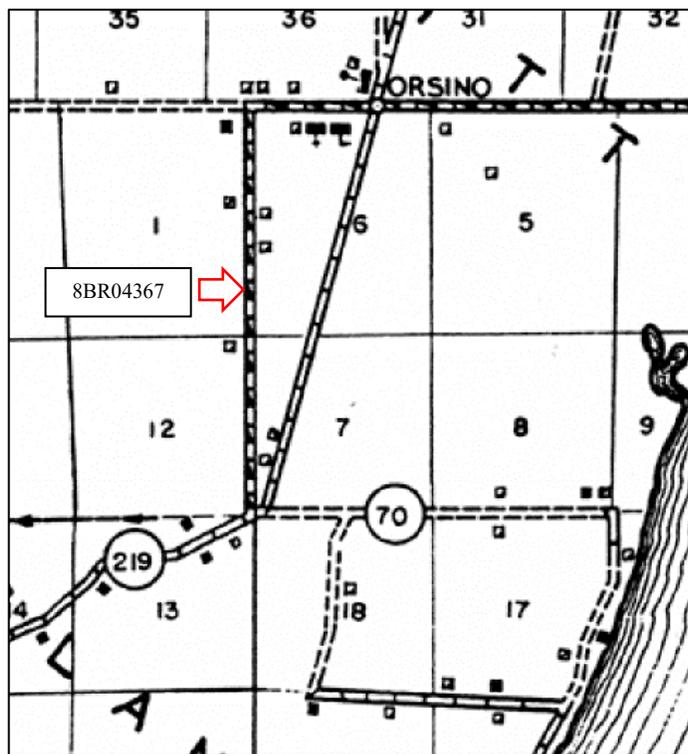


Figure 5.19 1936 Florida State Road Department State Road Map Depicting an Overview of the Road from Orsino to SR 219.

The road has since been altered due to development in the area. Space Commerce Way utilized much of the right-of-way of the unnamed north-south oriented road now documented as Howe Grove Road. The road adjacent to the Project APE, as it exists today, is an access road along the western boundary of the Project APE (**Figure 5.20**). A drainage ditch was excavated along the east side of the road, which likely facilitated drainage of the area, allowing for the construction of the road. It is likely the drainage ditch dates to the same time as the road construction, which is presumably prior to 1915.

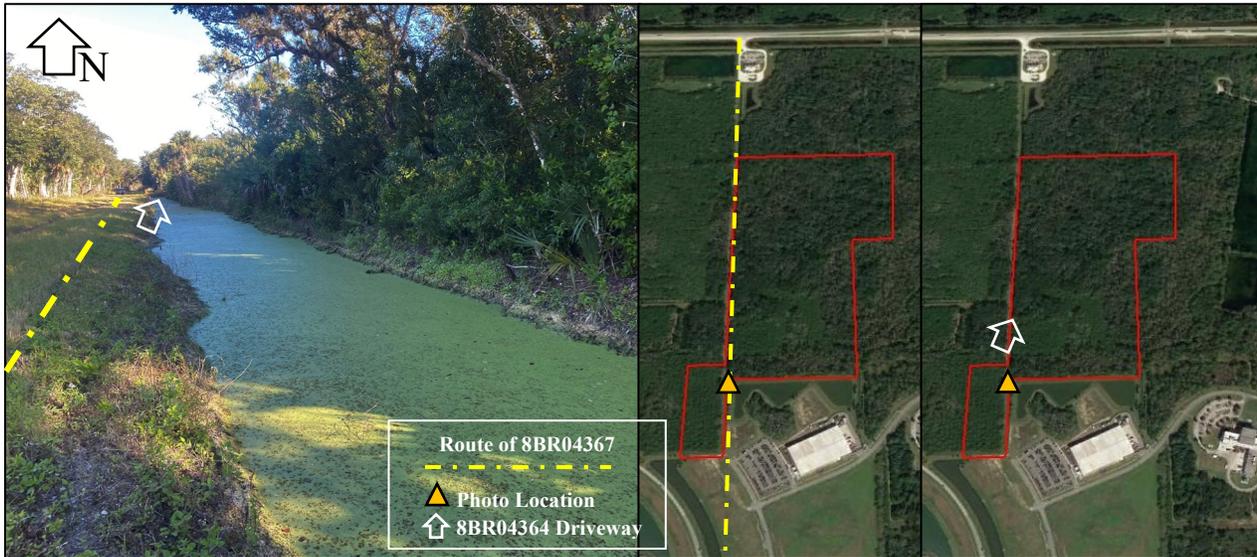


Figure 5.20 (Left) Current View of the Road and Drainage Ditch, Facing North Along the Project APE, and (Right) Current Aerial of Intact Portion of 8BR04367 in Relation to the Project APE.

Interpretation: Site 8BR04367 represents an early- to mid-twentieth century unimproved road. The earliest depiction of this road is on the 1936 Florida State Road Department state road map, which also depicts a building situated within a land tract owned by Walter H.J. Howe beginning in 1915 (FSRD 1936). This suggests that the road was likely constructed prior to 1915. A portion of the access road between the south end of the badging office parking lot and the north side of the parking lot retains much of its integrity, including integrity of location, integrity of design, integrity of setting, and integrity of feeling.

Evaluation: Site 8BR04367 represents an early- to mid-twentieth century unimproved road that likely dates to before 1915. Although the portion of 8BR04367 adjacent to the western Project boundary, approximately .68-miles (1.1-kilometers) in length, retains integrity of location, integrity of design, integrity of setting, and integrity of feeling, it does not meet the minimum criteria for inclusion on the NRHP. Therefore, LG²ES recommends 8BR04367 not eligible for the NRHP, and no further archaeological consideration is suggested.

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6.0 CONCLUSIONS

Between December 7-9, 2020, LG²ES conducted a Phase I CRAS of an approximately 61.4-acre parcel located approximately 400-m east of the KSC Visitor Complex in support of the proposed Exploration Park North Expansion EA at Kennedy Space Center on Merritt Island in Brevard County, Florida. The project area is contained to the *Orsino, Florida* 7.5-minute quadrangle (USGS 1976). This survey was conducted on behalf of Space Florida, BRPH, and Jones Edmunds (SF/BRPH/Jones Edmunds) to assist KSC in meeting its regulatory obligations under Section 106 of the NHPA, as amended. Proposed project activities include the expansion of property at Exploration Park to support development and construction of commercial aerospace facilities.

The Archaeological Area of Potential Effects (APE) is situated within the Merritt Island National Wildlife Refuge in the northern portion of Brevard County, approximately 952 m southwest of the intersection of NASA Parkway and Kennedy Parkway, 637 m southeast of the Kennedy Space Center Visitor Complex, and 425 m northeast of Space Commerce Way. The APE is comprised of a wooded area measuring approximately 61.4 acres.

The CRAS was conducted December 7-9, 2020 and consisted of historic background research, pedestrian survey, and the excavation of 31 STPs were excavated, all of which were negative for cultural material, and 13 “no dig” loci were documented across the project APE. “No dig” tests were written off due to inundation. Although all subsurface tests were negative for cultural material structural remains and a surface scatter was documented as 8BR04364, The Granite Rock Homestead, while a historic road documented in the southwestern portion of the Project APE, was recorded as 8BR04367, Howe Grove Road. **Table 6.1** summarizes the documented cultural resources and NRHP recommendations resulting from this CRAS.

Table 6.1 Sites Documented during the Phase I CRAS with NRHP Recommendations

Site Number	Site Name	Site Type	NRHP Recommendation
8BR04364	The Granite Rock Homestead	Early- to mid-20th homestead	Not Eligible
8BR04367	Howe Grove Road	Linear resource/road	Not Eligible

Site 8BR04364, The Granite Rock Homestead, consists of the structural remains of two concrete block structures, four bottle dumps, and ornamental vegetation. While a 1936 Florida State Road Department state road map indicates a structure was present in the Project APE in the mid-1930s, the artifact assemblage, consisting primarily of intact glass bottles, generally dates to the mid-1950s, suggesting this is when the structure was abandoned. This site does not retain integrity and does not meet the minimum criteria for inclusion on the NRHP. No further archaeological investigation is recommended.

Site 8BR04367, Howe Grove Road, represents an early- to mid-twentieth century unimproved road that likely dates to before 1915. Although the portion of road, approximately 1.1 km in length, adjacent to the western project boundary retains integrity of location, integrity of design, integrity of setting, and integrity of feeling, it does not meet the minimum criteria for inclusion on the NRHP. No further archaeological investigation is recommended. The proposed Exploration Park North Expansion project at Kennedy Space Center will not impact cultural resources eligible for, or already listed on the NRHP. Therefore, no additional archaeological investigation is recommended.

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APPENDIX A: FMSF Survey Log Sheet

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Ent D (FMSF only) _____



Survey Log Sheet

Florida Master Site File
Version 4.1 1/07

Survey # (FMSF only) _____

Consult *Guide to the Survey Log Sheet* for detailed instructions.

Identification and Bibliographic Information

Survey Project (name and project phase) Phase I CRAS of approximately 61.4-acre parcel located approximately 400-meters east of the KSC Visitor Complex

Report Title (exactly as on title page) Phase I Cultural Resources Assessment Survey of Exploration Park North Expansion EA Brevard County, Florida

Report Authors (as on title page, last names first) 1. Lombardi, Kathryn 3. _____
2. Nelson Blue 4. _____

Publication Date (year) 2020 Total Number of Pages in Report (count text, figures, tables, not site forms) _____

Publication Information (Give series, number in series, publisher and city. For article or chapter, cite page numbers. Use the style of *American Antiquity*.)
Lombardi, Kathryn and Blue Nelson 2021 Phase I Cultural Resources Assessment Survey of Exploration Park North Expansion EA Brevard County, Florida. Project No. 20-152

Supervisors of Fieldwork (even if same as author) Names Blue Nelson

Affiliation of Fieldworkers: Organization _____ City Jacksonville

Key Words/Phrases (Don't use county name, or common words like *archaeology, structure, survey, architecture, etc.*)

1. Orsino 3. KSC 5. Walter Howe 7. _____
2. Orange Grove 4. Kennedy Space Center 6. _____ 8. _____

Survey Sponsors (corporation, government unit, organization or person directly funding fieldwork)

Name Space Florida, BRPH, and Jones Edmunds Organization _____

Address/Phone/E-mail _____

Recorder of Log Sheet Blue Nelson Date Log Sheet Completed 12-10-2020

Is this survey or project a continuation of a previous project? No Yes: Previous survey #s (FMSF only) _____

Mapping

Counties (List each one in which field survey was done; attach additional sheet if necessary)

1. Brevard 3. _____ 5. _____
2. _____ 4. _____ 6. _____

USGS 1:24,000 Map Names/Year of Latest Revision (attach additional sheet if necessary)

1. Name ORSINO Year 2018 4. Name _____ Year _____
2. Name _____ Year _____ 5. Name _____ Year _____
3. Name _____ Year _____ 6. Name _____ Year _____

Description of Survey Area

Dates for Fieldwork: Start 12-7-2020 End 12-9-2020 Total Area Surveyed (fill in one) _____ hectares 60 acres

Number of Distinct Tracts or Areas Surveyed 1

If Corridor (fill in one for each) Width: _____ meters _____ feet Length: _____ kilometers _____ miles

Research and Field Methods

Types of Survey (check all that apply): archaeological architectural historical/archival underwater
damage assessment monitoring report other(describe): _____

Scope/Intensity/Procedures 50 m intervals in mod prob, 10 percent of the low prob, and a pedestrian survey. Although a large surface scatter was encountered, all STPs were negative.

Preliminary Methods (check as many as apply to the project as a whole)

Florida Archives (Gray Building) library research- local public local property or tax records other historic maps
Florida Photo Archives (Gray Building) library-special collection - nonlocal newspaper files soils maps or data
Site File property search Public Lands Survey (maps at DEP) literature search windshield survey
Site File survey search local informant(s) Sanborn Insurance maps aerial photography
other (describe): _____

Archaeological Methods (check as many as apply to the project as a whole)

Check here if NO archaeological methods were used.
surface collection, controlled shovel test-other screen size block excavation (at least 2x2 m)
surface collection, uncontrolled water screen soil resistivity
shovel test-1/4" screen posthole tests magnetometer
shovel test-1/8" screen auger tests side scan sonar
shovel test 1/16" screen coring pedestrian survey
shovel test-unscreened test excavation (at least 1x2 m) unknown
other (describe): _____

Historical/Architectural Methods (check as many as apply to the project as a whole)

Check here if NO historical/architectural methods were used.
building permits demolition permits neighbor interview subdivision maps
commercial permits exposed ground inspected occupant interview tax records
interior documentation local property records occupation permits unknown
other (describe): historic land deeds

Survey Results (cultural resources recorded)

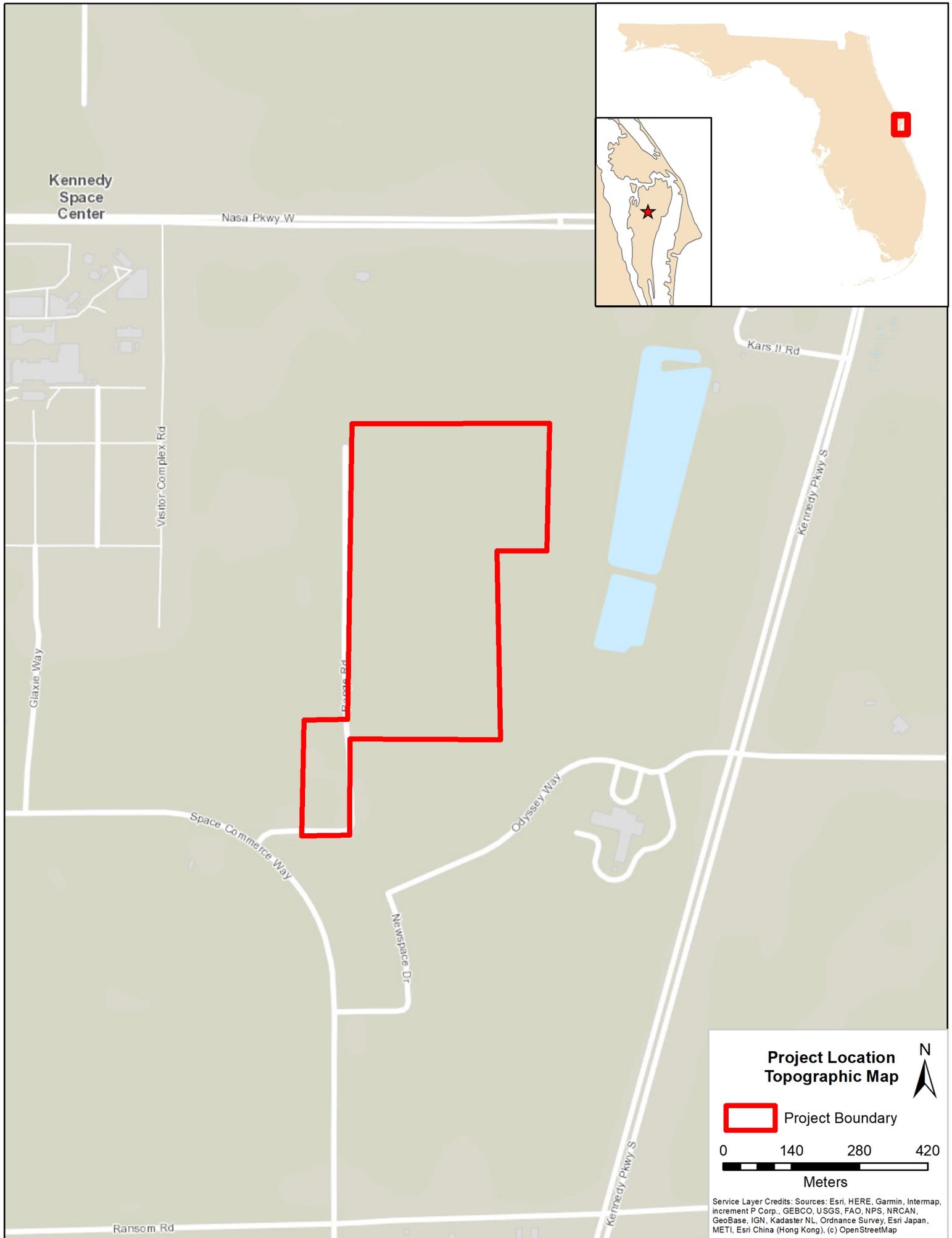
Site Significance Evaluated? Yes No
Count of Previously Recorded Sites 0 Count of Newly Recorded Sites 2
Previously Recorded Site #'s with Site File Update Forms (List site #'s without "8". Attach additional pages if necessary.) N/A

Newly Recorded Site #'s (Are all originals and not updates? List site #'s without "8". Attach additional pages if necessary.) BR04364, BR04367

Site Forms Used: Site File Paper Form Site File Electronic Recording Form

REQUIRED: ATTACH PLOT OF SURVEY AREA ON PHOTOCOPY OF USGS 1:24,000 MAP(S)

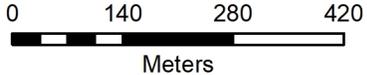
SHPO USE ONLY SHPO USE ONLY SHPO USE ONLY
Origin of Report: 872 CARL UW 1A32 # _____ Academic Contract Avocational
Grant Project # _____ Compliance Review: CRAT # _____
Type of Document: Archaeological Survey Historical/Architectural Survey Marine Survey Cell Tower CRAS Monitoring Report
Overview Excavation Report Multi-Site Excavation Report Structure Detailed Report Library, Hist. or Archival Doc
MPS MRA TG Other: _____
Document Destination: _____ Plotability: _____



**Project Location
Topographic Map**



 Project Boundary



Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap

APPENDIX B: Artifact Catalog

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Exploration Park North (8BR4364)

[Phase ??] Artifact Collection

Lot	Count	Weight (g)	Artifact Description	Note
1.001	1	374.1	Owens-Illinois Glass Co. clear glass bottle (ca.1915-1966)	Square bottle; screw top
1.002	1	64.0	Clear glass vial	Threaded collar, no neck, slightly flared base; embossed "571-D" on base
1.003	1	42.6	Sprague capacitor (ca. 1926-1987)	used as an electric component mostly in audio; (maker's mark: Sprague)
1.004	1	266.7	Metal electronic component	Cylindrical, dial-shaped; possible radio part; heavily oxidized/rusted; includes iron, lead, and brass
1.005	1	173.8	Variac General Radio Co. electronic component (ca. 1915-2001)	Possible autotransformer; (Makers' mark: Variac General Radio Co. Type 200-C, 115v50-60~5a
1.006	1	45.0	Plastic dial	Half circle, marked 0-180 degrees
1.007	1	33.1	Allen Bradley Co. radio ceramic gridleak and condenser (ca. 1920s)	
2.001	1	36.8	E.T. Cunningham, Inc. radio tube bulb (ca. 1915-1920)	Harrison, New Jersey (Makers' Mark: CX112A)
2.002	1	32.6	General Electric light bulb	60w 120v; possibly modern
2.003	1	86.8	McIlhenny Co. Tabasco clear glass dashing bottle (ca. 1915-1966)	New Iberia, Owens-Illinois Glass Co.
2.004	1	66.0	McIlhenny Co. Tabasco clear glass dashing bottle (ca. 1915-1966)	New Iberia, Owens-Illinois Glass Co.
2.005	1	45.1	Green glass dessert bowl	Possible depression glass; dessert or nut bowl; lime green
2.006	1	17.7	Blue willow pattern whiteware saucer	Transfer print
2.007	1	17.4	Blue willow pattern whiteware cup	Transfer print

Lot	Count	Weight (g)	Artifact Description	Note
3.001	1	115.3	Owens-Illinois Glass Co. clear glass vial (ca. 1954-1980)	Threaded collar with no neck (Makers Mark: A-S(above) 12(left) 7(right) 3(below))
3.002	1	277.0	Clear glass Texize cleaning bottle (ca. 1940s-1950s)	"Texize" embossed on shoulder, threaded finish
3.003	1	252.0	Owens-Illinois Glass Co. clear glass whiskey bottle (ca. 1954-1964)	Upside-down horseshoe embossing; probable Schenley Reserve, half pint
3.004	1	341.4	National Magnesia Co Inc. clear glass citrate magnesia bottle (possible ca. 1920s)	decorative patterns; (Makers mark: National Magnesia Co Inc.)
3.005	1	1.1	Aluminum threaded bottle cap	Aluminum
4.001	1	185.0	Hemingray Glass Co. aqua pony glass insulator (ca.1950s-1960s)	(Makers mark: Hemingray-9)
4.002	1	82.7	Aluminum beer can (ca. unknown-1967)	Oxidized/rusted; two triangle holes in top from can opener