National Aeronautics and Space Administration

KENNEDY SPACE CENTER

# VISION PLAN

## AND PROGRAMMATIC ENVIRONMENTAL ASSESSMENT

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# Kennedy Space Center

# Vision Plan

and

## Programmatic Environmental Assessment


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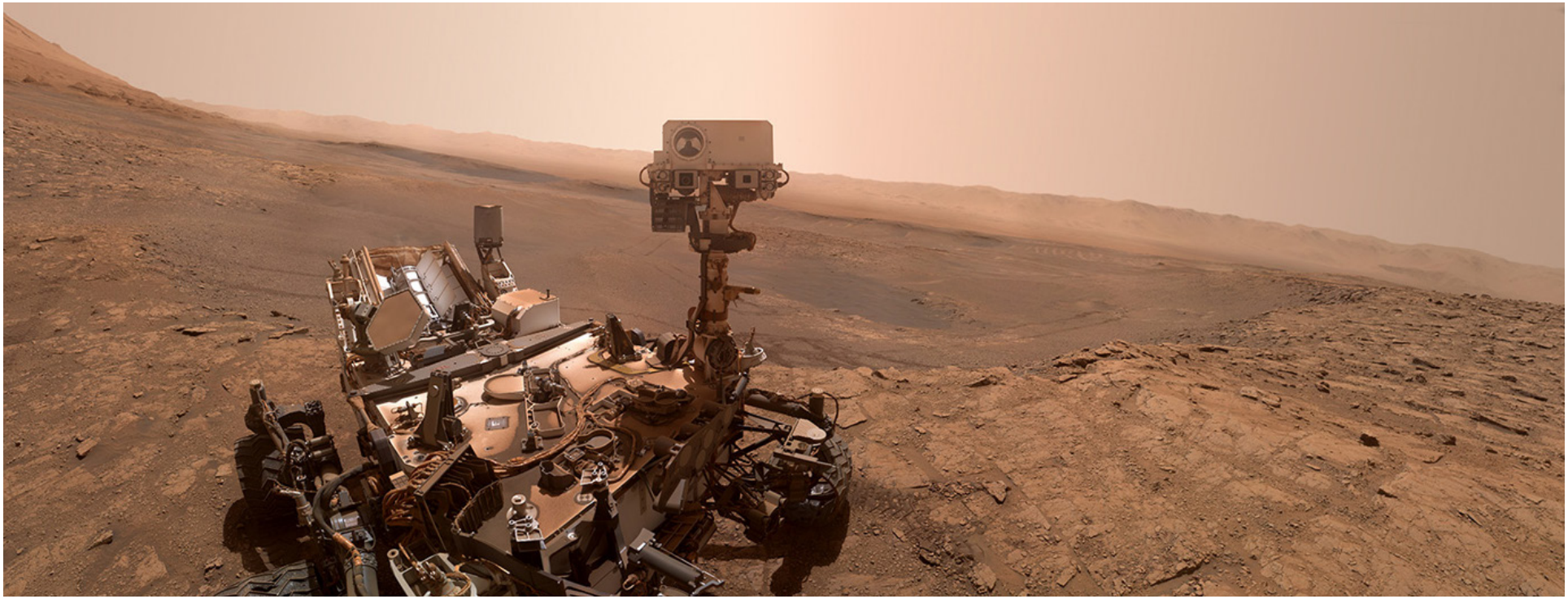

**Summary**
Kennedy Space Center's mission is to function as a multi-user spaceport for launch operations operated by NASA and a growing number of private partners. To support this mission safely, effectively, and efficiently, Center planners crafted this Vision Plan with the collaborative input of stakeholders and subject matter experts. Together, they developed a planning vision with four primary goals that are supported by 13 clear patterns.

In short, the Center will support **flexible processing and launch capabilities**, with **robust infrastructure**, **sustainable facilities**, and **responsible stewardship of the built and natural environment**. They also defined seven planning districts and established growth boundaries within each district to concentrate development so that 95% of the Center's 141,829 acres can remain largely undisturbed. Furthermore, they identified infrastructure interdependencies and ten planning precepts to leverage current and future investments most effectively. These precepts are preliminary concepts that will clearly and directly guide future projects needed to support the Center's five core competencies and six primary programs.

They also took lessons from previous planning efforts, including the 2014 KSC Master Plan in order to anchor this latest plan to the Center's legacy of planning excellence. This includes the need to support NASA missions and programs, the desire to grow leaner and greener, the need to divest without diminishing capabilities, and the opportunity to enhance the multi-user spaceport. This also includes integrating NASA standards for sustainable planning, natural and cultural resource preservation, effective real property management, and planning for a healthy, safe, and secure Center.

Already, following this legacy, the Center has modernized operations and reduced the physical footprint by a remarkable 26% since 2011 through selective demolitions, consolidations, and outgrants. In the future, development will continue to respect the varied operational and natural constraints present across the Center's diverse landscapes. Specifically, the 27 priority projects listed in this plan will increase operational capabilities while decreasing the risk to mission operations and they will do so in a way that does not have any significant adverse or cumulative effects on the environment.

Going forward, the Center intends to operationalize this plan in more detail through 1) the preparation of Area Development Plans for each district to show how to site and service all proposed projects; 2) the forecasting and minimizing of future energy and water use, waste generation, and stormwater mitigation through the development of Sustainability Component Plans for each district; 3) the integration of those district plans with plans that address transportation, utility, and green infrastructure networks across the Center; 4) the development of clear design standards for future facilities that address buildings, streets, and landscapes; 5) the preparation of Area Development Execution Plans to identify all projects large and small needed to implement this Vision Plan; 6) the publication of a summary digest that succinctly outlines all aspects of the plan; and 7) the creation of Customer Concept Documents for all key buildings in order to reduce time from idea to occupancy and reduce costs for construction and maintenance. In sum, this Vision Plan is a launchpad anchored to the Center's rich history and designed to flexibly guide sustainable and resilient development long into the future.

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# EXECUTIVE SUMMARY

## Overview

In the predawn hours of July 21, 2011, the Space Shuttle Atlantis touched down at Kennedy Space Center's (KSC) Shuttle Landing Facility for the final time. The landing marked the culmination of the Shuttle Program which for 30 years had served as the primary contributor to KSC's built environment and workforce requirements. With the end of the Space Shuttle Program, NASA KSC found itself with specialized facilities, and thousands of personnel with expertise in spacecraft processing operations and launch, and no immediate NASA launch program to support.

At the end of the Shuttle Program, KSC was at a transition point in the single-user operational model that had spanned the 50 years of its successful history. Because of the Apollo and Shuttle Programs, KSC's real property portfolio consisted of 67% of NASA's overall land holdings and nearly 20% of NASA's $30 billion (current replacement value) worth of facilities and infrastructure. With a highly unique asset base, and a constrained federal budget, KSC committed to transforming from a program-focused, single-user launch complex to a more capability-centric and cost-effective multi-user spaceport shared by government and commercial partners. Due to the transformative shift in the operations and culture of KSC since 2011, this Center Vision Plan uses that year as the baseline for all analysis that will help guide and justify the proposals within future planning documents that will support the development of the Master Plan. Using 2011 as the baseline year will enable the Vision Plan to best define the progress that has been made in this new era of KSC as a multi-user spaceport.

## Kennedy Space Center since 2011

The 2014 Master Plan served as the catalyst for what would become the multi-user spaceport. It was developed as NASA was beginning to operate under the National Space Policy established in 2010. This policy, among other things, stated "the United States will advance a bold new approach to space exploration. The National Aeronautics and Space Administration will engage in a program of human and robotic exploration of the solar system, develop new and transformative technologies for more affordable human exploration beyond the Earth, seek partnerships with the private sector to enable commercial spaceflight capabilities for the transport of crew and cargo to and from the International Space Station (ISS), and begin human missions to new destinations by 2025." KSC captured the opportunity to remain relevant in a bold new era of space exploration by developing partnerships and making its unique assets, capabilities, and expertise available to commercial and government space-faring entities. The 2014 Plan sought to enable KSC to preserve the institutional infrastructure needed to support NASA's programmatic requirement while simultaneously enabling the growth of the commercial space industry.

The result, since 2011, is that KSC 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% from the 8,304 jobholders in 2011, with approximately 3,333 positions not under the direct auspices of NASA, compared to only 564 in 2011. The diverse workforce has resulted in an increase in the economic impact of activities at KSC. In 2019, the economic impact of KSC on Florida's economy was approximately $3.98 billion,

an increase of 85% from $2.15 billion in 2011, and comparable to the high of $4.3 billion in 2009.

The diverse user base at KSC has been enabled by the divestment, through outgrants and transfers, of more than 20% (or more than $1.1 billion) of the assets NASA owned in 2011 to non-NASA stakeholders. The growth of the multi-user spaceport has brought tremendous benefits to NASA's missions since 2011. Beginning with the transition of Orbiter Processing Facility 3 to Boeing, Launch Complex 39A to SpaceX, and the Shuttle Landing Facility to Space Florida; KSC has built a foundation that has benefited the growth of the nation's commercial space capability and has allowed NASA to divest of excess Shuttle Program facilities without diminishing KSC's capability as a launch complex.

The ability for non-NASA entities to use excess NASA facilities and KSC's unique infrastructure has provided a diversity of benefits to NASA including: cost avoidance associated with the operations and maintenance of transferred facilities; subsidization of costs associated with launch infrastructure; and a reduction of costs for routine access to space for NASA crew and cargo in support of the ISS. Additionally, the ability for non-NASA entities to use excess NASA facilities and infrastructure has resulted in a significant decrease in cost per pound to orbit. NASA is able to take advantage of this decreased cost to access space, allowing resources that would have been dedicated to launch to be allocated more efficiently toward means that directly help NASA achieve long-term agency goals. This collaboration between NASA and its commercial partners has emphasized the inherent linkage between NASA and commercial space success, while also serving as a foundation for new investment by KSC's commercial partners into additional infrastructure and new state-of-the art facilities to support the further growth of commercial space at KSC and support cutting-edge exploration initiatives including NASA's Artemis program to land the first woman and next man on the Moon by 2024.

### Center Vision Plan

The Vision Plan is the first stage of a 2020 Master Plan update, which will serve as a framework for stewarding KSC's physical assets over the next 20 years. This foundational step, developed through collaboration with stakeholders within NASA and the federal government, state and local governments, and commercial entities, will guide the development of the 2020 Master Plan update, prioritizing mission and institutional alignment, affordability, sustainability, and launch throughput, in accordance with relevant policy and guidance. The Vision Plan aims to meet NASA's missions while maximizing opportunities for non-NASA stakeholders to develop and grow additional resources and capabilities at KSC.

Developed with stakeholders through a participatory approach, the Center Vision Plan includes a vision statement, goals, and planning patterns to guide continued development of a multi-user spaceport. The overarching planning vision emerged out of a participatory process during the Center Vision Plan workshop held October 7-10, 2019. Over 200 KSC staff and partners participated in interviews and the four-day workshop and continued to help refine the Vision Plan through active reviews.

The affordability analysis demonstrates a reduction in effective current replacement value (CRV) of 27% at KSC since 2011 as a result of intentional demolitions, transfers, and outgrants of property and facilities.

Development constraints show the various constraints affecting development at KSC. These include critical habitat, floodplains, sea level rise, and safety and infrastructure constraints. Using the constraints and site analysis as a foundation, the Developable Area Maps identify areas appropriate for development or redevelopment within the districts at KSC after constraints are taken into account. These maps show facilities at KSC. Facilities and other assets located outside of the Center are not shown on the maps; however, they are included in relevant analysis, such as the affordability calculations.

The Summary Future Development Map shows planned and potential future projects. Building on the risk assessment for each identified project, the future project list is ordered by funding avenue and priority.

### KSC Districts

The Center Vision Plan divides KSC into seven planning districts to focus follow-on planning efforts: Mosquito Lagoon District, Exploration Launch District, Vehicle Assembly Building (VAB) District, Space Launch and Landing Facility (SLF) District, Space Commerce District, Central Processing District, and Central Campus District. To meet KSC's planning vision and goals, each planning district has a defined Spaceport Growth Boundary (SGB) that defines the limits of future development within the environmental constraints of that district. This Vision Plan presents preliminary concepts and patterns that address the planning needs of each district while ensuring compliance with the most current planning standards.

The Central Processing, Central Campus, and Space Commerce Districts are the top priority for Area Development Plans (ADPs). This Vision Plan sets the foundation for follow-on planning efforts that will occur at the district level.

Planning Guidance Hierarchy for Future Development Decisions

# VISION & GOALS

Our planning vision is to enhance the multi-user spaceport with **flexible processing and launch capabilities**, **robust infrastructure**, **sustainable facilities**, and **responsible stewardship of our built and natural environment**.

From this planning vision, four goals emerged to guide the development process. Each goal has planning patterns, further detailed in Section 3, that will shape future development to meet KSC's goals.

Goal 1: **Flexible Processing and Launch Capabilities**
Planning Patterns
- Flexible launch infrastructure
- Continuous quinti-modal transportation network
- Ground support applied research and technology capabilities

Goal 2: **Robust Infrastructure**
Planning Patterns
- Modernized launch support infrastructure
- Resilient launch support capabilities
- Modern communication and security systems

Goal 3: **Sustainable Facilities**
Planning Patterns
- Environmentally-friendly buildings
- Mixed-function multi-story facilities
- Flexible operational spaces

Goal 4: **Responsible Stewardship of our Built and Natural Environment**
Planning Patterns
- Infill development
- Central Campus
- Adaptation Action Areas (AAAs)
- Climate change adaptation strategy

## KENNEDY SPACE CENTER MISSION

*KSC safely manages, develops, integrates, and sustains space systems through partnerships that enable innovative, diverse access to space and inspire the nation's future explorers.*

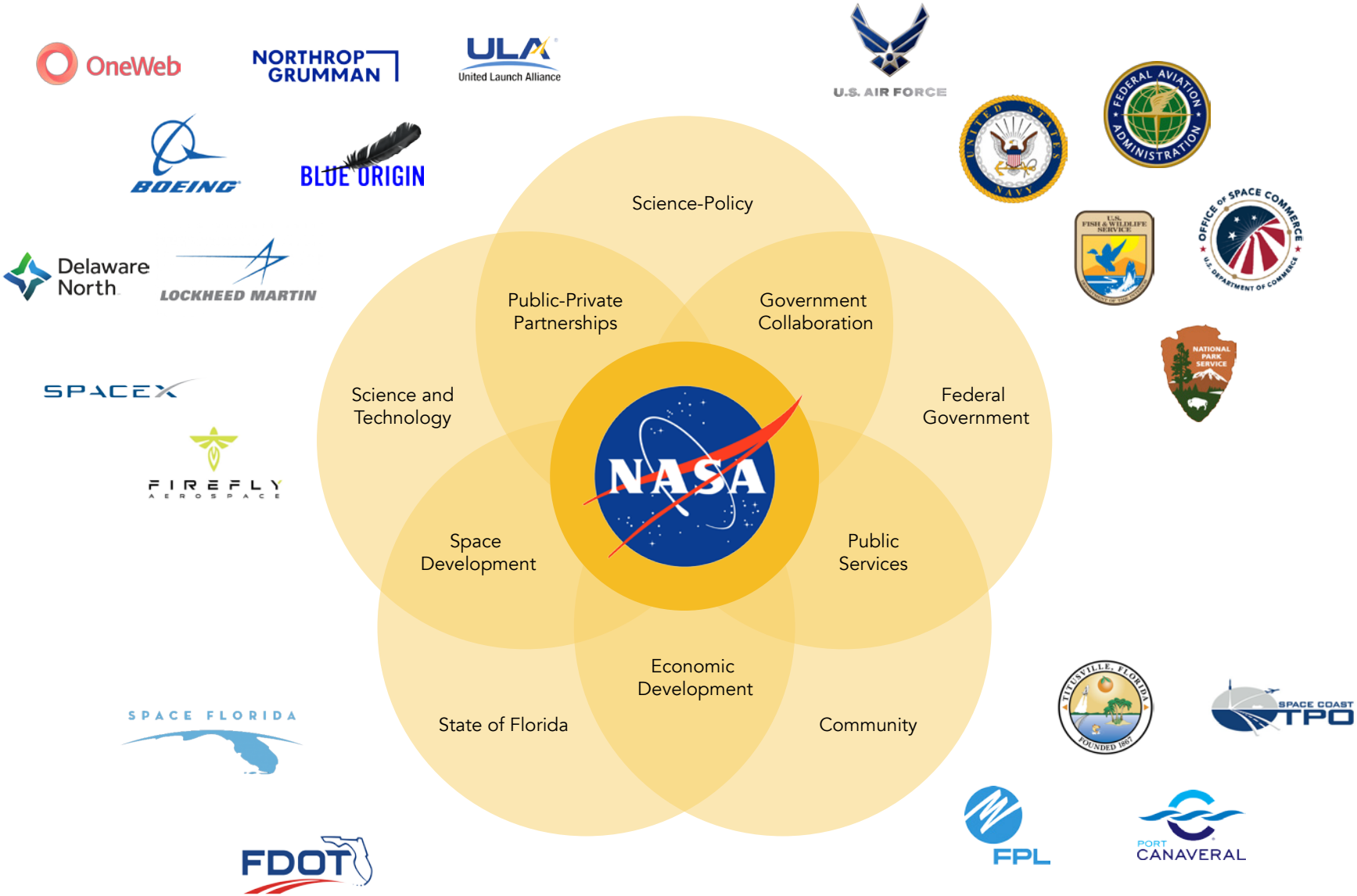
# PLANNING PRECEPTS

Stakeholders developed these planning precepts during the Center Vision Plan workshop. Along with the Vision and Goals, they are intended to guide future development decisions.

1. Support appropriate future development that minimizes adverse mission impacts and maximizes concurrent operations
2. Identify opportunities for additional launch, processing, and recovery operations to maximize the provision of end-to-end solutions for launch providers to position NASA-KSC as the premier gateway to space
3. As stewards of the natural environment, plan to protect critical habitat to the highest extent, ensure appropriate mitigation areas for NASA development, and implement a resiliency strategy to protect critical infrastructure from the adverse effects of climate change
4. To the highest extent possible, consolidate future non-hazardous development into the Central Campus District and future hazardous development into the VAB District or Central Processing District, while also consolidating NASA operations to allow additional opportunities for non-NASA development
5. Plan for infill development in each district consistent with that district's mission: Exploration Launch District for launch and recovery; VAB District for launch operations and support, Central Campus District for administrative and community support, Central Processing District for hazardous processing and flight hardware integration, SLF District for horizontal flight operations, and Space Commerce District for commercial support
6. Determine capacity for development and plan accordingly
7. Support new opportunities for non-NASA development in the Space Commerce District that will meet the needs of a changing market consistent with NASA and partner needs
8. Plan for new technologies that will promote more efficient transportation connectivity between NASA-KSC operational areas
9. Create a consolidated Central Campus for administrative and support uses
10. Ensure that NASA-KSC has the high-end laboratory and research facilities necessary to provide the end-to-end applied research and technology that support the variety of launch activities at KSC

# SPACEPORT STAKEHOLDERS

NASA KSC meets its mission by working with many other government and commercial entities who contribute as important stakeholders to the Center Vision Plan process. Together, these agencies, companies, and organizations contribute to a vibrant, multi-user spaceport.



# LAND MANAGEMENT

Of KSC's over 140,000 acres, a relatively small portion is designated for NASA's operational use. The U.S. Fish and Wildlife Service, Merritt Island National Wildlife Refuge (MINWR) manages all undeveloped property at KSC (within and outside of the Secured Area) except the withdrawn properties and properties exclusively managed by the National Park Service at Canaveral National Seashore (CNS).

This joint federal partnership protects prime habitat for unique and endangered species while maintaining the longest stretch of undeveloped beach on Florida's east coast. These two protected areas, along with the Indian River, provide sufficient buffer zones to ensure that nearby populated areas are not affected by KSC launches and hazardous activity.

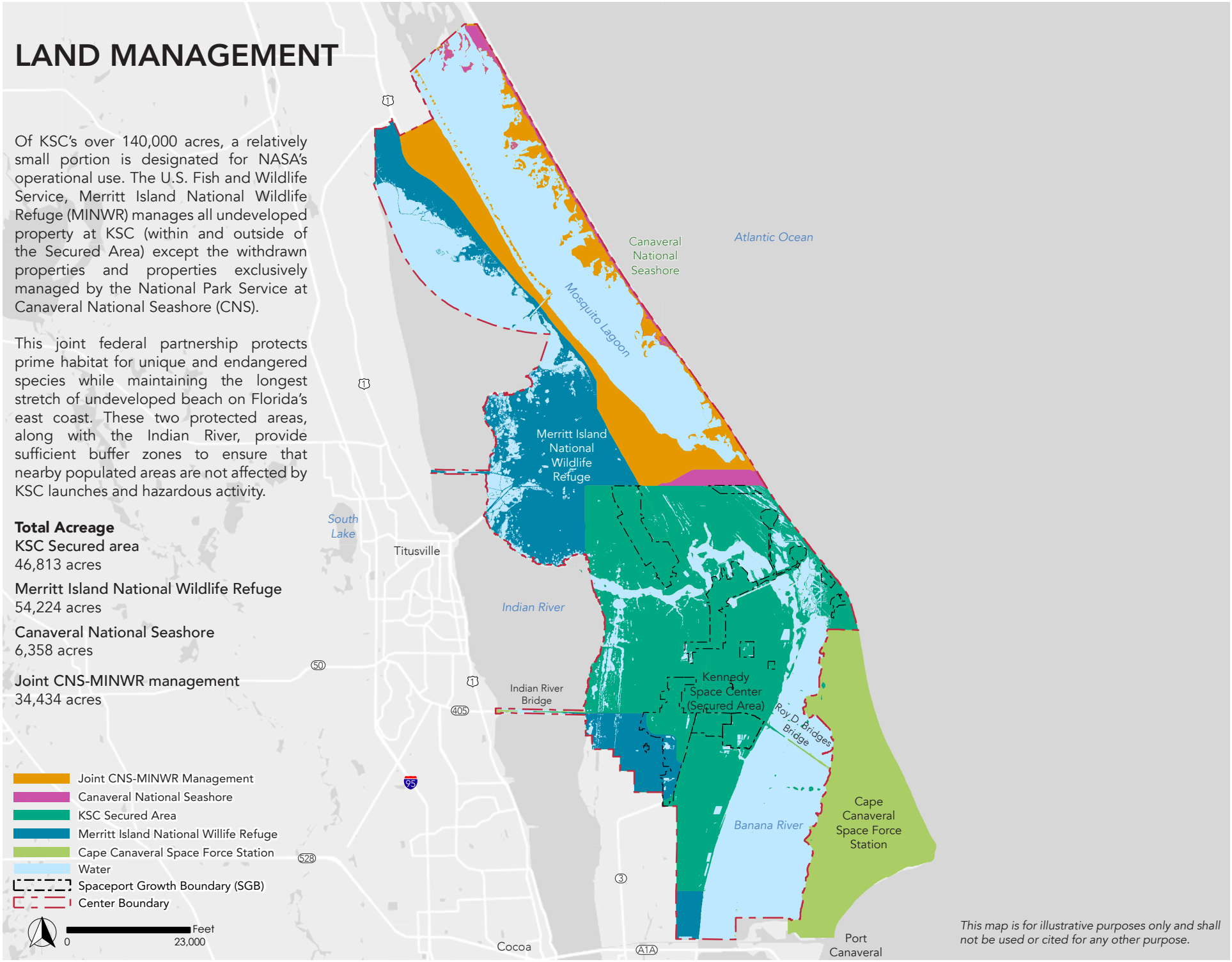
**Total Acreage**

KSC Secured area
46,813 acres

Merritt Island National Wildlife Refuge
54,224 acres

Canaveral National Seashore
6,358 acres

Joint CNS-MINWR management
34,434 acres




*This map is for illustrative purposes only and shall not be used or cited for any other purpose.*

# INFRASTRUCTURE INTERDEPENDENCIES

KSC designed its infrastructure system to provide the necessary utilities and services required to support NASA's launch operations. Once the shuttle program was retired in 2011, which marked the beginning of KSC's evolution to a multi-user spaceport consisting of both NASA and commercial operations, NASA identified horizontal infrastructure capacity that could be divested to non-NASA entities and incentivize commercial space growth. As KSC entered into new partnerships with commercial entities who were able to repurpose shuttle era infrastructure to meet new, evolving demands, its partners then became responsible for maintaining their newly acquired infrastructure and investing in necessary upgrades to support their mission. While upgrades were made to specific single-user systems and usage subsequently increased, this resulted in a greater demand placed on NASA-owned and shared-use infrastructure. This larger-scale impact associated with the rapid rate of new commercial space development on KSC generated the need to assess the broader impacts to KSC's infrastructure systems to ensure that sufficient capacity remained in place to support NASA operations and to identify system breaking points that would require large scale investments to be made to infrastructure systems.

As NASA's commercial partners have begun to use KSC's excess infrastructure to achieve their mission requirements, it has also become increasingly apparent that the success of NASA's mission is mutually dependent on the success of its commercial partners. KSC's utility network is intended to support launches and other high-usage events such as pre-flight engine tests, so the reliability of KSC's infrastructure system is paramount to ensuring that its launch manifest is successfully met. Due to its geographic proximity and its reliance on KSC to obtain gaseous commodities such as helium and gaseous nitrogen, infrastructure requirements for launches on Cape Canaveral Space Force Station (CCSFS) are similarly interlinked with maintaining the ability to support KSC's launch manifest. As KSC's launch manifest continues to grow and evolve (see the Aerospace Corporation manifest chart), the mission objectives and infrastructure needs for both government and commercial partners on KSC and CCSFS will become increasingly interdependent on each other. Particular focus should be placed on shared use infrastructure upgrades that can more effectively meet the needs of all system users.

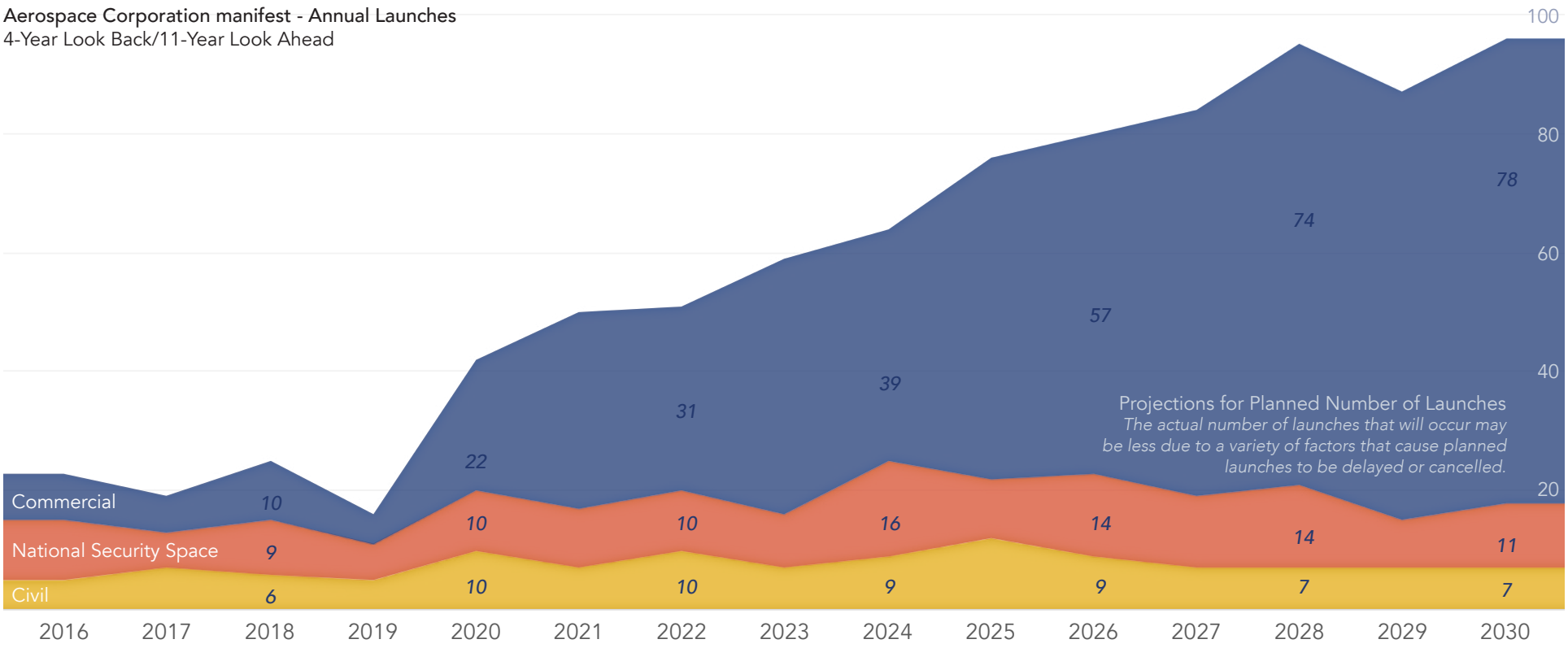
This infrastructure interdependence is consistent with the space industry as a whole as NASA and its commercial partners continue to collaborate and use shared infrastructure that provides more opportunities to achieve long-term mission success. Due to the interconnectivity of KSC's infrastructure systems that are inherently interlinked across a variety of operations and an expansive amount of property, there should be close coordination with CCSFS and KSC's commercial partners to ensure that the appropriate upgrades

*The success of NASA's mission is mutually dependent on commercial partners and commercial success is dependent on NASA*

# INFRASTRUCTURE INTERDEPENDENCIES

and modifications are made in a timely, strategic, and efficient manner. To meet the evolving demands of a variety of users and operations, KSC should work to identify creative funding solutions to invest in infrastructure upgrades that benefit not just NASA operations but its commercial partners who share in its overall, long-term mission success.

As flight rates and new launch vehicle infrastructure demands increase, specific system-wide infrastructure improvements should be identified that meet the demands of both NASA and its partners operational needs. Initial recommendations identified in a Center-wide infrastructure assessment are included in KSC's Capital Improvement Program Plan (CIPP) and will be crucial toward supporting the nation's launch manifest of both NASA and commercial launch operations. These infrastructure upgrades will be able to more effectively support a wide variety of modernized operations, users, and vehicles. Without these strategic investments, NASA and its commercial partners will be forced to rely on aging infrastructure that is no longer suited to meet today's modernized demands of launch operations that have evolved drastically since the shuttle era and previous NASA programs. In order to maintain its strong relationship with commercial partners, whom NASA relies on for mutual long-term mission success, these infrastructure investments are crucial toward enabling KSC to serve as America's premiere multi-user spaceport by providing the infrastructure required to support the nation's long-term launch manifest.



# AFFORDABILITY OVERVIEW

Affordability Plan

The Vision Plan is the first step in meeting agency-wide requirements established by NASA to reduce infrastructure assets by 25% by 2038. Per NASA Policy, NASA Centers may select a baseline year between FY 2008 and FY 2017 from which to count reductions. KSC established 2011 as the baseline year for the 25% reduction calculations at the Center. Since then, KSC outgranted or leased many facilities and land to commercial and government partners.

The Vision Plan takes into consideration several additional strategies that will help the Center meet the affordability goal. Strategies considered include transfers and outgrants of facilities, transitioning to sustainable and cost-effective models of water and energy consumption, identifying redundant activities and capabilities, re-evaluating storage needs to reduce on-site storage and other supporting activities, eliminating excess office space, and prioritizing crucial mission needs while assessing risk to program success. KSC strategies also include strategic reinvestment efforts and continuing the shift to a multi-user spaceport model, working with more commercial and government partners. Incorporating these strategies with an overall consolidation effort will allow KSC to achieve a more affordable infrastructure system and facilities consistent with KSC's mission and agency-wide requirements. These concepts will be incorporated in the Master Plan update.

At the Vision Plan workshop, facilitators worked with participants to establish the best reduction strategies suited for KSC. During the workshop, participants conducted a space use and mission support analysis that allowed them to visually understand the Center's current uses and space available in order to identify areas for consolidation, as well as facilities outgranted or transferred to other entities.

Since 2011, KSC has reduced its effective current replacement value (CRV) by 27.4%, from $5.6 billion to $4.1 billion in 2020. This reduction of $1.5 billion was achieved through outgrants, property transfers, and demolitions. An additional $103 million in reductions will be achieved through demolition in progress.

KSC's efforts to reduce its footprint equate to a 26% decrease in real property square footage. KSC's footprint was 8.6 million square feet in 2011 and was 6.7 million square feet in 2020, a reduction of 1.8 million square feet. An additional 488,000 square feet of demolition is in progress.

A further breakdown and analysis is shown in Section 2. The data used for this Vision Plan is intended to give a broad overview and will be updated throughout the planning process.

# FRAMEWORK PLAN

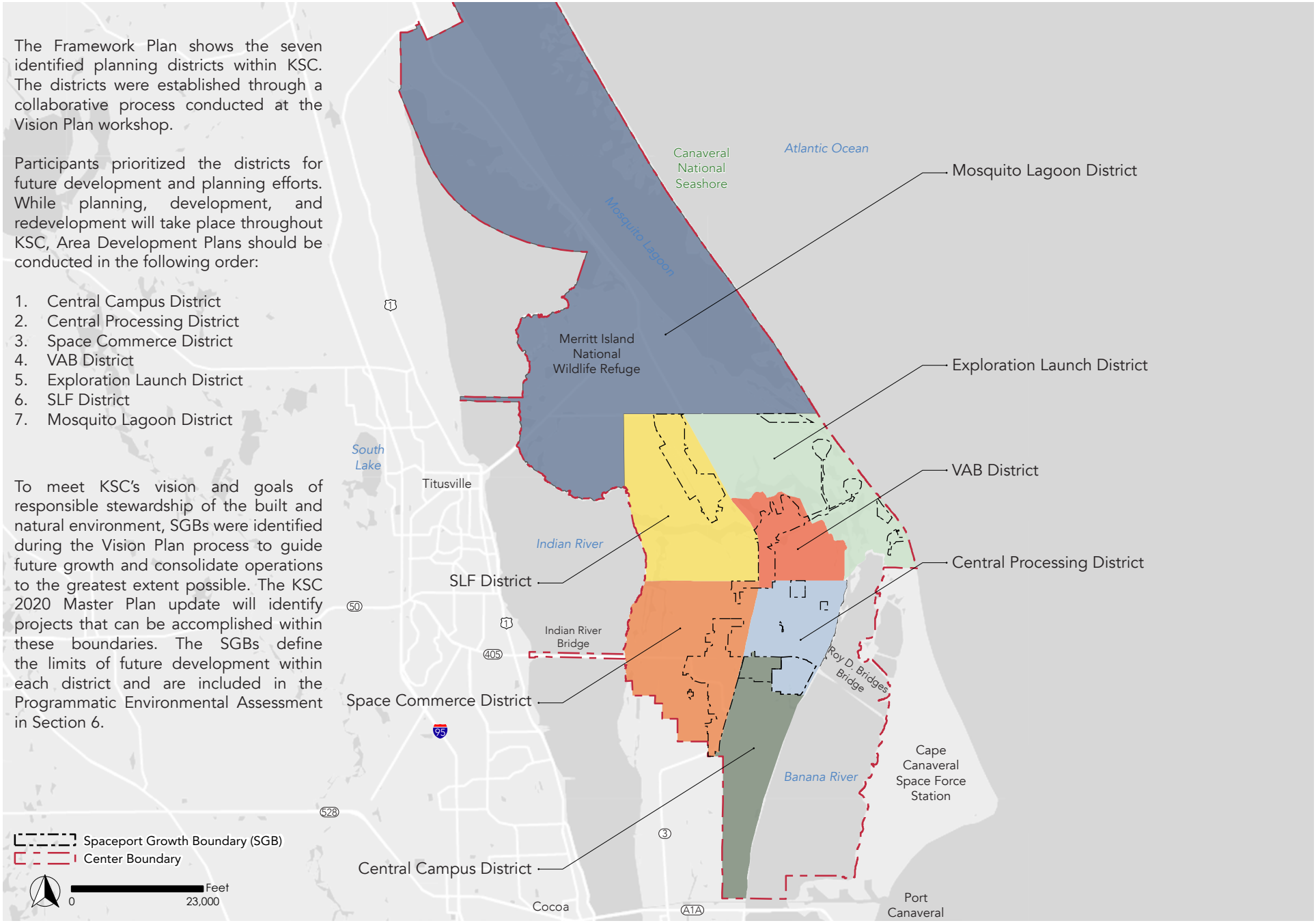
## KENNEDY SPACE CENTER SPACEPORT GROWTH BOUNDARIES

The Framework Plan shows the seven identified planning districts within KSC. The districts were established through a collaborative process conducted at the Vision Plan workshop.

Participants prioritized the districts for future development and planning efforts. While planning, development, and redevelopment will take place throughout KSC, Area Development Plans should be conducted in the following order:

1. Central Campus District
2. Central Processing District
3. Space Commerce District
4. VAB District
5. Exploration Launch District
6. SLF District
7. Mosquito Lagoon District

To meet KSC's vision and goals of responsible stewardship of the built and natural environment, SGBs were identified during the Vision Plan process to guide future growth and consolidate operations to the greatest extent possible. The KSC 2020 Master Plan update will identify projects that can be accomplished within these boundaries. The SGBs define the limits of future development within each district and are included in the Programmatic Environmental Assessment in Section 6.

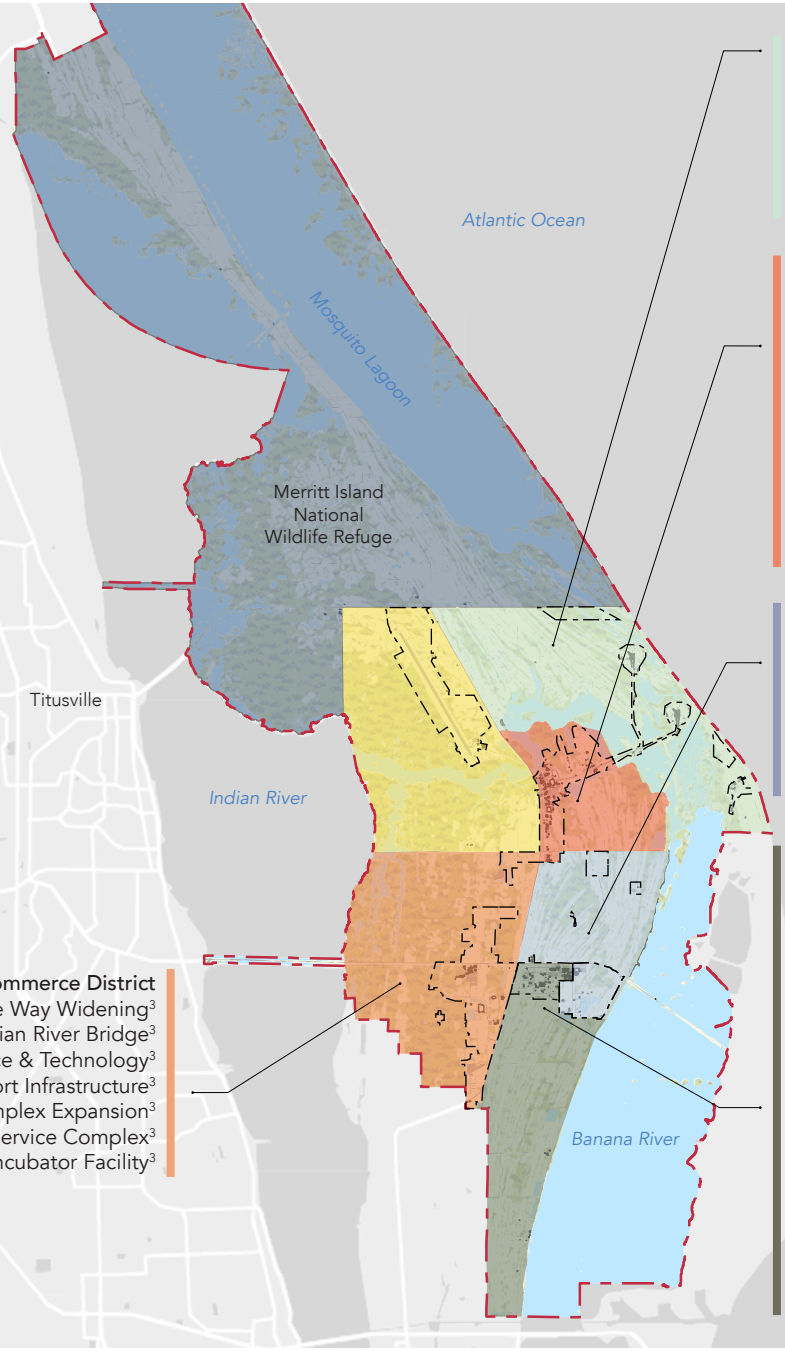


# SUMMARY FUTURE DEVELOPMENT MAP

The Summary Future Development Map reflects development opportunities generated by stakeholders as well as projects already identified as part of strategic priorities for KSC. The future projects list was developed during the Center Vision Plan workshop and then refined by leadership and key stakeholders. The project list, detailed in Section 5, is organized by funding stream and is in alignment with projected funding and footprint reduction initiatives to demonstrate affordability. Institutional funding streams support the overall Center, Program funding is for a specific NASA mission, such as the Artemis Program.

New facilities listed aim to consolidate and centralize functions within SGBs while replacing outdated facilities. Projects, prioritization, and locations will be further defined as part of the next steps in the Master Plan update.

**Funding Stream**
[1] Institutional
[2] Program
[3] Non-NASA




**Exploration Launch District**
KSC Multi-User Electrical Infrastructure Upgrades (LC-39 Feeder)[1]
KSC Multi-User Electrical Infrastructure Upgrades (Emergency Power Plant)[1]
Shoreline Resiliency Projects[1]
Launch Complex-49 Development[3]

**VAB District**
Communications, Press, and Public Engagement Facility (New Press Site)[1]
Bio-Wastewater Treatment Facility in VAB Area[1]
Expansion to Converter Compressor Facility, Phase 2[2]
Converter Compressor Facility (CCF) Upgrades, Phase 3[2]
New Electrical Substation[3]
Alternative Power Generation and Storage Facility[1, 3]
Expansion of Ordnance Storage[3]
Commodity Storage Complex[3]
Treatment, Storage and Disposal Facility (TSDF)[1]
Centralized Consolidated Warehouse Facility[1]

**Central Processing District**
Roy D. Bridges (Banana River) Bridge[1]
Advanced Exploration Processing and Encapsulation Facility (MPPF/PHSF/SSPF Successor) (Processing and Encapsulation Complex, Ph1)[2]
Next-Gen Animal Care Facility (Processing and Encapsulation Complex, Ph3) [2]

**Central Campus District**
Mission Support Consolidation (Central Campus Phase 2)[1]
Applied Science and Technical Analysis Facility (Central Campus Phase 3 Lab Consolidation)[1]
Spaceport Command, Control, and Emergency Support Facility (Central Campus Phase 4)[1]
Communication Distribution Switching Center[1]
Modernize and Upgrade Physical Security Infrastructure, Phase 1 and 2[1]
New Child Development Center[1]
Parking Garage[1]
Orion Processing Surge Facility[2]
Lunar/Mars Surface Systems / In-Situ Resource Utilization (ISRU) Test and Checkout Facility (Processing and Encapsulation Complex, Ph2)[2]
O&C South Wing Renovation - Phase 1[2]
O&C South Wing Renovation - Phase 2[2]
Fitness and Sports Center[3]

**Space Commerce District**
Space Commerce Way Widening[3]
Indian River Bridge[3]
Magnet School for Science & Technology[3]
Space Tourist Support Infrastructure[3]
Public Outreach / Visitor Complex Expansion[3]
Public/GOV Multi-Purpose Service Complex[3]
Small Business Collaboration Incubator Facility[3]

Spaceport Growth Boundary (SGB)
Center Boundary

0 — 23,000 Feet

# 2 BACKGROUND

Planning is never done in a vacuum. Great planners learn from history and advance the missions they support in environmentally sensitive and fiscally prudent ways. For this Vision Plan, planners at KSC have looked to the past to inform their plans for the future. One of the most important lessons is that through compact development, current and future missions can be met on just 5% of the Center's land. On this limited landscape, the Center has supported a wide array of launch operations since 1962 and the pace only seems to be increasing as NASA enhances partnerships with private partners to leverage taxpayer investments. These partnerships also support the Center's core competencies and current programs. In addition, KSC planners referenced previous planning efforts and NASA policy, including the standards outlined in the NASA Handbook for Master Planning, to enhance the affordability of the Center. To date, KSC planners have helped the Center achieve a remarkable 27% reduction in its current replacement value from a 2011 baseline and a 26% reduction in total building area. Over time, as the projects in this plan are implemented and as future information technologies transform operations, these efficiencies will only improve even as commercial launch operations increase.

# BACKGROUND

Kennedy Space Center is NASA's only launch site for human spaceflight. Established in 1962 as the NASA Launch Operations Center, KSC has carried out launch operations for the Apollo, Skylab, and Space Shuttle programs. The facilities at KSC enable the processing, integration, launch, and recovery of missions. KSC is located adjacent to Cape Canaveral Space Force Station, formerly the Cape Canaveral Air Force Station. The two entities work closely together to execute their missions, sharing resources, facilities, and infrastructure.

Numerous historic districts and historic properties exist at KSC for the events and achievements that occurred there, including the Vehicle Assembly Building, Launch Complex 39 area, and the Shuttle Landing Facility, among others.

In 2011, the center began an intensive effort to become a multi-user spaceport with public and private partnerships. KSC has partnerships with Space Florida, the economic development agency of the State of Florida, Boeing, SpaceX, Lockheed Martin, and Blue Origin including lease agreements for land and use permits for facilities that are in excess of NASA's needs. These partner facilities intend to increase the rocket launch rate, increasing their dependence on the infrastructure at KSC and Cape Canaveral.

NASA has only developed a small percent of the total land it owns at KSC. Much of the 219 square miles serves as a restricted safety buffer for the dangerous operations at the center. Today, approximately 7,500 acres are actively used to support space mission operations, leaving approximately 95 percent of KSC's 141,829-acre land area largely as it was when acquired and relatively undisturbed from its natural condition. The remaining lands are managed by partner agencies including the United States Fish & Wildlife Service (USFWS) as the Merritt Island National Wildlife Refuge (MINWR) and by the National Park Service (NPS) as the Canaveral National Seashore (CNS) and serve as habitat for many species. The site is at risk of severe damage from natural disasters and sea level rise.

*Today, 7,500 acres are actively used to support space mission operations, leaving 95% of KSC's 141,829-acre land area relatively undisturbed from its natural condition.*

### Planning at KSC

Planning for the post-Shuttle transition began with the 2002 Master Plan which had proposed that KSC and its federal neighbors combine planning efforts to leverage CCSFS's launch capabilities with KSC's launch, launch support, and processing capabilities to enable more efficient launch facilities. The 2008 Master Plan built off the 2002 effort with the addition of development areas for future development and the operations that occur there to separate uses, the first application of zoning at KSC. The 2014 Master Plan served as the catalyst for what would become the multi-user spaceport, making facilities and infrastructure, excess to NASA's future needs, available to non-NASA entities.

### Environmental Stewardship

KSC has a long history of environmental stewardship through land conservation and successful partnerships with USFWS and NPS. USFWS's knowledge and expertise regarding MINWR's resources help KSC identify suitable areas for future development and preservation. Future planning will maintain an emphasis on land conservation and environmental stewardship through a comprehensive framework for development and continued collaboration with partners.

In the future, KSC expects to have increased small payload launches, requiring more assembly and payload processing facilities. This includes the development of Launch Complexes 48 and 49 to accommodate small payload launches and possible medium class launches. Launch rates between 2016 and 2019 averaged around 20 launches per year. By 2026, the launch rate is predicted to be 80 launches per year, showing a substantial increase in a short amount of time. In anticipation of missions to the moon and Mars, the center will facilitate further research, development, and diverse partnerships to develop, integrate, and sustain space systems.

# VICINITY

Kennedy Space Center is located on Merritt Island to the north of Cape Canaveral, in East Central Florida, about an hour drive from Orlando. The location at 28°N latitude and on the ocean is ideal for safe launches and flight trajectories.

The area is geographically characterized by its low elevation and is surrounded by the Banana River, Indian River, Mosquito Lagoon, and the Atlantic Ocean. As part of Florida's High Tech Corridor, KSC is integrated with the region's universities, transportation networks, and economic infrastructure.

As the nation's premier launch site, KSC's history, location, and resources provide many opportunities for collaboration with other space-related industries in the region.

## QUICK FACTS

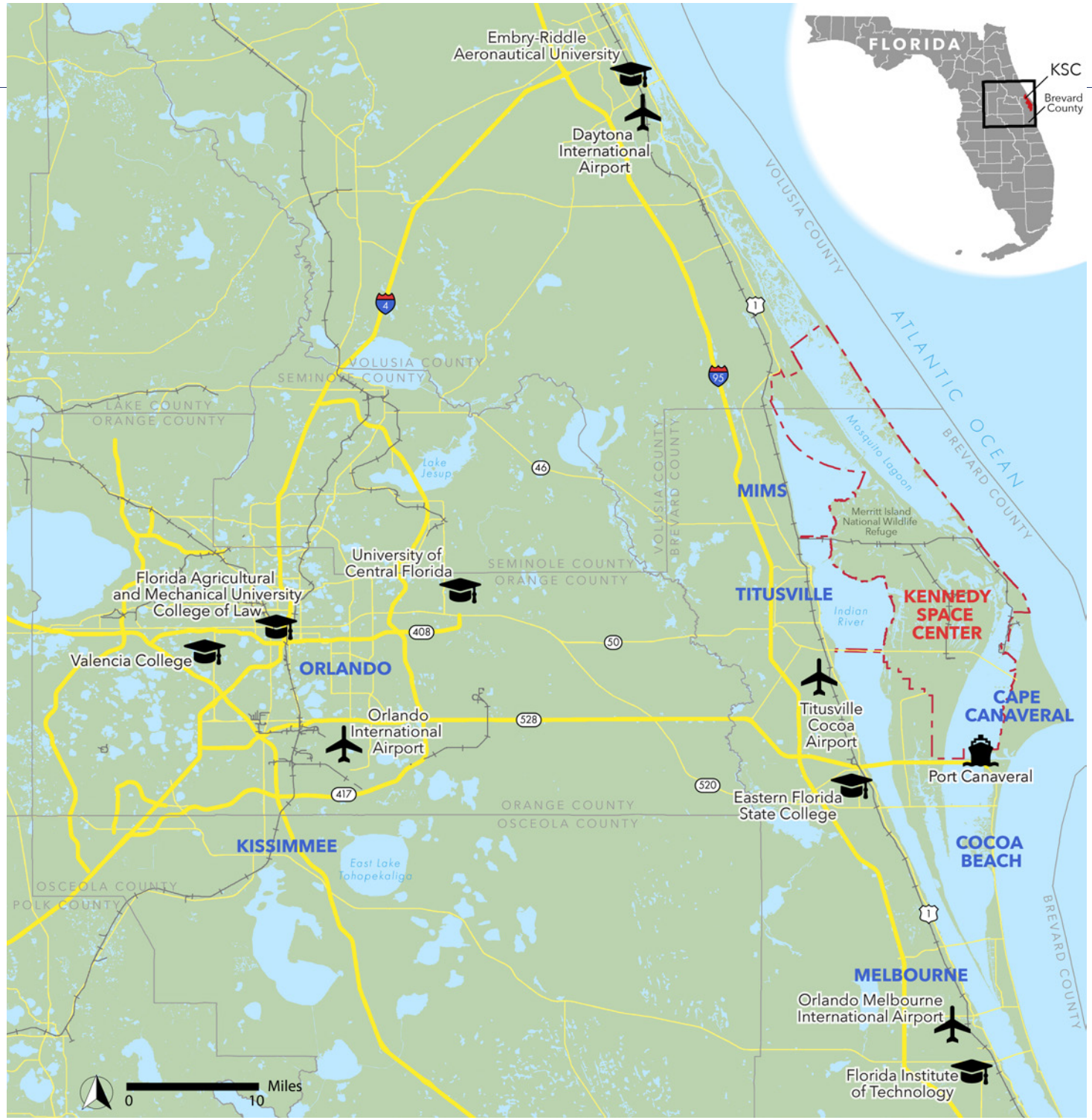
**Established:**
**1962**

**Area:**
**141,829 acres**

**Current Employees:**
**10,000+**

**Annual Visitors:**
**1.9 million**

**Launch Pads:**
**3 at KSC**
**5 at Cape Canaveral**



KSC History | NASA History

# TIMELINE OF KEY EVENTS IN KSC'S HISTORY

May 25, 1961:
President Kennedy challenges the country to put a man on the moon by the end of the decade.

August 24, 1961:
NASA acquires land adjacent to the Air Force Missile Test Center facilities and announces its intention to expand the Cape Canaveral facilities to launch humans to the moon.

January 31, 1958:
Explorer 1 becomes the first satellite launched by the United States.

August 2, 1963:
VAB construction begins.

November 30, 1966:
Launch Complex 39B is completed.

July 20, 1969:
Neil Armstrong and Buzz Aldrin become the first men on the moon.

May 14, 1973:
Skylab, the first U.S. space station, is launched.

July 17, 1975:
Launch of Apollo-Soyuz Test Project (ASTP).

March 8, 1979:
The first Space Shuttle orbiter, Columbia, arrives at KSC.

April 12, 1981:
Columbia becomes the first Space Shuttle to be launched.

April 4, 1983:
Initial launch of the second Space Shuttle, Challenger.

August 30, 1983:
Guion Bluford becomes the first African American in space.

October 3, 1985:
Initial launch of the fourth Space Shuttle, Atlantis.

1960 | 1970 | 1980

February 20, 1962:
John Glenn becomes the first American to orbit the Earth.

May 26, 1965:
Kennedy Space Center headquarters opens.

October 4, 1965:
Launch Complex 39A is completed as the first launchpad to support the Saturn V/Apollo lunar landing program.

January 27, 1967:
The crew of the first manned Apollo spaceflight die in an accidental flash fire during the first major dress rehearsal at Launch Complex 34.

June 2, 1972:
Merritt Island National Wildlife Refuge expands after NASA and the Department of Interior agree all land not being used will be managed by the Refuge.

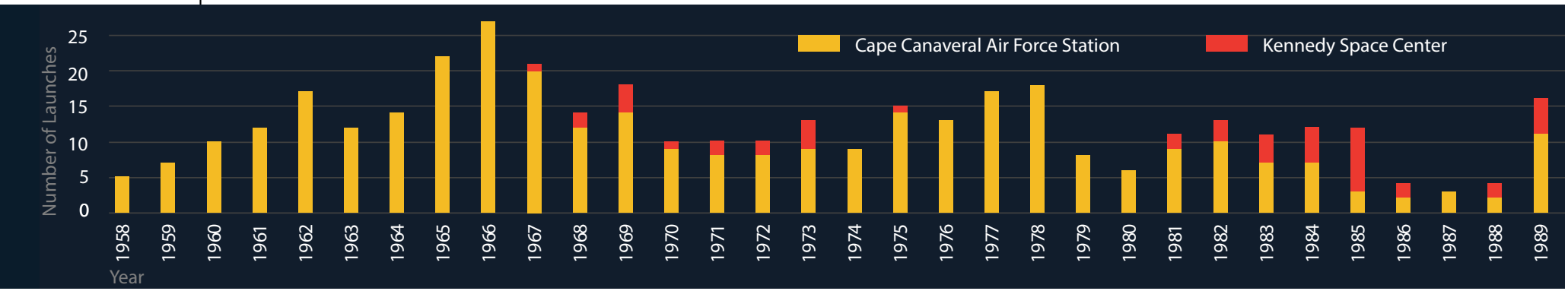
May 30, 1976:
U.S. Bicentennial Exposition on Science and Technology opens at KSC. The VAB is adorned with the largest American flag ever painted.

February 11, 1984:
The Space Shuttle lands at the Shuttle Landing Facility (SLF) for the first time with the completion of STS 41-B.

January 28, 1986:
The Space Shuttle Challenger fails on ascent shortly after its tenth liftoff.

August 30, 1984:
The third Space Shuttle, Discovery, is launched for the first time.

## Launches per Year



**1990**

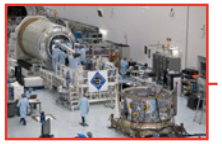
April 24, 1990:
The Hubble Space Telescope is launched aboard Shuttle Discovery.

**June 3, 1991:**
**The Space Mirror Memorial is dedicated at the KSC Vistors Complex as the national memorial for astronauts who die in the line of duty.**

September 1, 1991:
A third Orbiter Processing Facility (OPF-3) bay is dedicated after the conversion of the former Orbiter Modification and Refurbishment Facility.

**June 14, 1995:**
**The first piece of hardware to be processed for flight in the Space Station Processing Facility arrived at KSC. It was the Russian Docking Module.**

September 12, 1992:
Mae Jemison becomes the first African-American women in space.



June 3, 1994:
The Space Station Processing Facility is dedicated.

**2000**

**October 1, 1998:**
**Launch Services Program is founded to control the acquisition and management of expendable launch vehicle services for the agency, becoming the first program to be managed at KSC.**

December 4, 1998:
The first Space Shuttle mission dedicated to the assembly of the International Space Station is launched from Pad 39A carrying the Unity node.

February 1, 2003:
The Space Shuttle Columbia failed upon re-entry into the Earth's atmosphere, killing seven crew members.

**July 28, 2003:**
**Two new security gates complete the opening of Space Commerce Way which provides an alternative route for the general public between Titusville and Merritt Island.**

**Janurary 30, 2007:**
**NASA transitions the Operations and Checkout High Bay to Lockheed Martin to support development of the Orion Capsule.**

**November 2, 2007:**
**SpaceX breaks ground at Launch Complex 40 to build new commericial launch facilities at Cape Canaveral Air Force Station.**

**March 24, 2006:**
**Operations Support Building II in the Launch Complex 39 area is opened.**

**December 19, 2008:**
**Space Florida signs a lease with NASA to develop Exploration Park just outside the gates at KSC.**

**2010**

**June 4, 2010:**
**SpaceX Dragon Spacecraft Qualification Unit is launched, marking the first flight of Falcon 9 and first test of Dragon.**

Janurary 24, 2011:
KSC issues Notice of Availability for excess Shuttle Program related facilities for commercial entity lease.

**June 15, 2011:**
**The Ground Systems Development and Operations Porgam (GSDO) is officially stood up at KSC to facilitate the development of launch infrastructure for NASA's Space Launch System.**

July 21, 2011:
Space Shuttle Atlantis lands on Runway 15 at KSC and concludes the 30-year Shuttle Program.

**October 7, 2012:**
**A SpaceX Falcon 9 rocket carrying its Dragon spacecraft launches on NASA's first cargo delivery flight, to the International Space Station.**

December 5, 2014:
The Orion Multi-Purpose Crew Vehicle launches atop a Delta IV Heavy rocket on Exploration Flight Test-1.

**December 21, 2015:**
**SpaceX completes the first successful booster recovery from Falcon 9, setting a new expectation in reusable launch vehicles.**

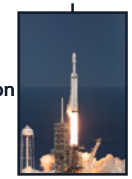
**February 19, 2017:**
**SpaceX launches an ISS cargo resupply mission from Pad 39A, the first commercial launch from the leased pad.**

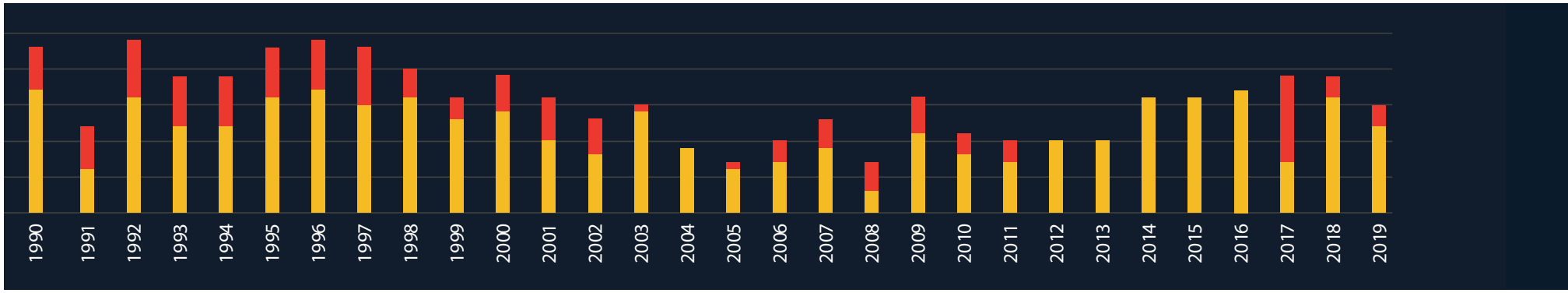
**2020**

**May 30, 2020:**
**The first astronauts are launched in a commercially built and operated spacecraft, SpaceX Crew Dragon.**

**March 2, 2019:**
**SpaceX Crew Dragon Demo-1 launch the Crew Dragon as part of the Commercial Crew Program.**

**February 6, 2018:**
**Falcon Heavy completes its maiden launch carrying a Tesla Roadster to space.**





# KSC CORE COMPETENCIES

KSC Core Competencies
The 2020 Vision Plan's primary objective is to support the fulfillment of current and future NASA requirements and missions and continue to supplement NASA launch capabilities with commercial entrepreneurship to make routine access to space less costly. Through the application of KSC's Core Competencies, the Vision Plan supports NASA Program objectives while providing for the further codependence of NASA and commercial launch operations. Mankind's interplanetary pursuits are complimented by the continued partnership between NASA and our commercial partners; NASA succeeds with commercial and commercial succeeds with NASA.

KSC's five main core competencies are:

1. Acquisition and management of Launch Services and Commercial Crew development
2. Launch vehicle and spacecraft processing, launch, landing, recovery, operations, and sustaining,
3. Payload and flight science experiment processing, integration, and testing,
4. Designing, developing, operating, and sustaining flight and ground systems and supporting infrastructure, and
5. Development, testing, and demonstration of advanced flight systems and transformational technologies to advance exploration and space systems.

Artemis Program
With the Artemis Program, named after Apollo's twin sister, NASA will land the first woman and next man on the Moon by 2024, using innovative technologies to explore more of the lunar surface than ever before. While the moon was the ultimate goal for Apollo – for Artemis, getting there is a crucial part of a longer journey. Artemis is the first step to begin the next era of exploration. NASA will establish a sustainable human presence on the Moon with the goal of sending humans to Mars.

KSC is critical to the success of Artemis as it is home to Exploration Ground Systems which is upgrading all the launch facilities at KSC to support Artemis missions to the Moon and beyond. KSC's Neil Armstrong Operations & Checkout Facility serves as the final assembly and checkout facility for the Orion spacecraft that will carry a crew to the Gateway lunar outpost in orbit around the moon. KSC also supports the development of the Gateway facility.

# CURRENT PROGRAMS

**Exploration Ground Systems**
The Exploration Ground Systems Program (EGS) was established to develop and operate the systems and facilities necessary to process and launch rockets and spacecraft during assembly, transport and launch. EGS's mission is to transform the center from a historically government-only launch complex to a spaceport that can handle several different kinds of spacecraft and rockets—both government and commercial.

Unlike previous work focusing on a single kind of launch vehicle, such as the Saturn V or space shuttle, EGS is preparing the infrastructure to support several different kinds of spacecraft and rockets that are in development, including NASA's Space Launch System (SLS) rocket and Orion spacecraft for Artemis I. A key aspect of the program's approach to long-term sustainability and affordability is to make processing and launch infrastructure available to commercial and other government customers, thereby distributing the cost among multiple users and reducing the cost of access to space.

EGS's challenge is focusing on the equipment, management and operations required to safely connect a spacecraft with a rocket, move the launch vehicle to the launch pad and successfully launch it into space. To meet this challenge, EGS is upgrading Launch Pad 39B, the crawler-transporters, the Vehicle Assembly Building (VAB), the Launch Control Center's Young-Crippen Firing Room 1 and mobile launcher (ML), and other facilities.

**Orion**
NASA's Orion spacecraft will launch atop the agency's Space Launch System rocket to carry crew to lunar orbit where they will transfer to a human landing system or the Gateway. KSC will play a significant role in processing Orion spacecraft by performing the factory assembly of the Orion spacecraft, launch operations, and hazardous processing before and after the mission. This undertaking represents an end-to-end capability the center has not had before. Previously, the spacecraft arrived at Kennedy fully assembled and the center's job was to put on the finishing touches and launch the mission. In support of this work, the high bay of the Neil Armstrong Operations and Checkout Building (O&C) operates as a high-tech factory, where Orion is being assembled, tested and readied for new missions to deep space destinations. Additionally, Orion will utilize the Multi-Payload Processing Facility (MPPF) to fuel the Orion spacecraft with hazardous propellants and other fluids the spacecraft will need for flight and remove unused hazardous propellants from Orion's tanks during spacecraft postflight processing. Before integration with the SLS rocket in the VAB, Orion will be mated with the Launch Abort System which will sit on top of Orion and will ignite to lift the spacecraft away if the astronaut's safety is threatened during launch or ascent.

# CURRENT PROGRAMS

Gateway Deep Space Logistics

The Gateway will be an outpost orbiting the Moon that provides vital support for a sustainable, long-term human return to the lunar surface, as well as a staging point for deep space exploration. It is a critical component of NASA's Artemis program. The Gateway is a vital part of NASA's deep space exploration plans, along with the Orion spacecraft and Human Landing System that will send astronauts to the Moon. Gaining new experiences on and around the Moon will prepare NASA to send the first humans to Mars in the coming years, and the Gateway will play a vital role in this process. It is a destination for astronaut expeditions and science investigations, as well as a port for deep space transportation such as landers en-route to the lunar surface or spacecraft embarking to destinations beyond the Moon.

In March 2020, NASA awarded SpaceX as the first U.S. commercial provider under the Gateway Logistics Services contract to deliver cargo and other supplies to the Gateway.

Gateway Deep Space Logistics (DSL) is based at KSC and leads the Agency for acquisition of commercial cislunar logistic systems development and services. DSL delivers cargo, payloads, and supplies to the Gateway, focused on the needs of the 2024 lunar surface mission, and extends to delivery of other elements of the Moon to Mars (M2M) architecture. Kennedy's DSL office is the focal point for all Gateway activities conducted at the spaceport, including:

- Commercial acquisition and contract management with a total contract ceiling of $7 billion over 12 years; open competition with ability to on-ramp new providers
- Payload processing and delivery services for the Gateway outpost

Launch Services Program

In 1998, the launch vehicle programs at several NASA centers were consolidated and established as the Launch Services Program (LSP) at Kennedy Space Center. LSP brings together technology, business, procurement, engineering best practices, strategic planning, studies and cutting-edge techniques – all instrumental components for the U.S. to have a dependable and secure Earth-to-space bridge that is dedicated to launching all types of spacecraft.

The principle objectives of LSP are to provide safe, reliable, cost-effective, and on-schedule processing, mission analysis, spacecraft integration, and launch services for payloads seeking transportation to space on commercial vehicles. LSP acts as a broker, matching spacecraft with optimal launch vehicles. Once the right vehicle is selected, LSP buys that spacecraft a ride to space and works to ensure mission success by delivering a healthy spacecraft to the correct orbit or destination. LSP provides support throughout the journey, from pre-mission planning to the post launch phase of the spacecraft.

LSP also supports NASA's return to the Moon. For NASA's Artemis architecture, LSP is serving in a major consulting role for the Gateway Logistics Element, the Human Landing System, the Habitation and Logistics Outpost and the Power and Propulsion Element; as well as providing mission management to deliver the Canadian Deep Space Exploration Robotic (DSXR) System to the Gateway. They are also leveraging their expertise in the Venture Class Launch Services (VCLS) for precursor lunar CubeSat missions to reduce technical risk in advance of crewed Artemis campaigns.

# CURRENT PROGRAMS

**Commercial Crew Program**
NASA's Commercial Crew Program is working with the American aerospace industry as companies develop and operate a new generation of spacecraft and launch systems capable of carrying crews to low-Earth orbit and the ISS. The goal of the program is to provide safe, reliable and cost-effective transportation to and from the space station. Upon successful NASA certification, commercial crew providers Boeing and SpaceX will begin to make regular flights with crew.
Commercial transportation to and from the space station will provide expanded utility, additional research time and broader opportunities of discovery on the orbiting laboratory. The station is critical for NASA to understand and overcome the challenges of spaceflight necessary for a return to the Moon and the long-duration journey to Mars. By encouraging industry to provide human transportation services to and from low-Earth orbit, NASA can expand its focus on building spacecraft and rockets for deep space missions.

**Exploration Research and Technology**
Exploration Research and Technology (ER&T) is responsible for preparing International Space Station (ISS) payloads for commercial flights and researching advancements and innovations of next-generation technologies that support enhanced and affordable capabilities that improve and sustain ground support systems for launch vehicle processing and operations and space-related activities for crewed and uncrewed spaceflight operations on the ISS and on planetary surfaces, such as the Moon and Mars. These technology areas include in-situ resource utilization (ISRU) and surface systems, space launch and suborbital technologies, life sciences and habitation systems, ISS multidiscipline research, environmental remediation and ecosystem sciences, and advanced ground launch and processing systems. The KSC team also collaborates on new technologies with commercial industry and academia and supports the commercialization efforts of KSC-developed technologies.

ER&T is leading critical life science and biomedical research for the development of life support and monitoring systems and technology for earth, earth orbit, and beyond. The Vegetable Production System is a plant growth system is supporting research that will allow astronauts the ability to grow a supplemental food crop in space to supplement a packaged diet on long-duration missions, such as during a two- or three-year mission to Mars.

ER&T's Swamp Works, provides government and commercial space ventures with the technologies required for working and living on the surfaces of the Moon or other planets and bodies in our solar system. The Swamp Works team establishes rapid, innovative and cost-effective exploration mission solutions through leveraging of partnerships across NASA, industry, and academia. Concepts start small and build up fast, with lean development processes and a hands-on approach. Testing is performed in early stages to drive design improvements.

# PREVIOUS PLANNING EFFORTS

The 2012-2032 Master Plan, Future Land Use map, and Strategic Goals serve as a foundation for the 2020 Master Plan update. The planning team incorporated previous planning efforts, policy and guidance documents, and enabling studies in the development of this Center Vision Plan, summarized on the following pages.

The 2012-2032 Master Plan describes a 20-year transformation from a single, government user launch complex to a multi-user spaceport.

The Master Plan's central focus is in support of NASA achieving its programmatic mission objectives, culminating in a crewed voyage to Mars in the 2030s. Additionally, the Master Plan is also designed to maximize the provision of capabilities and assets already available at KSC in support of joint NASA and non-NASA access to space.

The Plan's development approach was to support the highest and best use of land resources incorporating environmental sensitivity, operational requirements, and safety regulations. This approach strove to provide for anticipated NASA and non-NASA development in a way that best preserves KSC's environmentally-sensitive areas. The future land use plan promoted the clustering of compatible uses and the separation of hazardous and non-hazardous activities.

The goals of the Master Plan were developed to support NASA's strategic goals and help KSC transform from a government and program-focused, single-user launch complex to a more capability-centric and cost-effective multi-user spaceport, enabling both government and commercial space activities.

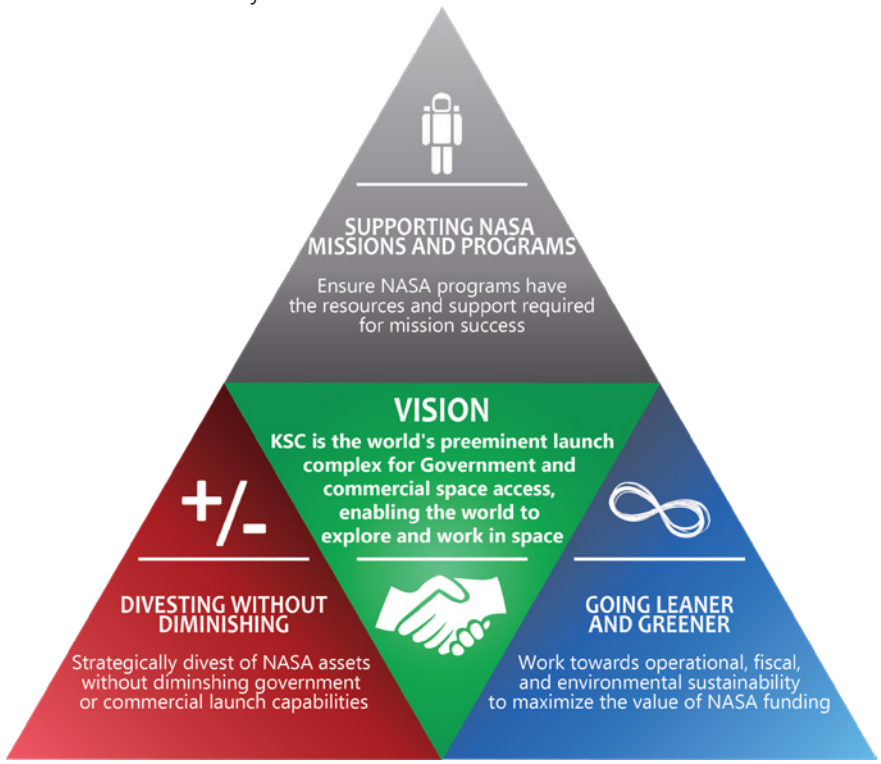
***Continue the transformation of technical capabilities and services required to support future NASA and other multi-use programs.***

With this rapid transformation, KSC is now on a path to enhance the multi-user spaceport with this Center Vision Plan and 2020 Master Plan update.

Core Strategies

The 2012-2032 Master Plan's Core Strategies require success at all phases to facilitate KSC's transformation, including:

- *Supporting NASA Missions and Programs*: Ensure NASA activities are operational and have capable facilities, assets, and resources to ensure success
- *Going Leaner and Greener*: Maximize the value of resources by promoting operational, fiscal, and environmental sustainability
- *Divesting Without Diminishing*: Strategically reduce NASA liability without diminishing capabilities to serve government and commercial missions
- *Enhancing the Multi-User Spaceport*: Continue to promote KSC's unique location, infrastructure, and capabilities to further support Non-NASA access to space



# POLICY & GUIDANCE - NASA HANDBOOK FOR MASTER PLANNING

The 2013 NASA Handbook for Master Planning describes the center master planning process including best practices, elements of a master plan, and standards. The handbook also discusses resources for master planners, including support for the career path of master planning.

The NASA Master Planning Handbook also outlines the following planning standards and guidance:

Sustainability Planning
NASA's sustainability policy is to execute NASA's mission without compromising our planet's resources so that future generations can meet their needs. Sustainability involves taking action now to enable a future where the environment and living conditions are protected and enhanced. In implementing sustainability practices, NASA manages risks to mission, risks to the environment, and risks to our communities, all optimized within existing resources.

Natural and Cultural Resource Preservation
All NASA locations have natural and cultural resources that may deserve special protection. Natural resources can include threatened and endangered species, wetlands, habitat areas, forests, undisturbed land, and important viewsheds. Cultural resources may include historic structures, cultural landscapes, and heritage monuments. The planner should coordinate planning decisions with the appropriate historic preservation officers to ensure protection of these resources. In addition, various environmental laws, requirements, and policies drive action that should be considered and prioritized throughout the planning process.

Real Property Management
Utilization, mission dependency, and condition are the primary factors driving NASA's decisions on whether to maintain, repair, consolidate, outgrant, sell, or demolish assets.

Health and Safety Campus Planning
Regular physical activity is critically important for the health and well-being of people of all ages and reduces the negative impact from many chronic diseases. Planners should incorporate health considerations and opportunities for physical activity based on advice from representatives from the Center's medical and fitness staff.

Protection Planning
The master plan should incorporate security analysis to minimize risk to the Center's strategic infrastructure and networked assets that support the critical missions at the Center. Where risk exists, the plan should have contingencies to mitigate or remediate the risk.

Capacity Planning and Area Development Planning
As part of the NASA master planning process, Center campuses will be divided into identifiable and connected districts based on geographical features, land use patterns, building types, and/or transportation networks. An ADP should then be prepared for each district. This leads to developing the master plan in logical planning increments.

Horizontal Infrastructure Network Planning
While significant planning is completed at the ADP level, these ADPs are also linked through network planning. These networks consider linkages and systems that span ADP district boundaries. They include Center-wide utility systems, transportation networks, and open space networks.

Campus Design Standards
Graphic plans should illustrate potential future development that supports the overarching planning vision. Illustrative Plans and Regulating Plans should be developed to show parcels and relevant project sitings for each district. Building, Circulation, and Landscape Standards should be Center-specific and follow NASA requirements and applicable regional code requirements.

Development Program
The Development Program is the overall Center strategy for using and investing in real property. Program requirements include all facility needs required to enable mission support. Facilities and projects should be validated against the master plan and the planning strategies before they are programmed.

# POLICY & GUIDANCE - 2018 NASA STRATEGIC PLAN

NASA's Strategic Plan guides the agency-wide master plan, which is turn guides Center-specific master plans. The Unified Facilities Criteria (UFC) for Installation Master Planning provides additional guidance on the components of a master plan. The guidance and policies in these overarching documents help to build the KSC Vision Plan and Master Plan.

**DISCOVER** — EXPAND HUMAN KNOWLEDGE THROUGH NEW SCIENTIFIC DISCOVERIES.

**EXPLORE** — EXTEND HUMAN PRESENCE DEEPER INTO SPACE AND TO THE MOON FOR SUSTAINABLE LONG-TERM EXPLORATION AND UTILIZATION.

**DEVELOP** — ADDRESS NATIONAL CHALLENGES AND CATALYZE ECONOMIC GROWTH.

**ENABLE** — OPTIMIZE CAPABILITIES AND OPERATIONS.

2018 NASA Strategic Plan
The 2018 NASA Strategic Plan outlines the strategic direction, goals, and priorities to be pursued to accomplish NASA's vision "To discover and expand knowledge for the benefit of humanity.".

The Strategic Plan identified four strategic goals that will strengthen NASA's ability to accomplish its Mission and contribute to U.S. space exploration, science, technology development, and aeronautics.

NASA's historic and enduring purpose is aligned to four major themes, characterized by a single word, that are accompanied by a strategic goal, shown here.

The forth strategic goal, to *Optimize Capabilities and Operations*, and corresponding strategic objectives are particularly important in guiding the vision and goals for physical planning at KSC.

Strategic Objective 4.1: Engage in Partnership Strategies. Support cooperative, reimbursable, and funded initiatives through domestic and international partnerships

Strategic Objective 4.2: Enable Space Access and Services. Support the communication, launch service, rocket propulsion testing, and strategic capabilities needs of NASA's programs

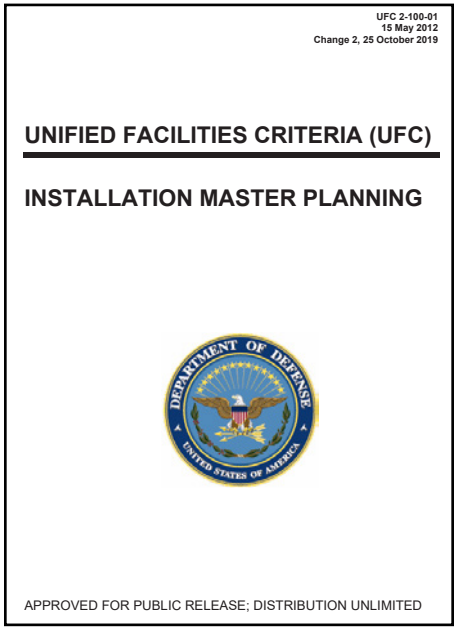
Strategic Objective 4.3: Assure Safety and Mission Success. Assure effective management of NASA programs and operations to complete the mission safely and successfully

Strategic Objective 4.4: Manage Human Capital. Cultivate a diverse and innovative workforce with the right balance of skills and experience to provide an inclusive work environment in which employees that possess varying perspectives, education levels, life experiences, and backgrounds can work together and remain fully engaged in our mission

Strategic Objective 4.5: Ensure Enterprise Protection. Increase the resiliency of NASA's enterprise systems by assessing risks and implementing comprehensive, economical, and actionable solutions

Strategic Objective 4.6: Sustain Infrastructure Capabilities and Operations. Enable NASA's Mission by providing the facilities, tools, and services required to efficiently manage, operate and sustain the infrastructure necessary to meet the mission objectives

# POLICY & GUIDANCE - NASA & FEDERAL


UFC 2-100-01
15 May 2012
Change 2, 25 October 2019

UNIFIED FACILITIES CRITERIA (UFC)

INSTALLATION MASTER PLANNING

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED

2012 Unified Facilities Criteria
The 2012 Unified Facilities Criteria (UFC) system is prescribed by MIL-STD 3007 and provides planning, design, construction, sustainment, restoration, and modernization criteria, and applies to the Military Departments, the Defense Agencies, and the DoD Field Activities in accordance with USD (AT&L) Memorandum dated 29 May 2002.

The purpose of the Installation Master Planning UFC, updated in October 2019, is to prescribe the DoD minimum requirements for master planning processes and products in accordance with the DoD instruction. The process is to use the tool of a Master Plan and its components to provide ongoing master planning of installations in support of the mission.

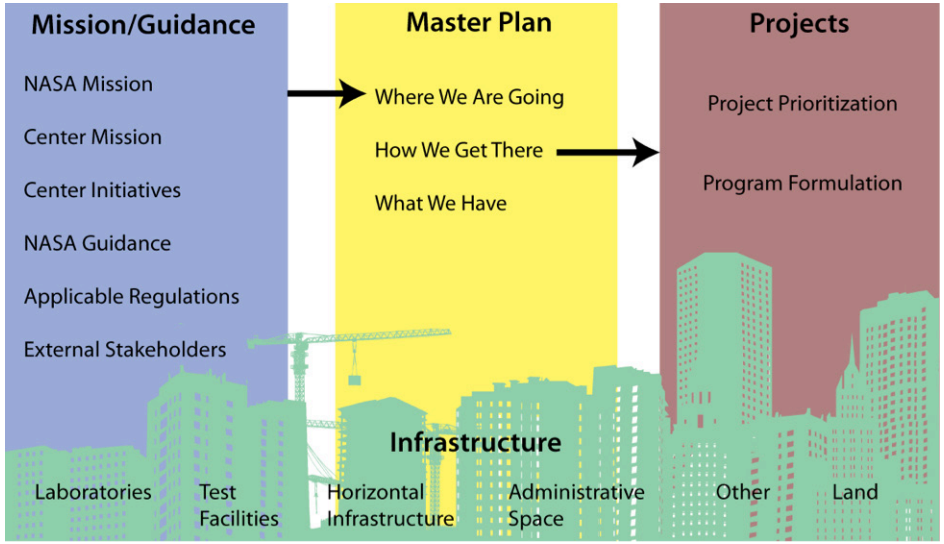
NPR 8810.1A
The purpose of the NASA Procedural Requirements (NPR) is to define requirements for NASA's Center Master Plans (CMPs). It contains NASA procedural requirements for Center master planning for real property. It provides responsibilities, procedures, and guidance for developing, documenting, communicating, and concurring with CMPs.

The document describes the development of a master plan occurring within the context of a larger process, shown in the process diagram here.

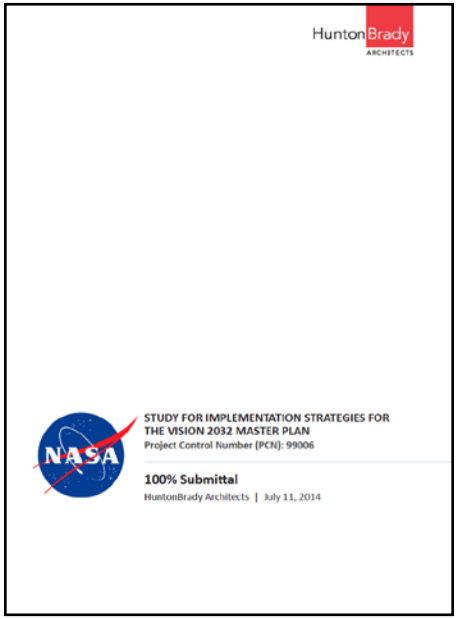
The CMP describes the intent, circumstances, and the characteristics of the end state the Center would like to reach and delineates plan implementation projects over a planning horizon of at least 5, 10, and 20 years.

Many additional policy and technical documents contributed to this iterative planning process in order to ensure NASA and federal guidelines and intents were met while developing the KSC Vision Plan. This includes documents:

- NPR 8800.15C
- NPD 8810.2A
- NPR 1620.2A
- NID 8000.104
- 40 CFR 1508.20
- 33 CFR part 332.2

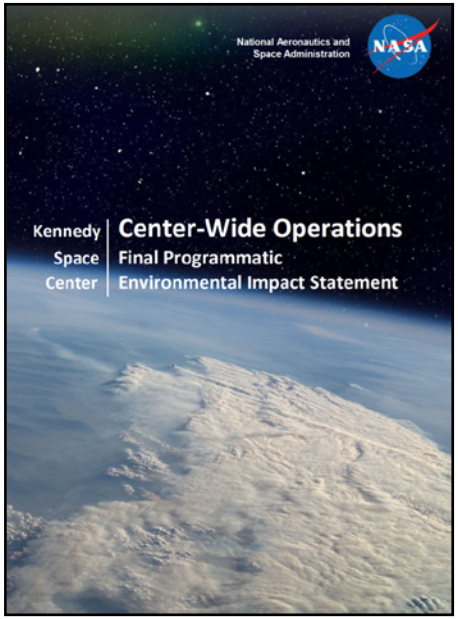


# ENABLING STUDIES




## 2014 Central Campus Consolidation Study

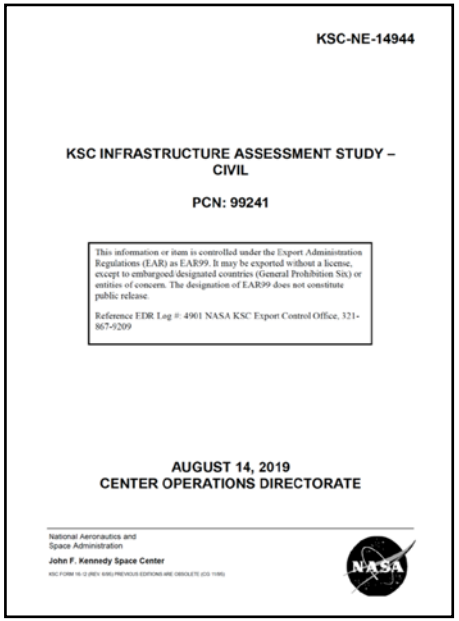
The 2014 Implementation Plan outlines the findings of a study for the implementation strategies for the Vision 2032 Master Plan at KSC and will be a critical step in the transition of KSC into a multi-user spaceport. The goals of this document are to develop an implementation plan that will achieve current replacement value reduction goals, further develop central campus concept goals, and provide an implementation plan for consolidation of KSC property.




## Programmatic Environmental Impact Statement (PEIS)

The 2016 Programmatic Environmental Impact Statement evaluates the potential environmental impacts from proposed center-wide KSC operations, activities, and facilities across a 20-year planning horizon. It considers three future scenarios for repurposing existing facilities and recapitalizing infrastructure. These scenarios include potentially reorganizing the management of KSC and its land resources with various kinds of partnerships. The PEIS broadly predicts and describes the potential environmental consequences resulting from each of the three alternatives.

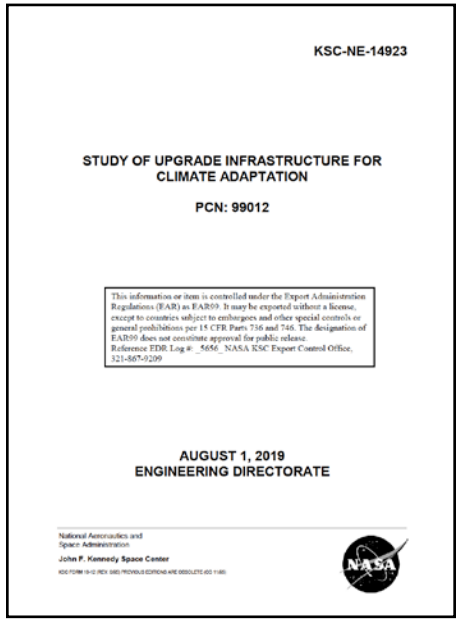
In addition, a programmatic Environmental Assessment will be integrated with this Center Vision Plan to reflect current conditions.




## 2019 KSC Infrastructure Assessment

The 2019 KSC Infrastructure Assessment Study was performed to identify and assess the ability of key KSC civil infrastructure systems – water, wastewater, stormwater/natural systems, and natural gas, electrical, and IT – to support current and future planned KSC Future Land Use (FLU) Areas between now and 2034. The results indicate that improvements are required to meet planned spaceport functions and a projected long-term population of 18,900 (current population is 10,300).

Infrastructure constraints are further detailed in Section 4, including forward steps to be taken as part of the Master Plan update. Future technology advances will also play a part in how the multi-user spaceport evolves, detailed in this section.

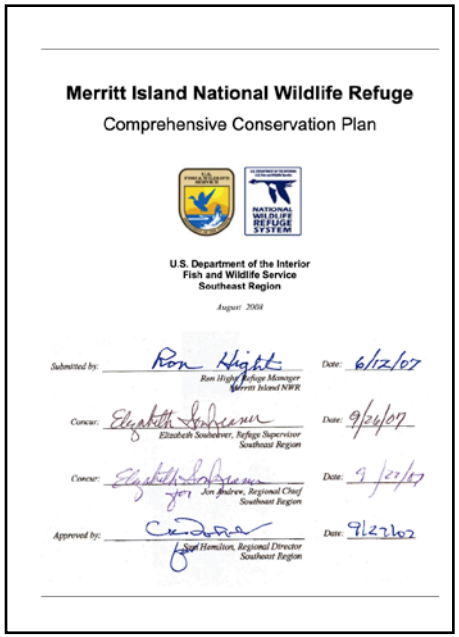


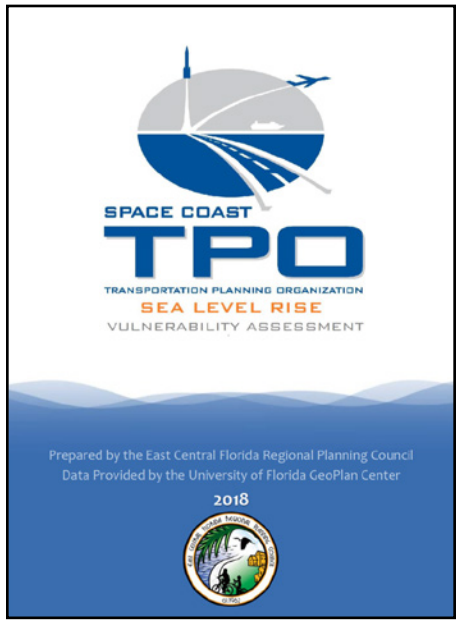

## Study of Upgrade Infrastructure for Climate Adaptation

The purpose of this study is to collect scientific climate change data and modeling tools developed by various agencies and organizations, evaluate them from an engineering perspective, and develop a standardized process that is to be used to project the effects on KSC until 2089.

Climate change and its effect of rising sea level are of critical importance to NASA, particularly its five coastal facility centers and all assets housed there. NASA's CASI Working Group concluded that a Sea Level Rise (SLR) of between 13 and 61 centimeters (5 to 24 inches) by the 2050s is projected for the coastal centers. Their study, completed in 2015, determined that even under conservative projections, the centers that already experience flooding will do so with much greater frequency.

# OTHER EXTERNAL DOCUMENTS




Cape Canaveral Spaceport Master Plan
This 2017 update of the Cape Canaveral Spaceport (CCS) Master Plan confronts a dynamic planning environment facing all stakeholders, providing both strategic and real property visions that support shared needs. Florida's legislative direction is to preserve CCS's unique national role while reducing costs, improving regulatory flexibility, and improving access for commercial launch activities. Future planning efforts by Space Florida will provide a more comprehensive analysis and definition of future development needs.

CCAFS General Plan
The Cape Canaveral Air Force Station (CCAFS) General Plan, if approved, presents a condensed picture of the present and future capability of the installation to support the 45th Space Wing (45 SW) mission and to ensure United States (U.S.) access to space.

The Plan incorporates currently identified projects, anticipates future program requirements, and ensures compliance with applicable Federal, state and local laws, regulations and policies. This document, if approved, will serve as a roadmap that guides the 45 SW to efficiently utilize land, allocate infrastructure resources and provide flexibility to meet current and evolving mission requirements.

MINWR Comprehensive Conservation Plan
The U.S. Fish and Wildlife Service developed this Comprehensive Conservation Plan (CCP) to guide the management of Merritt Island National Wildlife Refuge in Brevard and Volusia Counties, Florida. The plan outlines the refuge's programs and corresponding resource needs for the next 15 years, as mandated by the National Wildlife Refuge System Improvement Act of 1997.

2018 Sea Level Rise Assessment
The 2018 Sea Level Rise Assessment addresses observed changes in sea levels along Florida's coastline and research into the effects of climate change on rising sea levels leading to the establishment of vulnerability assessments at local and regional scales within the state of Florida. Such vulnerability assessments document the risks posed to community assets from potential sea level rise inundation and set a baseline for future policy and adaptation strategy development.

# AFFORDABILITY ANALYSIS - 2011-2020 CRV

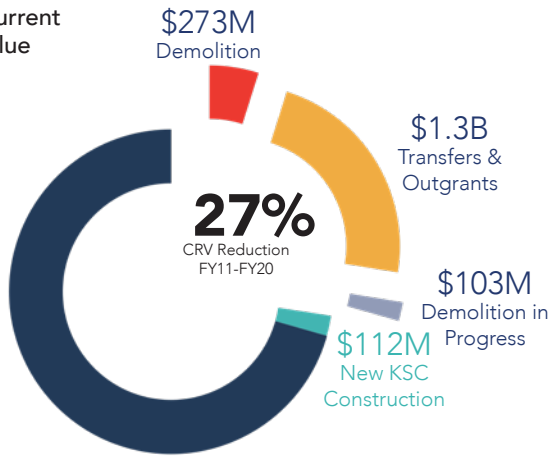
Since 2011, KSC has greatly reduced its overall footprint, CRV, and Operations and Maitenance (O&M) costs. The data used for this Vision Plan is intended to give a broad overview. Datasets will be updated as inconsistencies are identified and throughout the planning process.

## TOTAL CRV REDUCTION

### Effective Current Replacement Value Analysis

The KSC Effective Current Replacement Value graph at right demonstrates KSC's reduction in NASA-owned real property CRV by 27% between FY 2011 and FY 2020. In 2011 the CRV was $5.6 billion. Through planning and partnerships, KSC reduced its CRV by $1.5 billion, including $1.2 billion in outgranted properties. In 2020 KSC's CRV was $4.1 billion. These calculations include demolition in progress.

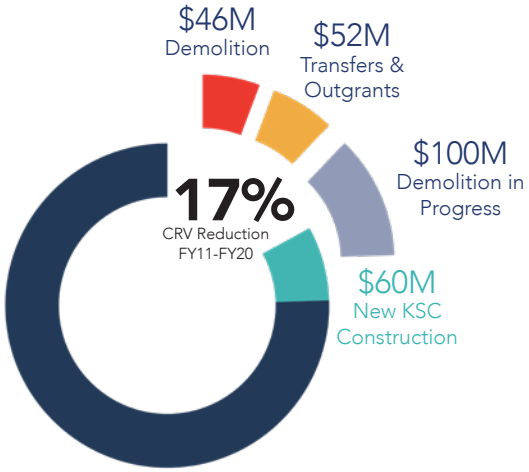
KSC Effective Current Replacement Value Reduction




## CRV REDUCTION BY FACILITY TYPE

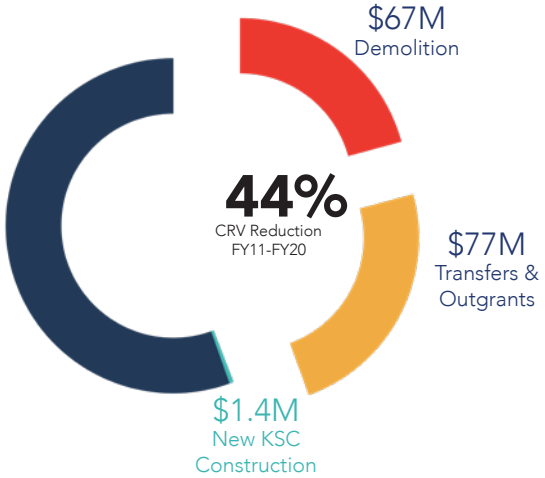
### Administrative Facility CRV Reduction

KSC reduced Administrative space CRV by 17% between FY 2011 and FY 2020. This includes $98 million of demolished, transferred, and outgranted facilities and an additional $100 million of in progress demolition.




### Shop/Warehouse Facility CRV Reduction

Since 2011, KSC reduced Shop/Warehouse facility CRV by $143 million, or 44% of the total CRV for Shop/Warehouse facilities in FY 2011.



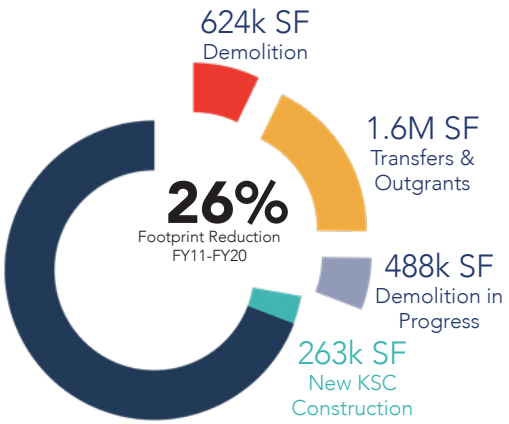
# AFFORDABILITY ANALYSIS - 2011-2020 FOOTPRINT

## TOTAL FOOTPRINT REDUCTION

### Footprint Analysis

The Footprint Reduction Analysis graph at right demonstrates KSC's reduction in NASA-owned real property footprint by 26% between FY 2011 and FY 2020. In 2011, KSC's footprint was 8.5 million sf. KSC demolished 624,000 sf of facilities, transferred 283,000 sf to other institutions, and outgranted 1,283,000 sf to other institutions. In 2020 KSC's footprint was 6.8 million sf with an additional 487,500 sf of demolition in progress. These calculations include demolition in progress.

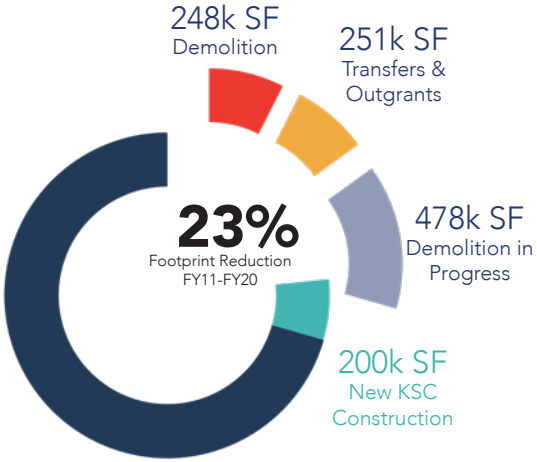
### KSC Footprint Reduction




## FOOTPRINT REDUCTION BY FACILITY TYPE

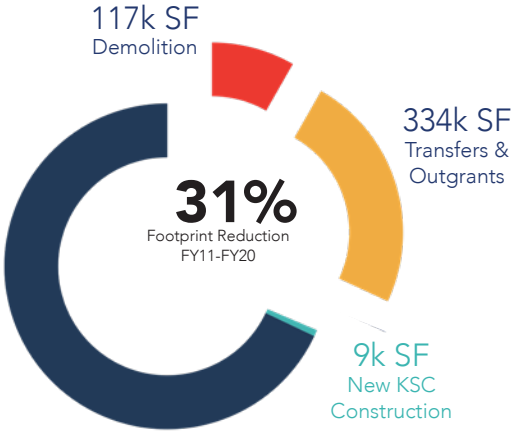
### Administrative Facility Footprint Reduction

This reduction was achieved through the demolition of 248,000 sf of facilities, the transfer of 39,000 sf of facilities, and the outgranting of 212,000 sf of facilities, amounting to 499,526 sf of footprint reduction between 2011 and 2020. KSC has an additional 477,725 sf of in progress demolition.




### Shop/Warehouse Facility Footprint Reduction

This largest reduction was achieved through outgranting 163,000 sf of facilities. The total footprint reduction was 442,616 sf, a 31% decrease from FY 2011 calculations.



# AFFORDABILITY ANALYSIS - 2011-2020 OPERATIONS & MAINTENANCE COST

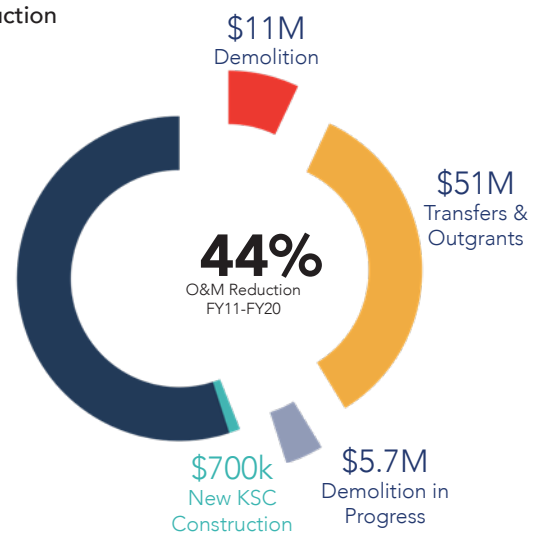
## TOTAL O&M REDUCTION

### Operations & Maintenance Cost Analysis

The Operations & Maintenance Cost Analysis graph at right demonstrates KSC's reduction in NASA-funded operations and maintenance costs through a combination of disposals, transfers, consolidation, modernization, outgranting, and increased offset funding from partner and tenant organizations with new contract mechanisms (e.g., fixed price contracts). In 2011, the O&M Costs for KSC-funded infrastructure was $151 million; using the strategies listed above, KSC reduced this cost by $66 million or 44% between 2011 and 2020 to it's current O&M cost of $90 million.

The 2011 baseline FY 2011 O&M Costs represents all infrastructure at KSC and at CCSFS that was funded by KSC on January 1, 2011. It excludes any infrastructure that had been outgranted or demolished prior to that date. The FY 2020 O&M Costs represents all infrastructure at KSC and at CCSFS that was funded by KSC on January 1, 2020. It excludes all outgranted infrastructure and infrastructure demolished between 2011 and 2020.

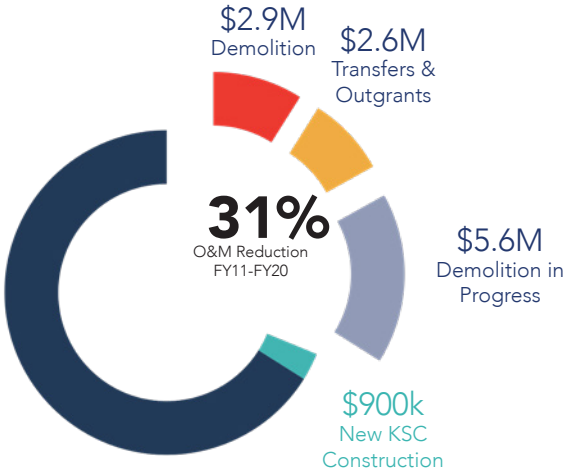
KSC O&M Reduction




## O&M REDUCTION BY FACILITY TYPE

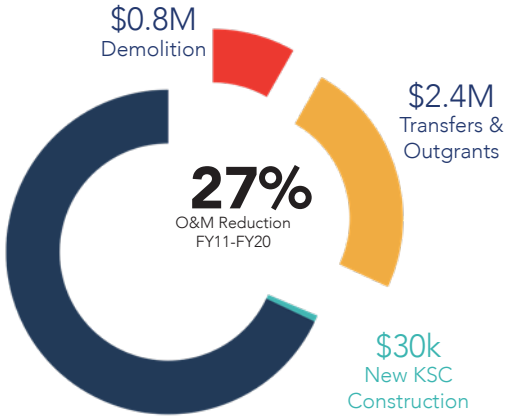
### Administrative Facilities O&M Reduction

These Administrative space divestments result in a significant O&M reduction of $5.5 million, with an additional $5.6 million reduction with the in progress demolition. These reductions equate to a 31% decrease in KSC's O&M budget for administrative spaces.




### Shop/Warehouse Facilities O&M Reduction

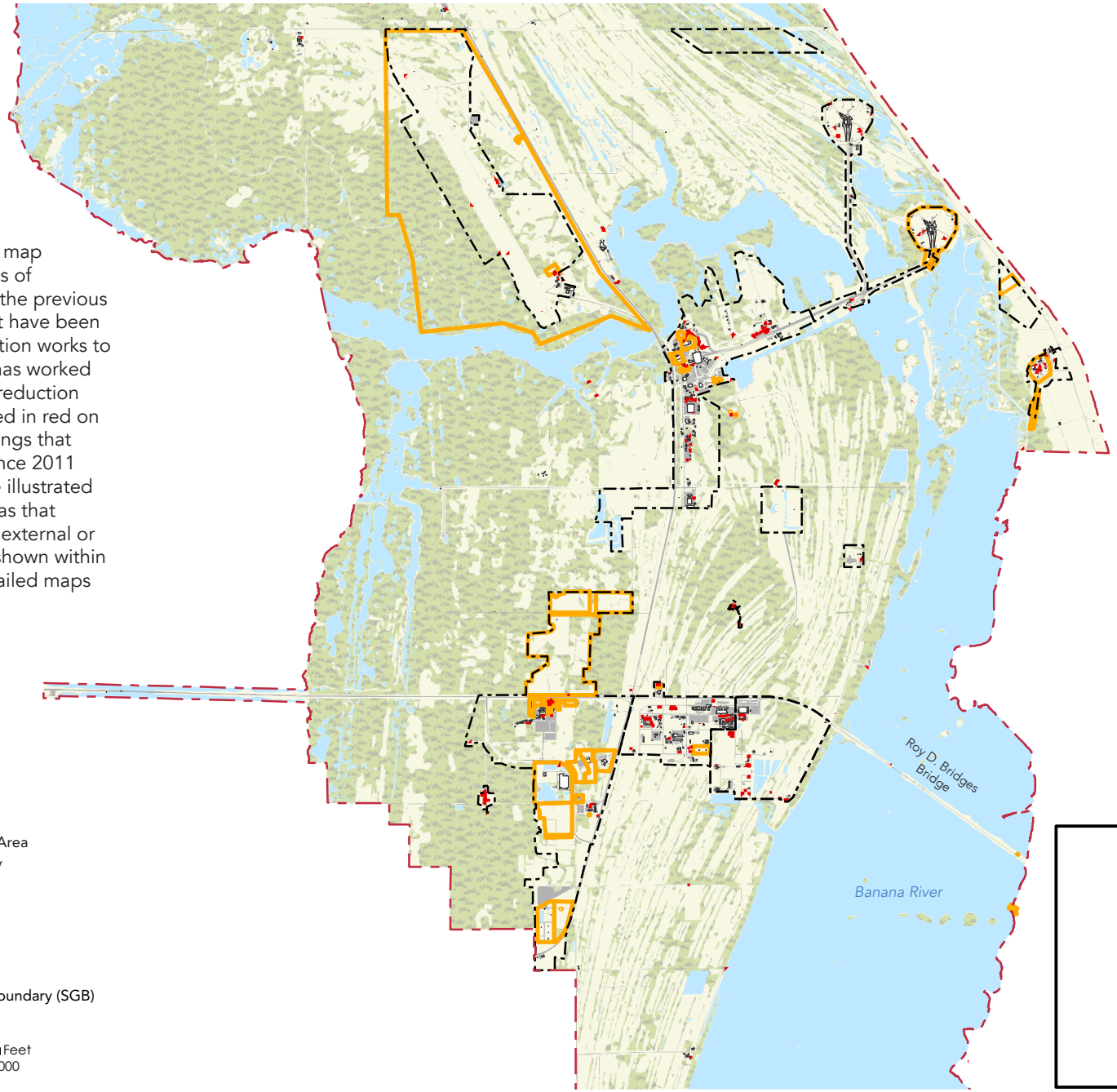
KSC reduced the Shop/Warehouse O&M Costs by 27% or $3.1 million between FY 2011 and FY 2020.



# AFFORDABILITY ANALYSIS

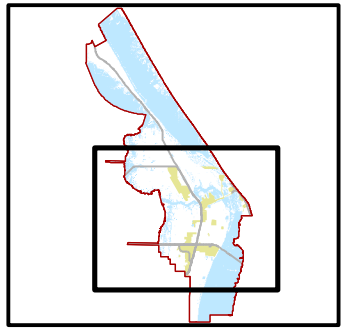
## DEMOLITION & OUTGRANTS

The Affordability Analysis map provides existing locations of outgranted property and the previous locations of buildings that have been demolished. This information works to visually inform how KSC has worked towards its infrastructure reduction goals. Footprints illustrated in red on the maps represent buildings that have been demolished since 2011 and existing buildings are illustrated in white. Additionally, areas that have been outgranted to external or commercial partners are shown within an orange boundary. Detailed maps are found in Appendix E.




- Demolished Facility Area
- Outgranted Property
- Buildings
- Pavement
- Wetlands
- Greenspace
- Water
- Spaceport Growth Boundary (SGB)
- Center Boundary

0 Feet 10,000



# FUTURE INFORMATION TECHNOLOGY ANALYSIS

Many future trends will affect development at KSC and identifying these trends, such as new transportation modes, will help KSC plan for potential changes. IT is rapidly evolving and NASA is planning for this through the Digital Transformation (DT) Initiative.

### Digital Transformation

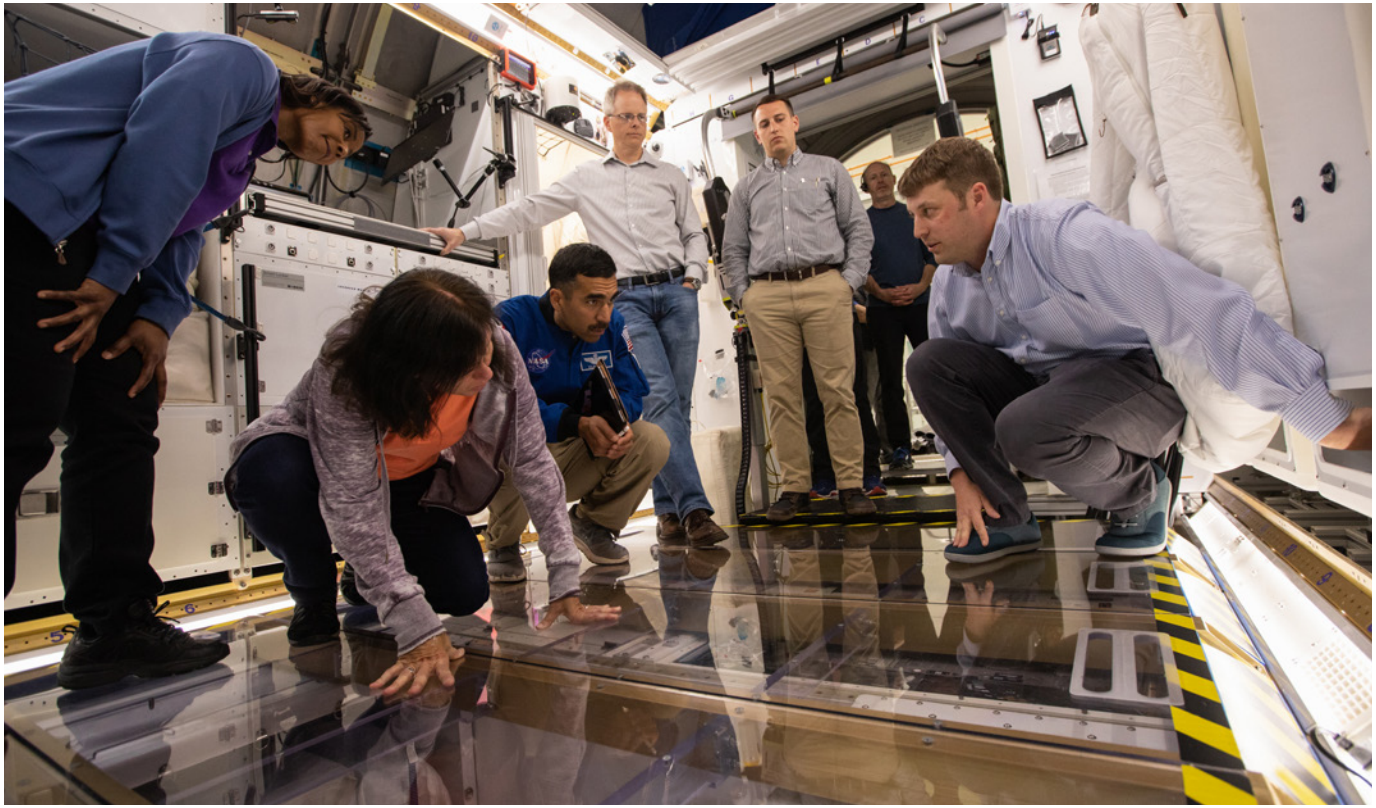
The DT Initiative arose as a proposal in the 2017 Agency Program Management Council (APMC) Capability Days to provide a more agency-integrated approach towards evolving NASA to a state where digital advancements for processes are at the core of the way NASA does business. Digital Transformation is the use of new and frequently changing digital technology to solve current problems and enhance processing. For NASA, this includes the transformation of activities, processes, competencies, capabilities, and products to maximize mission success by fully leveraging evolving digital technologies. For example, using cloud computing throughout KSC would reduce reliance on NASA-owned hardware.

The overarching vision of the DT Initiative at NASA lends itself to advancing agency missions, enhancing efficiency, and encouraging a culture of innovation. Implementing the DT Initiative will help KSC ensure mission success and meet affordability goals by enabling the following improvements:

- Accelerated creativity, innovation and creation of new knowledge
- Capable and reliable vehicle concept design and development
- Complex yet efficient and safe mission development
- Real-time, data-driven decision making
- Enthusiastic and talented workforce acquisition
- Stronger, fully integrated partnerships

The DT Initiative aims to improve how technology is used and experienced at NASA. It comes with several changes that will help NASA adapt to advancing and ever-changing technologies. One of these changes regards how data is collected, retrieved, shared, and analyzed. For example, the DT Initiative will replace NASA's previous Software Usage Agreement (SUA) for external user information sharing. In 2017, it was recognized that flaws with SUA allowed individuals to subvert export control regulations, thereby posing an intelligence threat. SUA also made accessing data challenging due to multiple sources, fragmentation, and general accessing difficulties. In its place, the DT Initiative aims to not only reduce the cost of performing these functions, but also improve security, management insight, and user experiences. The approach defines a standardized process for the entire agency, adds new capabilities to data retrieval and analysis processes, redesigns the data collection process, and standardizes data formats and access.

# FUTURE INFORMATION TECHNOLOGY ANALYSIS



In 2018, the DT Initiative was accepted as a strategy for NASA and a phased approached was developed for future implementation. The strategy aims to optimize existing processes and deliver disruptive processes and approaches over time by initiating demonstrations at the project or team level; piloting formal adoption into some procedures and reviews, adopting the changes and standardizing throughout projects and program offices; integrating within all programs, mission directorates, and all Centers across the agency; and finally transforming the culture to create permanent change with management and resource support.

Over time, the Digital Transformation will result in reduced time for concept generation and verification and reduced risk. It will help KSC in consolidation efforts as well as improve affordability through technology upgrades.

KSC DT initiatives include:

**GeoSIMS : Geospatial Spaceport Integrated Master Schedule.** A tool which integrates the KSC master schedule with operational geofencing requirements like contamination control areas, hazardous ops clears and controlled burns

**CIMS : Circuit Information Management System.** An application for managing communication circuits including equipment and cable management

**iKCMS : Integrated Kennedy Communications Management System.** An application for health and status monitoring of most of the communication system used across KSC

**TPM : Technical Performance Measures.** A tool to continually assess each infrastructure system's capacity and identify upgrades needed to support development

EXPLORE
MOON to MARS

# 3 PLANNING VISION

The planning vision, developed through a highly collaborative process, directs development at KSC now and into the future. The intent is to ensure current and future operations happen in a safe, orderly, and efficient manner. Leadership intent and program needs guide this vision and input from the Center's primary stakeholders – through interviews and surveys - ensures that this vision supports the wide array of missions conducted at KSC. Specific planning patterns, which are physical solutions to recurring needs, support clear goals and those goals form the vision. The patterns in effect form a checklist that future designers shall use to ensure individual projects support the larger vision.

# VISION PROCESS

The Center Vision Plan process began by identifying key stakeholder groups to be interviewed prior to the Vision Plan workshop. The planning team interviewed 199 individuals representing 56 organizations or focus groups in September 2019. The focus groups included all KSC directorates, NASA Headquarters, spaceport partners, regional planning agencies, and government partners. The interviews focused on each group's real property planning constraints and needs to support their missions.

The Vision Plan workshop was held October 7-10, 2019. Over 80 stakeholders attended the collaborative workshop at the SSPF Conference Room. KSC Director Robert D. Cabana welcomed participants and introduced the planning effort, KSC missions and initiatives, and the need for maintenance and improvement of facilities and infrastructure to meet KSC goals. All participants had an opportunity to introduce their role at the Center and planning considerations they felt were most important.

Workshop participants responded to a Visual Preference Survey (VPS), establishing the preferred architectural and landscape design principles for future development. Attendees completed a Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis of the KSC and gave their vision for the campus and spaceport. Using this data, participants worked in small groups to establish a planning vision for the Center's Master Plan and design principles that would enable that vision.

Planners and KSC staff reviewed site analysis maps including built and operational constraints, building age and use, safety constraints, environmental habitats and hazards, floodplains, and sea level rise - verifying and updating GIS data as necessary. From the constraints of the site analysis, facilitators worked with participants to identify developable parcels on the center's property. KSC's subject matter experts reviewed existing documentation of the Center's real property conditions, including engineering and utility reports, former planning documents, future needs assessments, regional transportation and sea level rise projections, land use plans, and climate change assessments. The synthesis of the analysis, information, and data collected, is used to develop planning patterns and guide future development at KSC.

# LEADERSHIP INTENT & NEED

Throughout the participatory planning process, key leadership from KSC gave their input and participated in the Center Vision Plan workshop. This high-level guidance helps to keep the Vision Plan focused on leadership intent and needs.

1. *If we are going to be a 21st Century Spaceport, we need to look like it*
2. *Create a viable plan that outlines what we have done, what we need to do, and allows for continued growth*
3. *Be bold, think big*
4. *Take care of the workforce*
5. *Maintain focus on KSC's key missions*
6. *Treat KSC like a national treasure*
7. *NASA talent should be managing programs, not day-to-day operations*
8. *Bring KSC to the public and the public to KSC*
9. *Be good stewards of the environment*
10. *Be efficient and effective*

# STAKEHOLDER INTERVIEWS

Key Numbers & Themes

The planning team conducted stakeholder interviews as the first step in the Center Vision Plan process. Interviews took place over seven days from September 9th through the 17th at KSC or nearby in Titusville and Cape Canaveral. Stakeholders included NASA leadership and all organizations involved with KSC, including early career employees, commercial and government tenants, and local partners, such as the port. Summaries of the interviews can be found in Appendix A.

7 *Interview Days*

56 *In-Person Interviews*

27 *Additional Interviews by Phone or Submitted in Writing*

**Total Interviewees**

**199**

# SWOT ANALYSIS

Using a technique called the Crawford Slip Method, participants responded to a series of questions about Kennedy Space Center's **strengths**, **weaknesses**, **opportunities**, and **threats** for the campus. In addition, Vision Workshop participants responded to the questions "What makes a great campus?" and "What makes a great spaceport?" to solicit visionary principles for KSC. Participants had three minutes for each question to come up with as many ideas as possible, each written on a separate piece of paper.

Teams arranged the responses into a concept map for each question that visually depicts common themes. Each team then presented their concept map to the group. Details and concept maps are provided in Appendix B.

| | |
|---|---|
| *Strengths* | *366* |
| *Weaknesses* | *300* |
| *Opportunities* | *263* |
| *Threats* | *318* |
| *Great Campus* | *373* |
| *Great Spaceport* | *401* |

**2,021**

*Total SWOT Responses*

For full results, see Appendix B.

The top five responses in each category show the most important issues brought forward by stakeholders when considering KSC's current state and future growth.

### STRENGTHS

1. LOCATION & LAND AVAILABILITY
2. WORK FORCE
3. AMENITIES
4. INFRASTRUCTURE NETWORK
5. PARTNERSHIPS

### WEAKNESSES

1. AGING INFRASTRUCTURE
2. AGENCY MINDSET
3. ENVIRONMENTAL
4. CAMPUS SPRAWL
5. BUDGET CONSTRAINTS

### OPPORTUNITIES

1. PARTNERSHIPS
2. CAMPUS CONSOLIDATION
3. FUTURE MISSIONS
4. DEVELOPMENT OF LAUNCH PADS
5. SUSTAINABILITY

### THREATS

1. CLIMATE/ENVIRONMENTAL
2. WORKFORCE RETENTION
3. FUNDING/BUDGET
4. POLITICS & POLICY
5. CONSEQUENCES OF THE 25% REDUCTION TARGET

### GREAT CAMPUS

1. ACCESS
2. SAFETY & SECURITY
3. GREEN ENVIRONMENT
4. WORK ENVIRONMENT
5. AMENITIES/FOOD SERVICES

### GREAT SPACEPORT

1. ACCESS
2. WORKFORCE
3. LOCATION
4. SECURITY
5. KSC LEGACY

# VISION, GOALS & PLANNING PATTERNS

1

### Flexible Processing and Launch Capabilities

- Flexible launch infrastructure (pads, towers, utilities, buildings, processing functions, etc.) will expand support of diverse launch vehicles and a high launch cadence and allow for additional launch and recovery operations, risk reduction, and focused environmental preservation.
- Continuous quinti-modal transportation network will be maintained and expanded (as necessary) to ensure the transport of people, manufacturing materials, commodities, launch vehicles, ground support equipment, and payloads (whether air, sea, road, rail, or space) into and within the spaceport meets the needs of all users.
- Ground support and applied research and technology capabilities to provide the end-to-end processing capabilities and technical expertise required to support flexible, safe, secure, efficient, and successful operations for a variety of users, uses, and missions at KSC.

2

### Robust Infrastructure

- Modernized launch support infrastructure will support emerging users and technologies
- Resilient launch support capabilities (utilities, manufacturing, processing, and testing) will meet current and emerging mission demands and withstand acute and long-term natural and artificial threats.
- Modern communication and security systems will support continuous operations, remote access, and virtual teams.

3

### Sustainable Facilities

- Environmentally-friendly buildings will reduce operational costs and environmental impacts.
- Mixed-function multi-story facilities enhance consolidation of technical and mission support space, use our limited developable land more efficiently, improve space utilization, and support footprint reduction.
- Flexible operational spaces for processing, research, industrial and administrative uses will meet today's mission needs but be adaptable for unknown future missions.

4

### Responsible Stewardship of our Built and Natural Environment

- Infill development will be utilized, to the maximum extent possible, to direct all new facilities to previously developed areas to minimize incursions into undeveloped habitat.
- Central Campus District will serve as the centralized location for siting new mission support facilities to consolidate non- or minimally-hazardous institutional functions into a common area to promote workforce safety and synergy, reduce the administrative footprint at KSC, conserve available land for future hazardous facilities, and maximize opportunities to preserve the natural environment.
- Adaptation Action Areas (AAAs) will be identified based on 2080 sea level rise projections to provide a geographic bound for the implementation of a pragmatic climate change adaptation strategy that aims to minimize the effects on the built and natural environment of intermittent or permanent flooding associated with sea level rise.
- Climate change adaptation strategies will be developed and implemented to provide for the protection and accommodation of critical facilities and infrastructure in the near-term and will help guide future capital investments to support the relocation and avoidance from the areas at most risk of the adverse effects of climate change.

Our planning vision is to enhance the multi-user spaceport with flexible processing and launch capabilities, robust infrastructure, sustainable facilities, and responsible stewardship of our built and natural environment.

From this planning vision, four planning goals, highlighted above, emerged to guide the development process. Each goal has several planning patterns that will shape future development to meet those goals.

Planning Patterns
The patterns listed under each goal were collaboratively developed during the vision workshop based on lessons learned during the SWOT, visual preference survey, findings from the document review, and direct input from participants. Leadership and key stakeholders then refined the planning patterns. It is important to note that these patterns work best in concert. This should be considered a beginning language for planning and can be added to and modified over time.

*Highlighted planning patterns are described in the following pages, organized by goal.*

# PLANNING PATTERNS - GOAL 1: FLEXIBLE PROCESSING & LAUNCH CAPABILITIES

**Flexible Launch Infrastructure**
Flexible launch infrastructure includes flight hardware processing facilities, payload processing facilities, launch pads, utilities, and other processing infrastructure that can accommodate emerging users and new launch vehicles. Launch infrastructure should be constructed to support processing, integration, launch and recovery of launch vehicles and spacecraft and adaptable to future technologies and commodities needed to achieve a high launch rate. Appropriate clear zones should be maintained around processing and launch infrastructure to ensure safe operations. Capabilities and development with clear zone requirements should not adversely affect future operations. Non-mission essential buildings should not be located in these areas.

**Continuous Quinti-Modal Transportation Network**
A continuous transportation network should be maintained to transport people, manufacturing materials, commodities, launch vehicles, ground support equipment, and payloads into and within the spaceport. KSC has five modes of access available – air, sea, highway, rail, and space – making it the world's only quinti-modal transportation hub. Planning decisions should alleviate inefficiencies and should not inhibit these transportation networks. Elements including signs, plants, lights, powerlines, and bridges should be located outside of necessary setbacks. Horizontal constraints including pavement width, facility and utility siting, and clear zones should be identified for the efficient and safe movement of people and goods to facilitate end-to-end processing capabilities.

Exploration Ground Systems moves NASA's mobile launcher along the crawlerway in support of the Artemis I mission

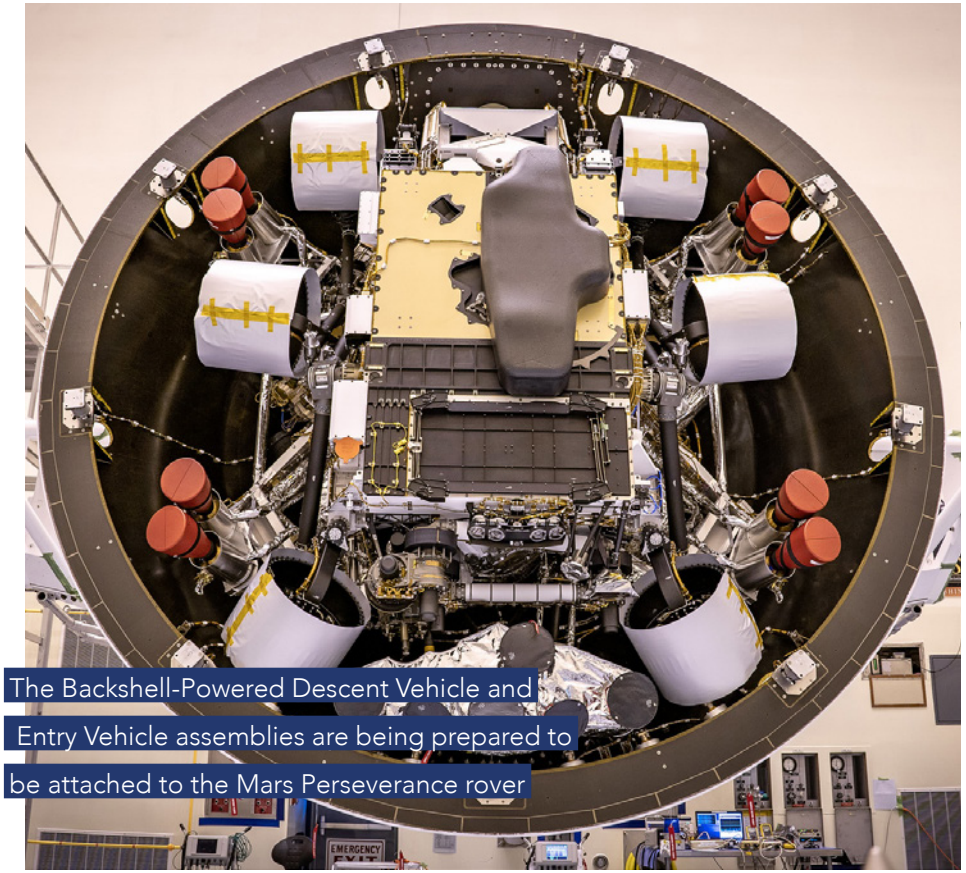
Plants are studied for their potential to grow in space in the Veggie growth chamber in the Space Station Processing Facility

**Ground Support and Applied Research and Technology Capabilities**
Specialized ground support capabilities include the unique facilities and infrastructure that are essential to the provision of end-to-end processing of a launch vehicle or payload from arrival at KSC to launch. These capabilities include: space vehicle and payload component assembly, integration, and processing prior to launch; the specialized lab resources and technical expertise required to provide timely solutions to complex problems that may arise during integration and test activities of the vehicle; and the conveyance of the final assembled vehicle over the last mile for launch including the mobile launch platforms, Crawler, and Crawlerway. Future mission success will require that KSC has dedicated facilities that include state-of-the-art laboratories and technical space to support the cutting-edge biological and applied science research, materials analysis, final testing of flight experiments and interface testing for an increasingly diverse variety of spacecraft and payloads that will be necessary to support NASA's missions into the solar system and partners who rely on KSC's technical capability expertise. The planning focus will be to ensure that KSC has research capabilities to provide scientific analysis and engineering solutions that will enable safe, adaptive spaceflight and that new facilities will be flexible space to meet the needs of existing and future missions, meet the Agency Capital Plan to be operationally/fiscally efficient, will contribute to the consolidation of NASA's geographic facility footprint, and will be located in areas least susceptible to the adverse effects of climate change to maximize the value of the facility investment.

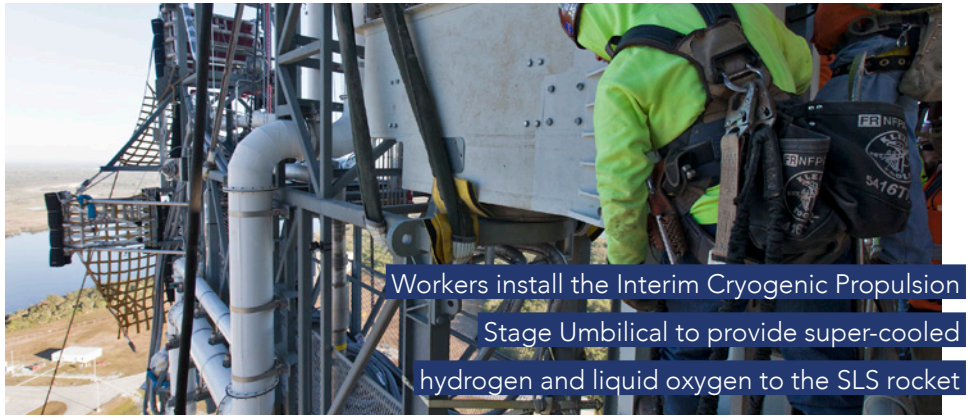
# PLANNING PATTERNS - GOAL 2: ROBUST INFRASTRUCTURE

**Modernized Launch Support Infrastructure**

Modernized launch support infrastructure should meet the needs of existing and future launch requirements. New payload processing facilities capable of supporting multiple users simultaneously will be required to support the cadence of Space Launch System (SLS), other NASA programs, and the variety of NASA's commercial partners. Utility networks should have the ability to support multiple concurrent launch campaigns and provide the necessary commodities depending on vehicle type, size, and frequency of operations. An appropriate amount of propellant storage supply (GN2, GHe, LN2) and distribution system should be efficiently managed to promote optimal high-pressure gaseous flow rates that support a variety of launches and other high-usage events. NASA and commercial infrastructure needs are interdependent for achieving long-term mission success, therefore future launch infrastructure systems should be designed with enough flexibility to support all long-term mission/launch requirements.



The Backshell-Powered Descent Vehicle and Entry Vehicle assemblies are being prepared to be attached to the Mars Perseverance rover



Workers install the Interim Cryogenic Propulsion Stage Umbilical to provide super-cooled hydrogen and liquid oxygen to the SLS rocket

**Resilient Launch Support Capabilities**

Facilities, such as utilities, manufacturing, processing, security, and launch infrastructure, should be constructed to support continued mission operation despite the adverse effects of climate change, natural disasters, and human-caused threats. Additionally, the planning of utilities, manufacturing, testing, processing, security, and launch infrastructure should anticipate future mission demands and withstand long-term exposure to natural elements. This can include hardening structures, decreasing dependence on grid-tied utilities and communication, locating infrastructure strategically to avoid excessive risk, and planning for flexibility, redundancy, and repairability.

**Modern Communication and Security Systems**

The center should continue to enhance its modern communication and security systems, including the ability to rapidly insert new technology and upgrades into facilities and infrastructure. Facilities should be networked with high-speed fiber-optic cable in anticipation of changing mission requirements demanding increased cloud computing and virtual training. Cable ducts and communications rooms should be constructed with adequate space to accommodate future mission demands, ease of modernization, and adequate space for future expansion of technology systems. Mission communication services should use diverse optical rings using native carrier Ethernet technology. Communications and IT services to include commercial cell carrier augmentation in weak service areas, Wi-Fi calling, and next generation Wi-Fi. Sensitive and hazardous missions require various levels of spaceport security to protect users and assets. Communications infrastructure will support the rapid deployment of both mission-oriented and institutional communications and IT services. Physical security measures such as badge-access entries and perimeter barriers, including secure fencing and access points, should be considered in design and planning decisions. Systems to improve IT security and prevent cyber attacks should be integrated into networks. Modern workstations and advanced conference room technology should be configured to facilitate remote access and virtual conferencing.

# PLANNING PATTERNS - GOAL 3: SUSTAINABLE FACILITIES

**Environmentally-Friendly Buildings**
Buildings should be constructed to be environmentally-friendly to minimize adverse impacts on the environment, reduce operational costs, and create a healthier work environment. Per NASA requirements, new construction and major renovations should meet the Leadership in Energy and Environmental Design (LEED) rating of Silver and strive to meet a LEED rating of Gold or the equivalent in an alternative rating system. Passive lighting, heating, cooling, and ventilation strategies should be employed in conjunction with energy-efficient systems to reduce energy use. Low-power equipment should be selected for workstations and mission requirements as appropriate. Future development of solar photovoltaic panels should, to the highest extent possible, be sited to maximize renewable energy production, minimize the reduction of greenspace and developable areas for future mission-critical operations, and maintain critical wildlife habitat.

**Flexible Operational Space**
Future facilities will endeavor to serve the agency for 75 years and be designed to meet current and future mission requirements avoiding obsolescence over that horizon. Facility design will ensure the maximum flexibility of the operational functions and allow for changing mission needs and a variety of users to share the facility. Facilities should aim to incorporate transitory administrative space that meets work-from-anywhere policies and provides more flexibility and opportunities for NASA and non-NASA employees who only require short-term workspace needs. Flexible floor plans, configurable technical/lab spaces, and other space configuration methods that promote the ability to change, expand, or divide space easily and economically will support the ability to change the operational focus of a facility with minimal renovation.

**Mixed-Function, Multi-Story Facilities**
Mixed-function facilities combine complementary functions into a single building. Employee morale amenities such as childcare, food options, retail stores, exercise areas, and launch viewing areas can be integrated into mission support buildings. This increases the overall sustainability and resiliency of the facility as well as workforce well-being. Multiple levels in buildings provide for a more efficient use of space on a smaller footprint and enhanced efficiency in mission operations. By combining functions and building up and not out, facilities can avoid costs by requiring less roof area, fewer utility runs, the sharing of mechanical and common spaces, and construction may require less materials. Additionally, the consolidated nature of such construction disturbs less land area, reduces the cost of habitat mitigation, preserves developable areas for future mission-critical facilities, and conserves the natural environment.

New workstations and buildings at KSC are designed to maximize natural light

# PLANNING PATTERNS - GOAL 4 RESPONSIBLE STEWARDSHIP

**Infill Development**

Infill development is the process of developing on previously disturbed lands such as the site of a previously demolished facility or underutilized parking lot. Utilizing a strategy of infill development will optimize existing infrastructure (such as roads, wastewater, telecom, stormwater, etc.) which will result in a more efficient delivery of services to the workforce and limit the need for the expansion of these infrastructure networks to more remote undeveloped areas. Additionally, this strategy will minimize the reduction of critical habitat and natural resources for new development unless operationally required. Lastly, infill development will enable the geographic concentration of non-hazardous operations which will enable the expansion and necessary separation of future hazardous operations which will be required for the growth of the spaceport.

**Central Campus**

Future facility development will aim to separate, where appropriate, institutional and programmatic functions to the highest extent possible. This will be supported by the continued development of the Central Campus concept that will consist of consolidated non- or minimally-hazardous functions that are co-located within a smaller geographic footprint in the Central Campus District. Co-locating these functions within a smaller footprint in the same district, will increase opportunities for interdisciplinary collaboration, lower operating costs, and improve security and safety while maximizing opportunities to preserve the natural environment.

Functions that will be included in the future development of Central Campus will be comprised of future technical/lab functions, administrative support functions, workforce amenities (e.g., food service, childcare, etc.), and other non-hazardous functions as appropriate.

**Adaptation Action Areas (AAAs)**

Future development and investment will adhere to defined Adaptation Action Areas (AAAs) which utilize the latest sea level rise projection data for 2080 to identify the geographic areas at most risk of intermittent or permanent effects of sea level rise. The AAAs will be incorporated into planning as an overlay zone and facilities and infrastructure within the AAAs will be included in the implementation of the Climate Change Adaptation Strategies.

Infill development within the Central Campus District will optimize existing infrastructure and reduce the impact on natural resources

AAAs will be incorporated into future planning for areas at highest risk from rises in sea level

# PLANNING PATTERNS - GOAL 4: RESPONSIBLE STEWARDSHIP

**Climate Change Adaptation Strategies**
Resiliency planning requires flexible and adaptive approaches to the design, construction, and maintenance of climate-resilient infrastructure in a way that anticipates, prepares, and adapts to changing conditions and increased storm events. To adapt to climate change, facilities and infrastructure within the AAAs will be subject to a four-pronged strategy of Protection, Accommodation, Managed Relocation and Avoidance of future development in AAAs.

Protection
Protection strategies are structurally defensive measures that directly protect vulnerable structures, allowing them to be left largely unaltered. Mission-critical infrastructure and facilities near the shoreline and in flood prone areas should be systematically protected from sea level rise and storm events utilizing flood barriers and floodproofing strategies. Flood barrier plans will utilize green (soft) protection strategies such as beach nourishment, sand dune development, oyster reef restoration, and living shorelines as a first option but will utilize gray (hard) protection strategies such as seawalls, revetments, and levees if necessary. To better absorb storm surges and flooding, control erosion, and create habitat, KSC should enhance on-site stormwater mitigation through low-impact development methods such as bioswales, passive rainwater retention, and native plantings.

Accommodation
Accommodation strategies alter physical design of vulnerable structures to allow the structure or land use to stay in place with modification. Floodproofing, which involves elevating critical equipment or infrastructure (such as raising roads or lift stations) to accommodate the hazard should be employed when appropriate.

Managed Relocation
The gradual relocation of facilities and infrastructure from AAAs, where protection or accommodation will not be efficient, will be done over time. NASA can continue to invest in assets based on that asset's expected lifetime and projected inundation. Relocating critical facilities and infrastructure, such as utilities, treatment plants, and pump stations, to higher elevations would reduce risks from coastal flooding and exposure because of coastal erosion or wetland loss.

Avoidance
Involves guiding new development away from AAAs to minimize the threat to the investment from coastal hazards. Since capital infrastructure is developed and maintained for a relatively long lifespan, planning for future changes in sea level should be a part of the siting and initial design of facilities. The Master Plan will be used to direct future development and relocated facilities outside of the AAAs and into areas at a lower risk of being affected by storms and sea level rise.

Aerial view of wetlands and the shoreline at KSC

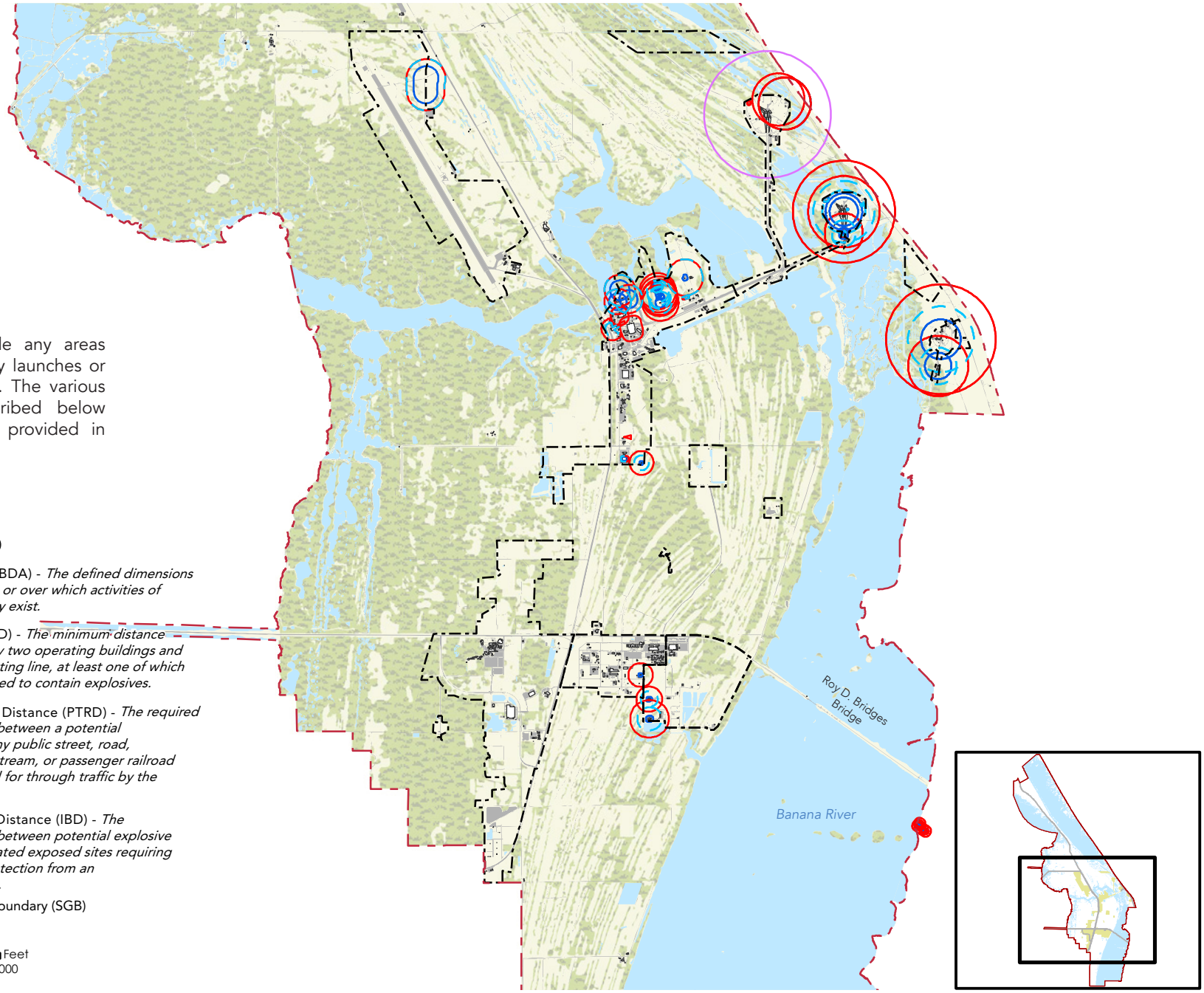
# 4 DEVELOPMENT CONSTRAINTS

Unique missions and environmentally-sensitive landscapes limit the type of development that can occur on land managed by Kennedy Space Center. This section presents these constraints to development. First, the exceptional nature of KSC's mission presents unparalleled safety issues that limit where development can and should occur. While NASA missions are inherently risky, we can mitigate that risk by developing in the safest possible areas. Second, numerous environmental factors limit development options and these include unique wildlife areas such as land preserved for Florida scrub-jay habitat, floodplains, and areas impacted by projected sea level rise. Third, the availability of and access to existing infrastructure naturally limits where we should develop. KSC does not want to waste resources extending infrastructure into new areas without first maximizing the use of infrastructure elements in existing areas.

Taken together, these constraints help demarcate where development should occur and these areas are shown in maps referred to as Developable Area Maps. In the end, this analysis shows that the bulk of the Center is undevelopable so the focus is on a few key areas where KSC will concentrate development. In no way do these constraints unnecessarily limit KSC's ability to support missions. Rather they help KSC planners focus development in support of current and future missions in the most efficient and effective ways.

# SAFETY CONSTRAINTS

Safety constraints include any areas that could be affected by launches or other explosive activities. The various distance arcs are described below and detailed maps are provided in Appendix E.




**Quantity-Distance Arc (QD Arc)**

- Blast Danger Area (BDA) - *The defined dimensions of an airspace within or over which activities of potential danger may exist.*
- Intraline Distance (ID) - *The minimum distance allowed between any two operating buildings and sites within an operating line, at least one of which contains or is designed to contain explosives.*
- Public Traffic Route Distance (PTRD) - *The required separation distance between a potential explosion site and any public street, road, highway, navigable stream, or passenger railroad that is routinely used for through traffic by the general public.*
- Inhabited Building Distance (IBD) - *The separation distance between potential explosive sites and non-associated exposed sites requiring a high degree of protection from an accidental explosion.*
- Spaceport Growth Boundary (SGB)
- Center Boundary

0 — 10,000 Feet

# ENVIRONMENTAL CONSTRAINTS

### Environmental Constraints Maps

Environmental Constraints maps include Florida scrub-jay habitat (Core, Support, and Auxiliary habitat), 100- and 500-year flood plains, and wetlands and sea level rise. Combined, these maps help to define where development can occur while having minimum impact on the natural environment and helping meet the planning goals of sustainable infrastructure and responsible stewardship of our built and natural environment. The Developable Area maps reflect these constraints as defined in each Developable Area type.

### Future Development Constraints

Kennedy Space Center's (KSC) designation as a wildlife refuge and location on a barrier island with ±96,000 acres of aquatic resources represents one of the greatest constraints to future development. NASA's history of environmental stewardship has always avoided, to the highest extent possible, development on wetlands and when such development is necessary the minimization of the adverse impacts. As the multi-user spaceport grows, there is expected to be wetland impacts and it is necessary to identify KSC's capacity to offset those impacts by enhancing, restoring, creating and preserving wetlands elsewhere within the Center. The work to offset wetland impacts by improving wetland functions elsewhere is referred to as compensatory mitigation (CM) and is expressed in a value system of Credits. NASA and the USFWS have worked closely to identify approximately 1,000 acres across the Merritt Island National Wildlife Refuge to preserve for future mitigation needs. The challenge is that these mitigation areas represent a finite resource to create these Credits [A credit is a transactional unit of measurement based on improved wetland functions, and they're determined by a wetland condition assessment such as the Uniform Mitigation Assessment Method]. This means that development (both NASA and commercial) could be constrained in the future by the availability of these credits on KSC, and there are issues with Mitigation Bank (MB) Credit availability. NASA has always had to balance the needs of the country's launch capabilities with the protection of the habitats and species that provide an incomparable setting for humankind's greatest feats.

### Compensatory Mitigation

This Vision Plan is suggesting a developable area that continues to minimize adverse impacts to wetlands while balancing the development needs of NASA and our commercial partners. In siting a project, it's not a simple matter to shift development to the high ground to reduce wetland impacts, as such an approach would likely increase impacts to Florida scrub-jay (State/Federally listed species) and potentially affect long-term viability of the species. NASA performed an assessment of future wetland impacts based on minor development and in consideration of wetland avoidance and minimization. Using this approach, future KSC Spaceport development could result in a minimum of 500 acres of wetland impacts. If more "big box" development is needed (e.g., launch facilities, warehouse-type vertical construction, etc.), this number would be larger. While these wetland impacts are not ideal, this development can be permitted by state and federal agencies with CM for the purpose of offsetting unavoidable wetland impacts.

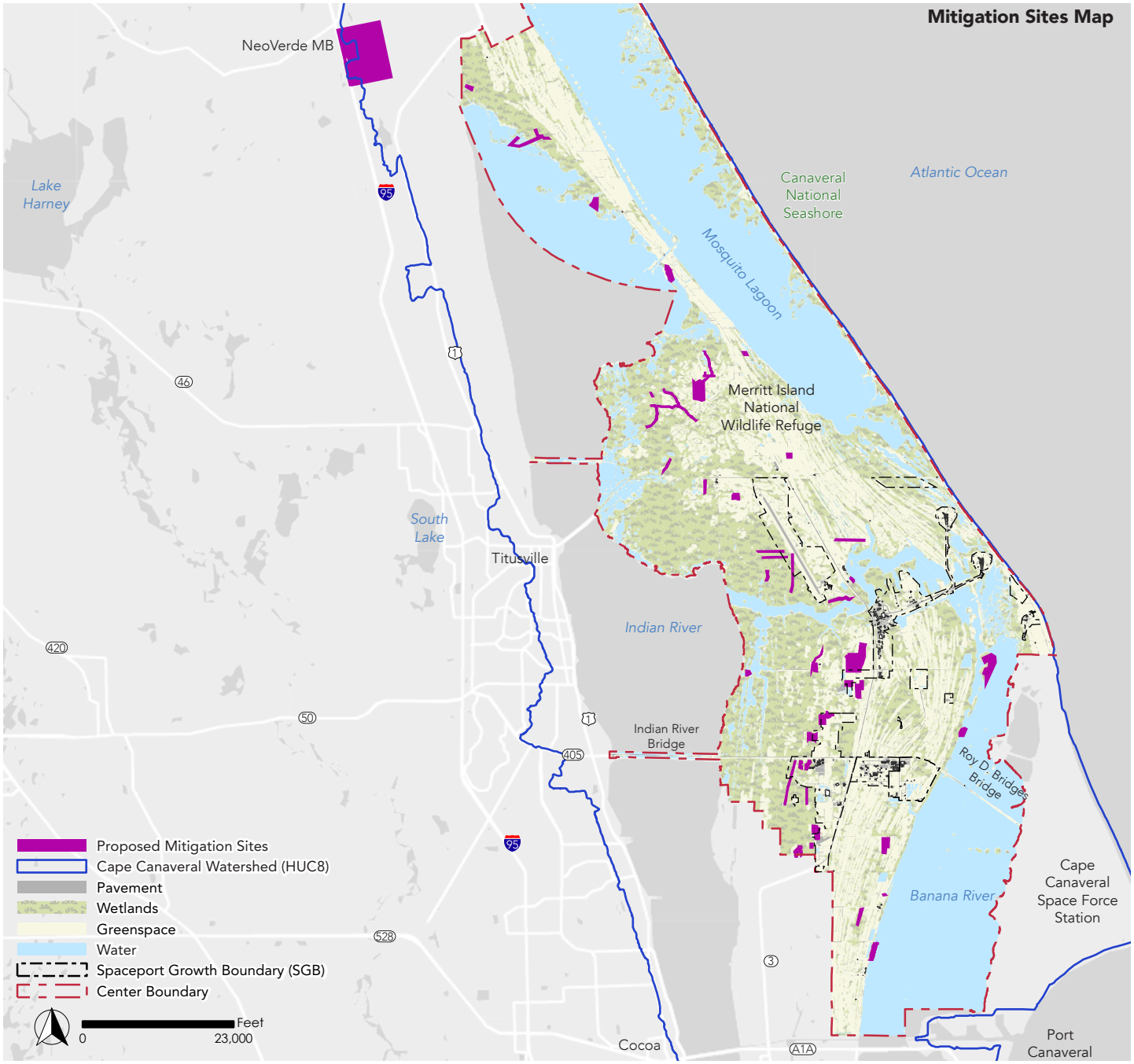
# ENVIRONMENTAL CONSTRAINTS

NASA, and its partners, have previously completed CM on KSC to compensate for project driven wetland impacts (e.g., Shoreline Dune Restoration, KARS Revetment, Visitor Center, Blue Origin development, etc.). CM at KSC must occur in the Cape Canaveral portion of our Indian River Lagoon watershed (see Cape Canaveral Watershed - Hydrologic Unit Code (HUC) #03080202).

### Compensatory Mitigation – Long-term Outlook

The buildout of the Spaceport and realization of 500 acres of wetland impact could happen over a 10-20-year period, or more, the timeframe of which is ultimately determined by demand and growth of the multi-user spaceport. The 500 acres of anticipated wetland impacts would have a compensatory mitigation requirement of approximately 350 federal credits. There are three major sources of federal compensatory mitigation for development at KSC:

1. (On-Center) Advanced Ecological Mitigation (AEM) – Where mitigation is performed in advance of project needs and credits are maintained on a ledger. This approach was initially permitted at KSC in 2015;
2. (Off-Center) Mitigation Banks (MB) – Similar to AEM but mitigation is performed by a private entity and credits may be sold to developers for the purpose of meeting their permit requirements. Currently, one federal MB (NeoVerde) serves the KSC area, with a second federal MB set to receive approval by the end of 2020 (Pine Island). Currently, no MB credits are available to support development at KSC.



3. Permittee-responsible mitigation (PRM) – means an aquatic resource restoration, establishment, enhancement, and/or preservation activity undertaken by the permittee (or an authorized agent or contractor) to provide compensatory mitigation for which the permittee retains full responsibility. These "ad hoc" mitigation projects can be performed on-site (adjacent to development that requires the mitigation) or at other sites within the watershed.

These credits are critical because the state and federal environmental resource permit process occurs much faster where MB/AEM credits are available. NASA (in partnership with resource agencies) controls the rate at which AEM credits are generated and the timing of their availability (when mitigation projects are complete). NASA does not control the rate at which MB credits are generated, or the timing of their availability for purchase. Additionally, NASA and our partners must compete with off-Center developers for the purchase of MB credits with credit costs based on market mechanisms (the current estimated price for a state/federal credit in the watershed is $240,000).

The availability of CM credits to support future development at KSC is a risk to the future development of the multi-user spaceport. As identified in the table, there are currently no federal CM credits available in our watershed, and several partner projects at KSC could experience environmental resource permitting delays. Long-term, there is a minimum of 350 CM credits needed for full build-out of the Vision Plan's developable areas, and approximately 314-424 federal credits that could be available in the watershed. Due to limited opportunities for compensatory mitigation in the watershed, most mitigation will likely come from KSC property. Future development must be substantially covered by credits derived through KSC's AEM program. MB credits are also an important resource when available but market-driven credit price increases are a concern. Future credit prices could make development at KSC cost prohibitive and adversely impact growth and success of the Spaceport.

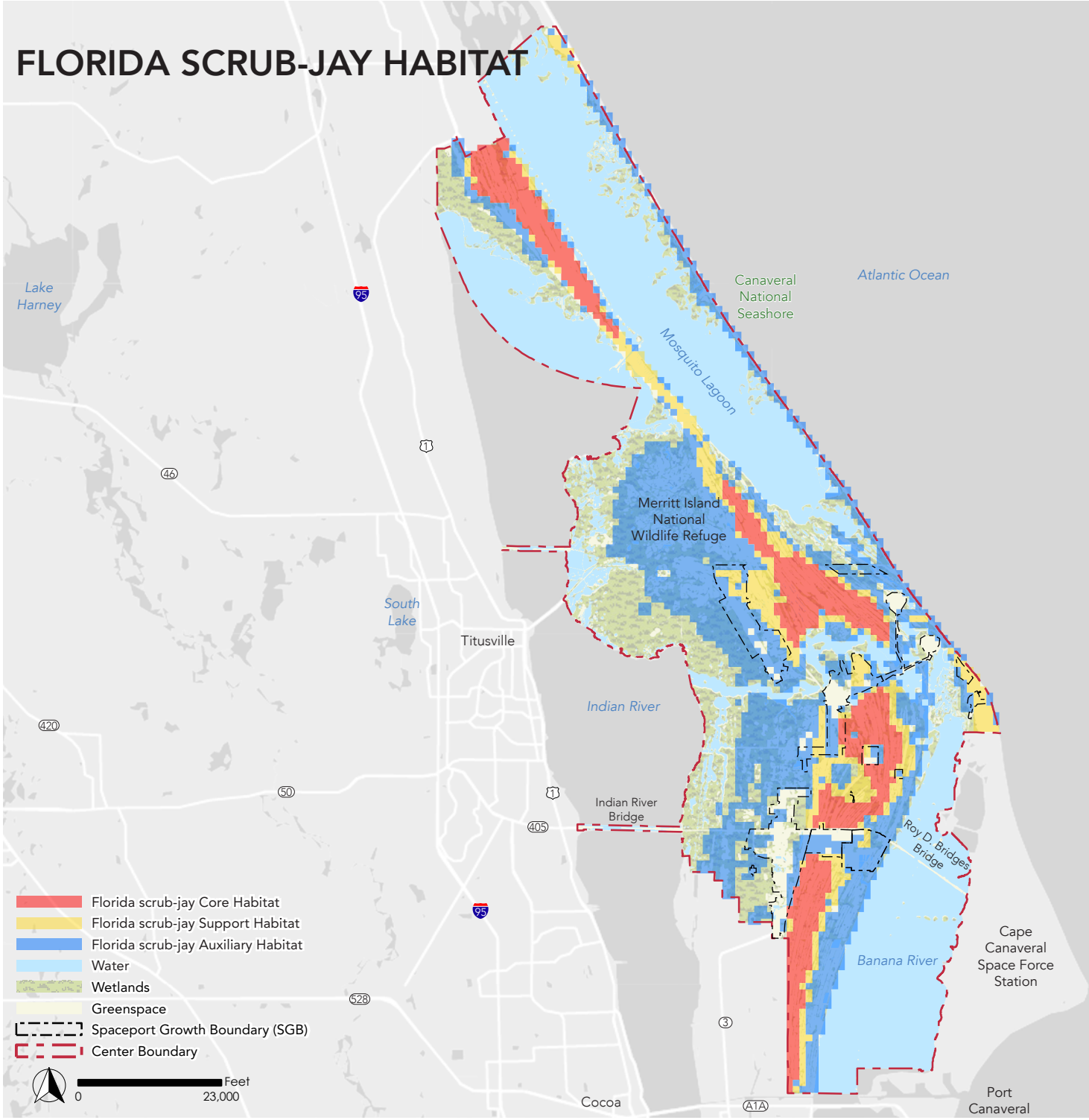
| MITIGATION SOURCE | POTENTIAL CREDITS | CURRENT AVAILABLE CREDITS |
|---|---|---|
| Mitigation Banks (MB) | 84 | 0 |
| KSC Advanced Ecological Mitigation (AEM/PRM) | 230-340 | 0 |
| TOTAL | 314-424 | 0 |
| NEEDED | 350+ | |

Future Development Considerations

The availability of CM on KSC property is a finite resource. Moreover, the possibility that there could be insufficient CM credits available in the watershed to support full buildout of the developable areas identified in the Vision Plan could be a significant risk to the future growth of the Mutli-User Spaceport. As such, this Vision Plan has developed three strategies to support the preservation and strategic allocation of AEM credits to ensure there are enough potential credits on the AEM ledger for future development supporting NASA program and mission requirements:

1. Preservation of Potential AEM Mitigation Areas - It is imperative that every potential area where AEM credits could be derived is identified and preserved for that land use. The map Mitigation Sites Map shows the areas that have been identified by NASA and USFWS as future mitigation areas for the AEM Program. These identified areas will be zoned as mitigation areas to ensure that future development does not impede on them, unnecessarily decreasing the maximum credits available to NASA programs and missions in the future.
2. In order to utilize these future mitigation areas, more detailed design work is required to convert the notional projects identified within the future mitigation areas into credits that could be utilized to offset future development. KSC should continue to work closely with USFWS, its commercial partners, and local regulatory agencies to establish actual projects within these notional areas that could be utilized as AEM credits.
3. Strategic Allocation of Credits to Spaceport Users – NASA will not need every credit that could be created within the AEM Program, however, AEM credits should be held in reserve to support development with an identified, demonstrable, direct correlation to the success of a NASA mission or Program related to launch, landing, or recovery. Commercial partners will be directed to utilize MB credits or PRM until KSC's AEM credit supply increases and policy is established that enables commercial partners to utilize KSC AEM credits.

# FLORIDA SCRUB-JAY HABITAT

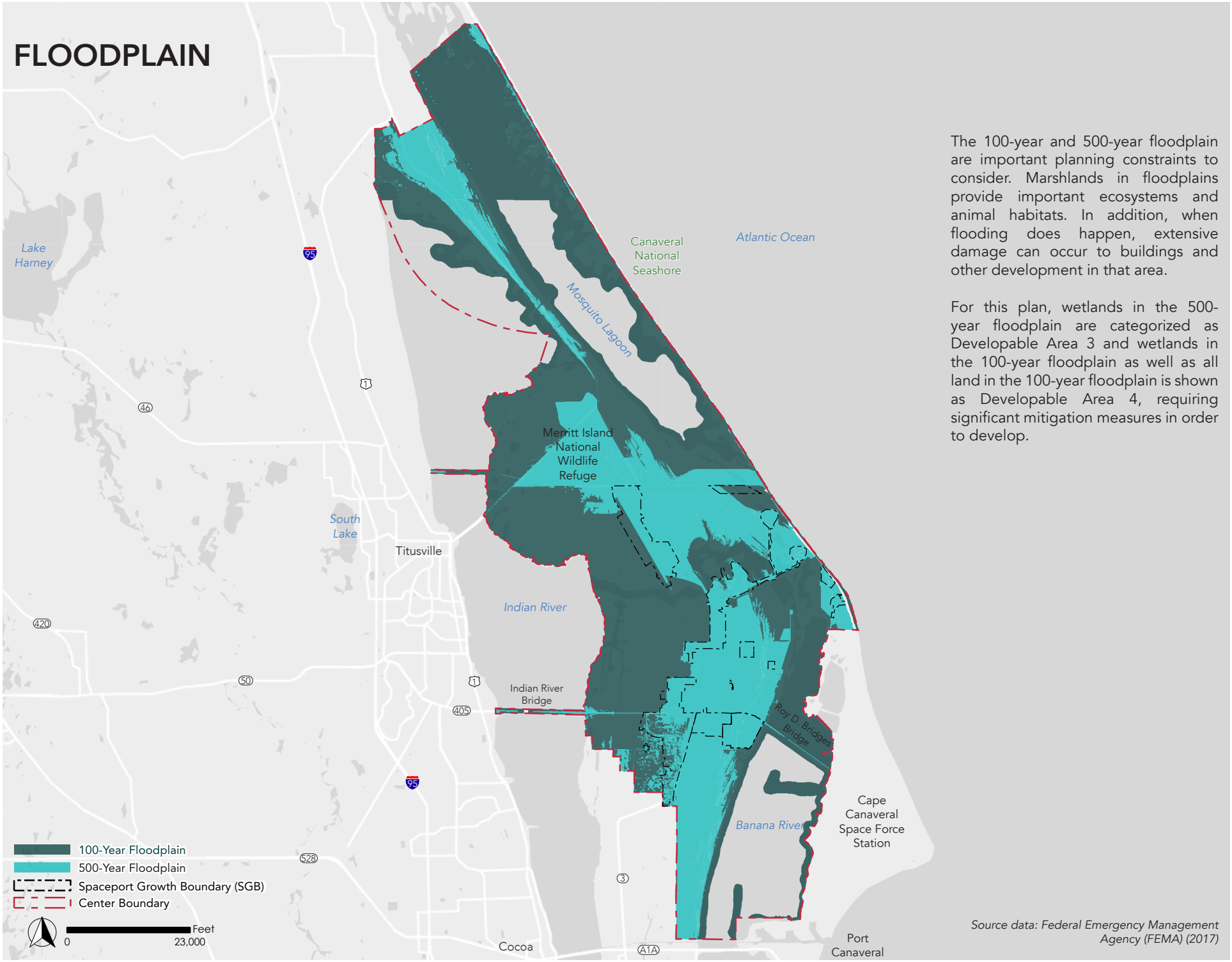



Much of KSC property is an integral area for regional species diversity. Some species are listed as endangered or threatened and KSC is working with their partners to protect and preserve important habitat and ecosystems.

KSC provides habitat for one of the three largest populations of the Florida scrub-jay. The Florida scrub-jay was added to the endangered species list in 1987 and is classified as threatened. Preserving, restoring and maintaining the bird's remaining habitat, which requires frequent controlled burns, is the key to saving the species and an important development constraint for future planning at KSC.

MINWR and KSC continue to work together to protect the Florida scrub-jay habitat on the Center.

# FLOODPLAIN




The 100-year and 500-year floodplain are important planning constraints to consider. Marshlands in floodplains provide important ecosystems and animal habitats. In addition, when flooding does happen, extensive damage can occur to buildings and other development in that area.

For this plan, wetlands in the 500-year floodplain are categorized as Developable Area 3 and wetlands in the 100-year floodplain as well as all land in the 100-year floodplain is shown as Developable Area 4, requiring significant mitigation measures in order to develop.

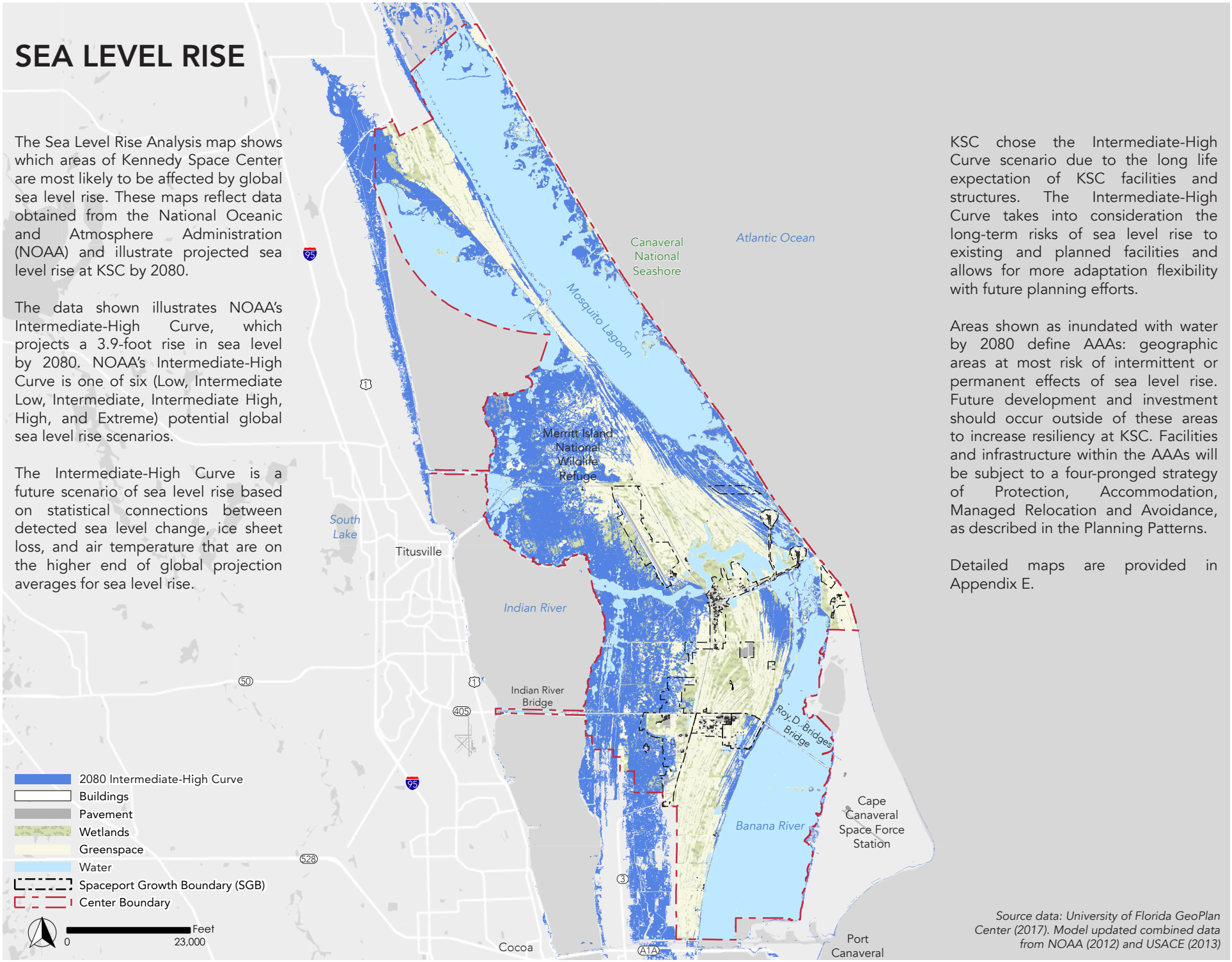
*Source data: Federal Emergency Management Agency (FEMA) (2017)*

# SEA LEVEL RISE

The Sea Level Rise Analysis map shows which areas of Kennedy Space Center are most likely to be affected by global sea level rise. These maps reflect data obtained from the National Oceanic and Atmosphere Administration (NOAA) and illustrate projected sea level rise at KSC by 2080.

The data shown illustrates NOAA's Intermediate-High Curve, which projects a 3.9-foot rise in sea level by 2080. NOAA's Intermediate-High Curve is one of six (Low, Intermediate Low, Intermediate, Intermediate High, High, and Extreme) potential global sea level rise scenarios.

The Intermediate-High Curve is a future scenario of sea level rise based on statistical connections between detected sea level change, ice sheet loss, and air temperature that are on the higher end of global projection averages for sea level rise.




KSC chose the Intermediate-High Curve scenario due to the long life expectation of KSC facilities and structures. The Intermediate-High Curve takes into consideration the long-term risks of sea level rise to existing and planned facilities and allows for more adaptation flexibility with future planning efforts.

Areas shown as inundated with water by 2080 define AAAs: geographic areas at most risk of intermittent or permanent effects of sea level rise. Future development and investment should occur outside of these areas to increase resiliency at KSC. Facilities and infrastructure within the AAAs will be subject to a four-pronged strategy of Protection, Accommodation, Managed Relocation and Avoidance, as described in the Planning Patterns.

Detailed maps are provided in Appendix E.

*Source data: University of Florida GeoPlan Center (2017). Model updated combined data from NOAA (2012) and USACE (2013)*

# INFRASTRUCTURE CONSTRAINTS

The 2014 Master Plan developed a strategy which aimed to balance the ability for NASA's mission to be successful while providing maximum opportunities for non-NASA investment at KSC. To these ends, the Plan outlined areas where new commercial development could occur that would be appropriately separated from NASA Programs to avoid, to the maximum extent possible, any new operational impacts to NASA's mission. To these efforts, KSC developed the Land Use Notice of Availability (NOA) process which provides a mechanism for commercial entities to propose new development and, as landowner, the opportunity for NASA to adjudicate those proposals to ensure they support KSC's strategic goals. As a result of these strategies, the growth of the multi-user spaceport has been remarkable, with almost 30% of employees at KSC working outside the auspices of NASA in 2019 up from only 7% in 2011.

While the growth of commercial activities at KSC provided new options and capabilities in support of NASA's missions, it also created a number of concerns. Chief among them, is if KSC's aging infrastructure, built by and for one user (NASA) over 50 years, can adequately support the extensive commercial growth and the launch cadence required by KSC's partners to meet their business cases in addition to meeting the requirements of NASA's missions and programs. A successful launch requires considerable logistics to ensure the launch vehicles and launch control have the commodities needed to launch. Outside of launch day, the separation of commercial and government has resulted in a wider geographic area for spaceport service infrastructure and an increased demand on KSC's day-to-day support infrastructure (e.g wastewater, water, stormwater, IT, etc.).

In an effort to understand the ability for KSC's infrastructure to meet existing and future demands of NASA and its commercial partners, NASA developed a comprehensive assessment of its civil, electrical, and mechanical infrastructure to identify any weaknesses in launch or day-to-day infrastructure that would impact launch rate and the further growth of the multi-user spaceport. KSC examined the spaceport's water, wastewater, natural gas, stormwater, electric, fiber optics/IT, gaseous nitrogen (or GN2) and gaseous helium (or GHe) systems to identify each system's "breaking point" and provide KSC with data to help prioritize and justify future investments. The analysis utilized a maximum-growth scenario (based on full build-out of the 2014 Master Plan) which projected that KSC's population would grow from 10,300 in 2019 to 18,900 in 2034 and as many as 100 projected annual launches by 2028. The growth projections utilized current partner projected employee totals as a projection baseline and assumed that form and pace of growth would continue until KSC reached its full build-out capacity (15,000 total acres).

## IDENTIFIED INFRASTRUCTURE CONSTRAINTS

**Launch Infrastructure**

NASA analysis has determined that the current launch infrastructure is appropriately sized to support NASA's Space Launch System (SLS) which has the largest draw upon the systems along with other future NASA programmatic

requirements. The analysis found minimal impact on launch infrastructure as utilized for traditional launch campaigns sufficiently separated on the launch calendar (5-7 days minimum).

Spaceport Viability Consideration

While the infrastructure is able to support the traditional manifests it was developed for, the analysis has found that limitations related to the availability and storage of GN2 (gaseous nitrogen), LN2 (liquefied nitrogen) and GHe (gaseous helium) might limit KSC's ability to support the overlapping launch campaigns that will be necessary to meet the projected launch tempo over the next two decades. As commercial launch providers often support NASA missions these limitations could adversely impact the success of those missions being launched from KSC. In order to maximize the future launch potential at KSC, upgrades will need to be made to KSC's GN2 system to increase flow rates and provide additional LN2 storage to provide a range of launch vehicles with the capacity needed to conduct frequent high-usage events. Future launch providers will also require additional helium supply and expansion of its distribution system as helium storage and flow rate are the infrastructure limitations expected to have the biggest impact on the launch manifest. The global helium shortage will make these limitations challenging to address and will require a strategy to minimize the delay of launches and other events to remain within capacity.

**Wastewater**

All of KSC uses the CCSFS Wastewater Treatment Plant for its wastewater. The growth of commercial development at KSC since 2011 has increased system loads by a considerable amount. The system is unique to other municipal systems as it not just used for the effluence of personnel, the system is used to dispose of water utilized for launch (specifically the sound suppression deluge systems). As personnel increases and launch rates increase so will the Treatment Plant's wastewater discharge amount that is currently permitted to handle only 0.8 million gallons per day.

Spaceport Viability Consideration

Based on NASA's maximum growth scenario, the CCSFS Wastewater Treatment Plan could reach its capacity by 2028 which would constrain future development at KSC unless near-term steps are taken to address this total permitted capacity. Additionally, KSC's legacy wastewater infrastructure is inefficient due to its age and the growth of its service area impacting flow rates. This geographic expansion of the development area has contributed to a number of bottlenecks and decreased flow rates impacting the efficiency of the system. There are a number of focused improvements that have been identified that would modernize this critical system to meet future demands. The force main that connects KSC's wastewater flow to CCSFS via the Banana River should be replaced or upgraded to support more efficient flow rates and protect against potential failures. Upgrades to the system's lift stations and pump stations should also be addressed to improve the system's flow rates. Additionally, KSC should be looking to have municipal sewer expanded to commercial zones or other strategies including expansion of the spaceport's treatment capacity.

# INFRASTRUCTURE CONSTRAINTS

**Electrical**

KSC's power distribution consists of 115 kilovolt (kV) powerlines that supply power to KSC's power substations (C-5 and Orsino), FPL's Mars substation located near Exploration Park, and power substations at CCAFS. The distribution systems for the C-5 and Orsino substation are owned and maintained by NASA to ensure that KSC's launch activities can obtain sufficient and consistent power capabilities needed to support operations that require high levels of demand. KSC's distribution systems are also designed with redundancies that protect against potential outages that occur as a result of high-demand operations. The Mars substation is owned and operated by FPL to provide power to non-NASA entities in Exploration Park and the surrounding area. Its distribution system is not connected to KSC's grid that reduces the load demands supplied by KSC's substations.

Spaceport Viability Consideration

While KSC's existing power grid can support existing NASA operations, additional upgrades and modifications are needed to support concurrent operations. To provide future NASA programs with greater redundancy, investments should be made toward the grid's feeder capacity to ensure potential failures/outages do not impact launch schedules. Because of its age, the study also recommended replacing and/or upgrading other grid components such as load break switches, transformers, and other substation support equipment to ensure the electrical grid can support future and evolving operations. Additional substations are recommended to support future development.

FORWARD STEPS

The future viability of the spaceport requires opportunities for growth to meet existing and future missions and the ability to support a launch cadence that meets the demand of commercial users while simultaneously ensuring NASA requirements continue to be met. KSC's understanding of infrastructure limitations that could adversely impact this spaceport viability will continue to evolve as the number of users grows and as new technologies come online. In the near term, NASA will prioritize the infrastructure investments currently identified as potential contributors to a reduced launch rate or development at KSC and include them in KSC's capital improvement plan.

Going forward, KSC must prioritize projects that will help the spaceport "right size" its infrastructure, such that there is enough capacity to support near- and long-term growth without over sizing the infrastructure at additional expense and operational inefficiency. To accomplish this, NASA is developing infrastructure modeling capabilities and toolsets that will convey each system's capacity based on current and future demand, along with how planned and potential future projects impact each portion of KSC's infrastructure network. This form of collaboration among spaceport operations, programs, and other users will provide Center stakeholders with the ability to track each infrastructure system's capacity and limitations to inform decision making and the future prioritization of investments. These tools will also confirm that projects are sized properly and account for long-term growth, rather than just the immediate need. Additionally, these modeling capabilities will be used to identify which operational events need to be supported in parallel to adequately support the launch manifest. This approach ensures that KSC infrastructure will be sized consistently and able to support the same parallel events.

KSC continues to create and evolve its approach to holistically managing the spaceport with these metrics to inform decision making that will influence how investments are made across KSC's infrastructure system. Utilizing a combination of our current analysis of KSC's infrastructure limitations and these models and tools will allow KSC to be adaptable in a dynamic multi-user environment of evolving infrastructure demands to ensure that the nation's launch manifest, consisting of both NASA and commercial operations, can successfully operate at KSC.

# DEVELOPABLE AREA

Using the constraints and site analysis as a foundation, the Developable Area Maps identify areas appropriate for development or redevelopment within the districts at KSC. SGBs within each district were identified during the Vision Plan process to guide future growth and consolidate operations to the greatest extent possible. The SGBs, shown here, define the limits of future development within each district thus areas outside of the SGBs are considered Undevelopable Areas.

Developable Area 1 is the easiest to develop as this signifies land available with the minimum amount of constraints, such as flooding or safety hazards. Land within Developable Area 4 would require significant mitigation to develop.

The legend corresponds to the following definitions for each Developable Area type:

**Developable Area 1 (green)**
Minimal natural and manmade constraints, free of buildings, roads, and parking, and as such can be built on immediately

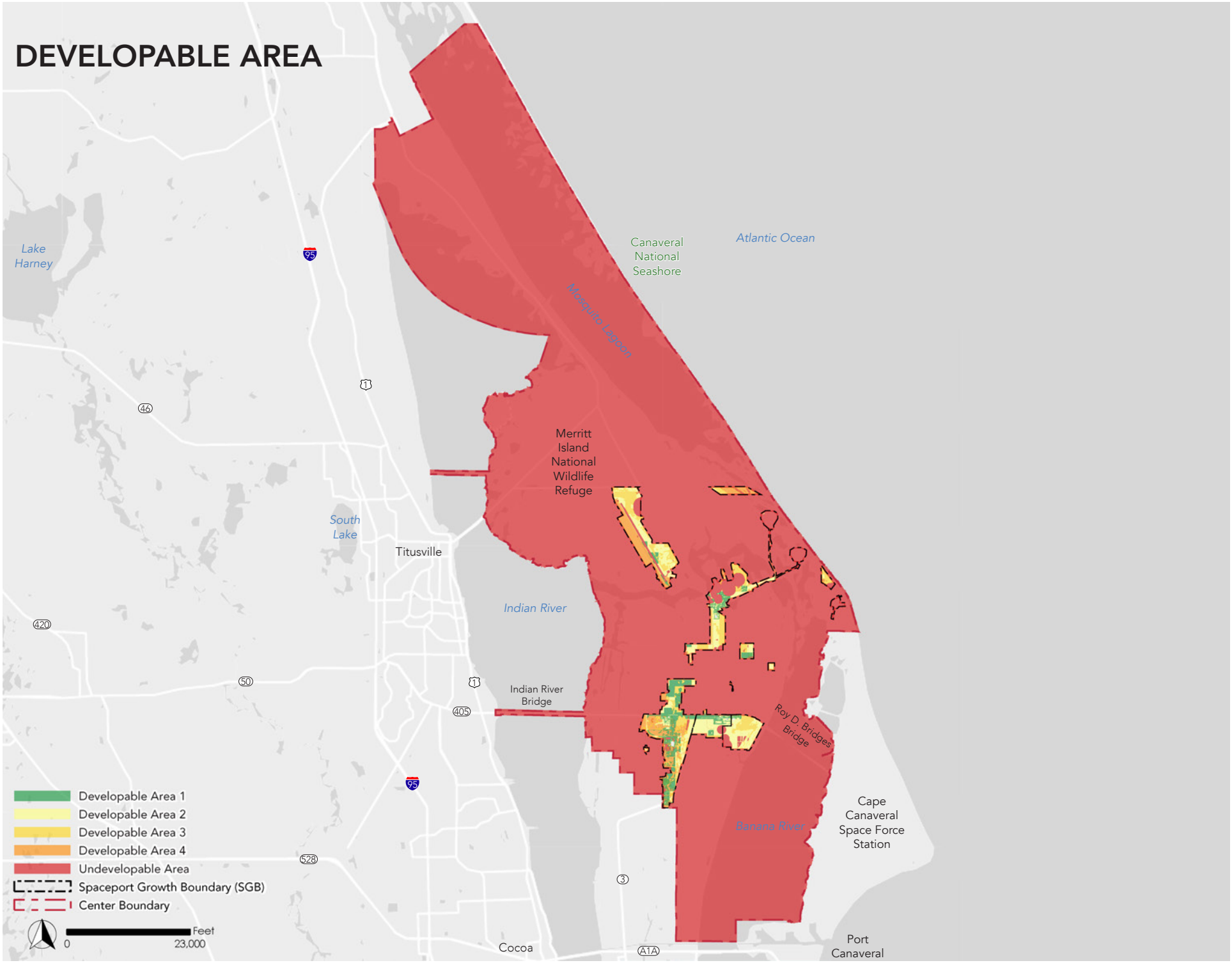
**Developable Area 2 (yellow)**
Some natural and manmade constraints and may include existing horizontal infrastructure, auxiliary areas for potential Florida scrub-jay habitat, significant vegetation, sidewalks, driveways, hardstands, and most pavement unless denoted as a road or bridge; Appropriate opportunities for infill development

**Developable Area 3 (light orange)**
More constraints, including land with existing buildings that may need to be demolished or areas that require significant environmental or cultural mitigation, core and support areas for potential Florida scrub-jay habitat, buildings and structures (unless categorized as "to Remain" which show in grey), and wetlands in the 500-year floodplain

**Developable Area 4 (dark orange)**
Areas requiring significant mitigation analysis including wetlands in the 100-year floodplain, and the 100-year floodplain

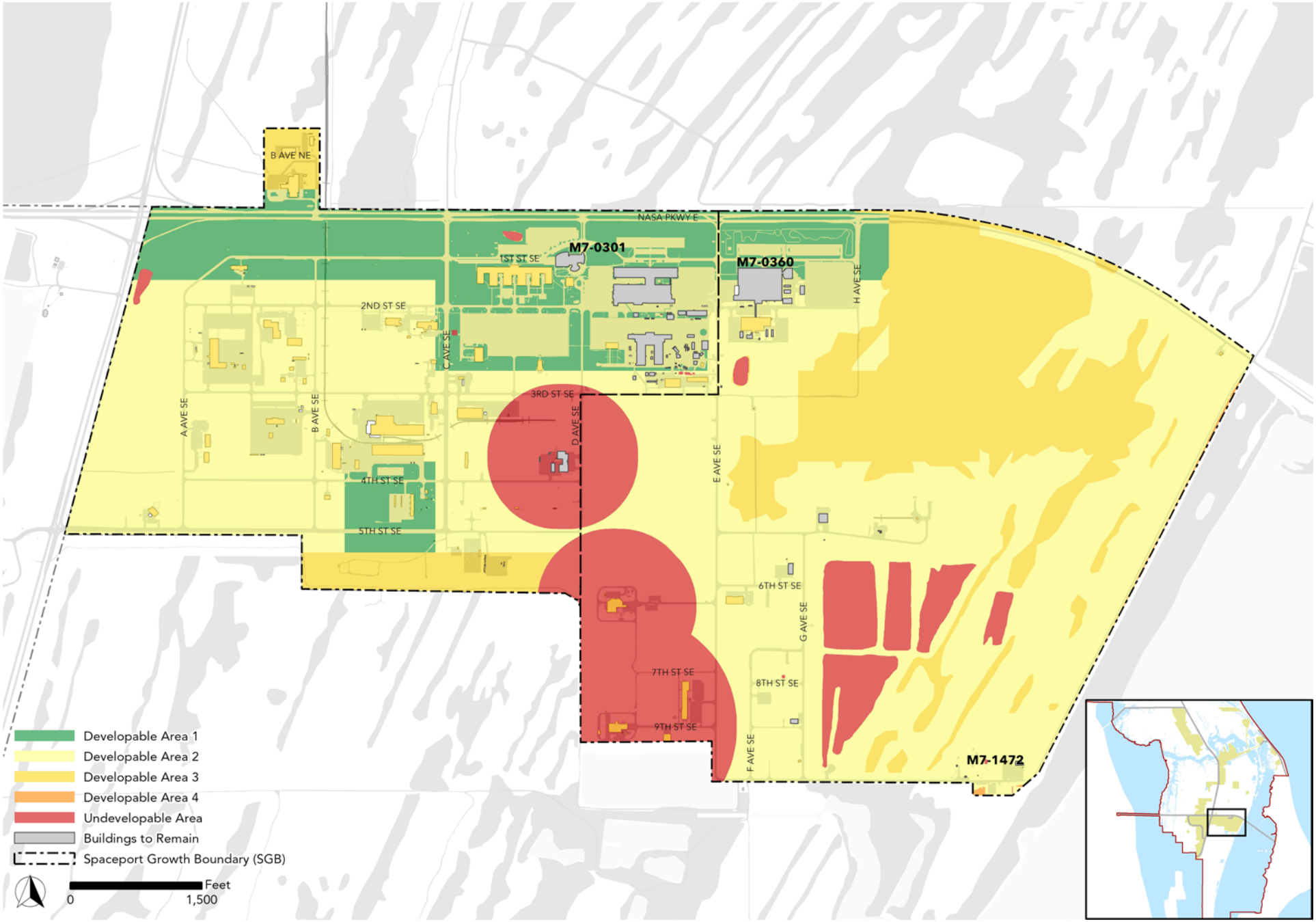
**Undevelopable Area (red)**
Areas with significant constraints and/or are outside the designated development boundary, railroad infrastructure, protected species areas (i.e., Eagle's nest), archeological sites, QD Arcs, and water bodies

# DEVELOPABLE AREA



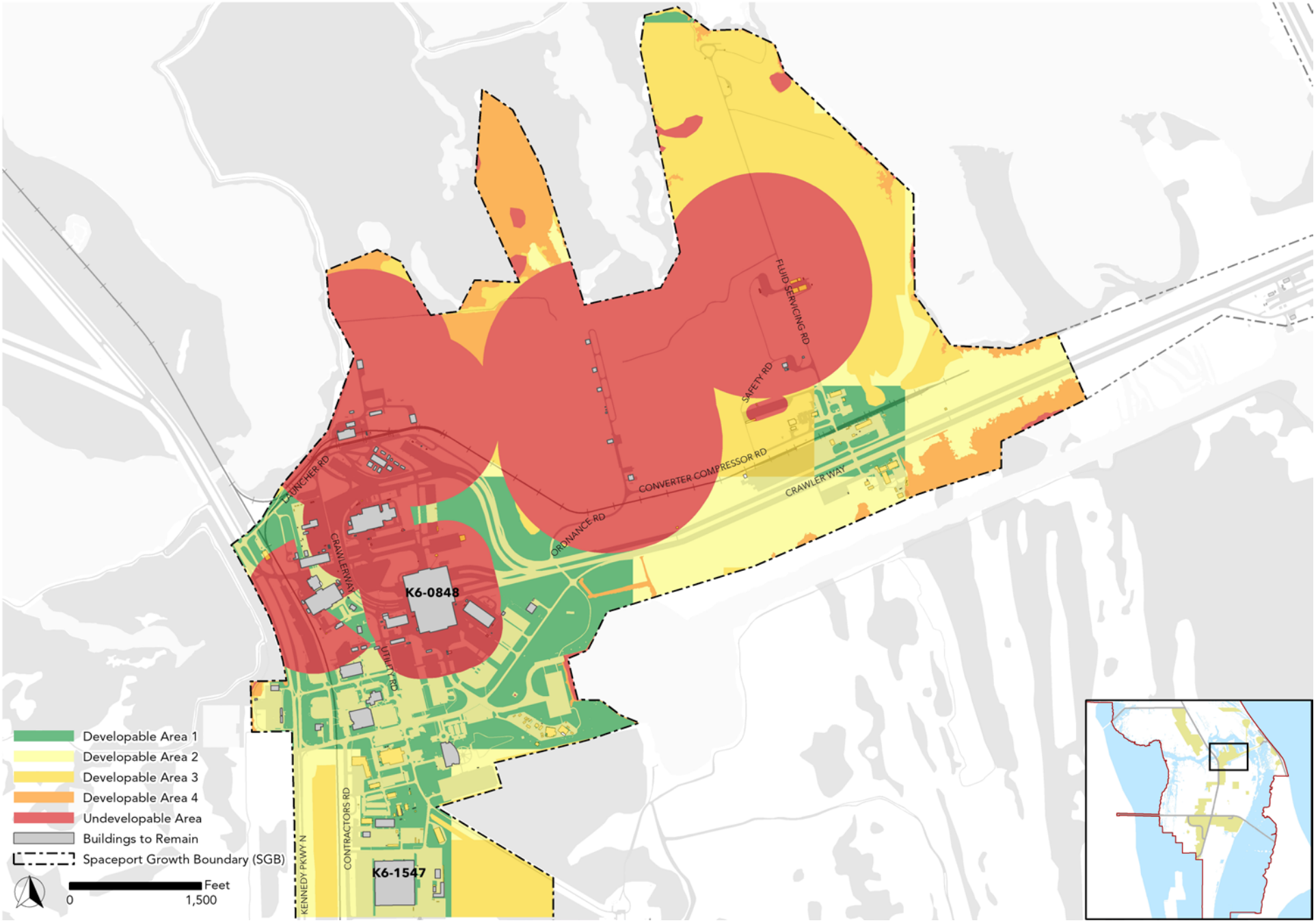
# DEVELOPABLE AREA

CENTRAL CAMPUS DISTRICT SGB & CENTRAL PROCESSING DISTRICT SGB



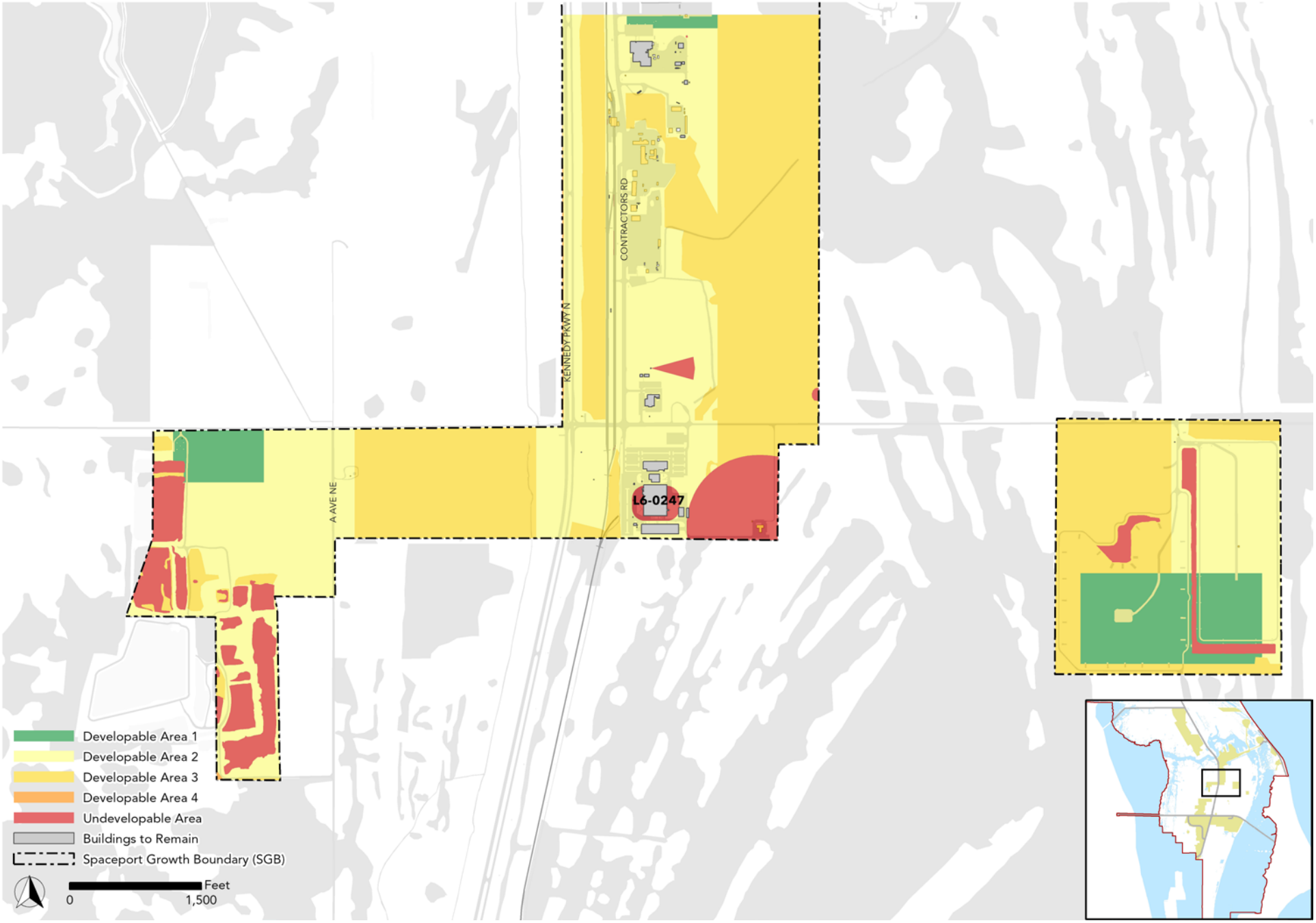
# DEVELOPABLE AREA

VAB DISTRICT SGB - NORTH



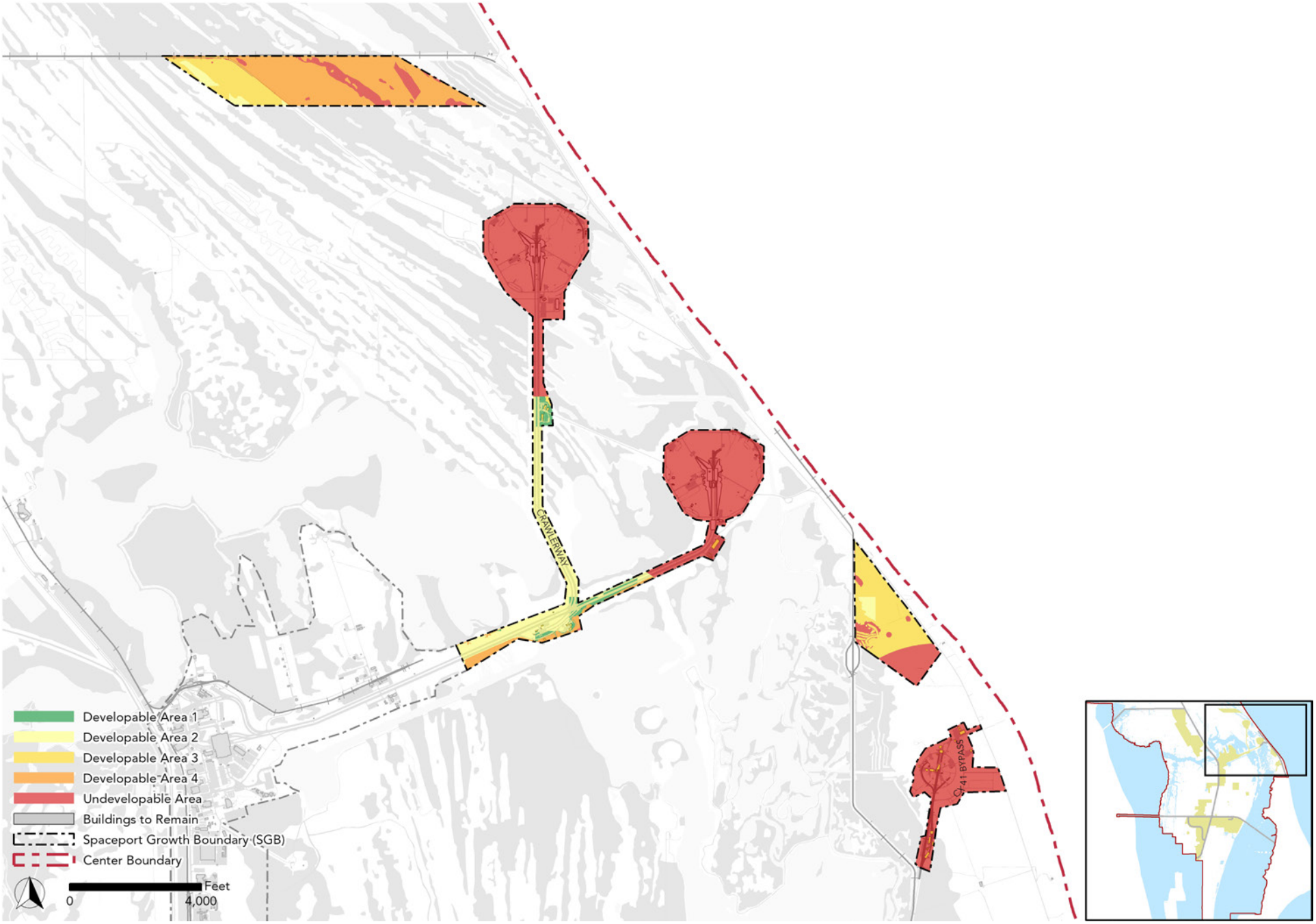
# DEVELOPABLE AREA

VAB DISTRICT SGB - SOUTH



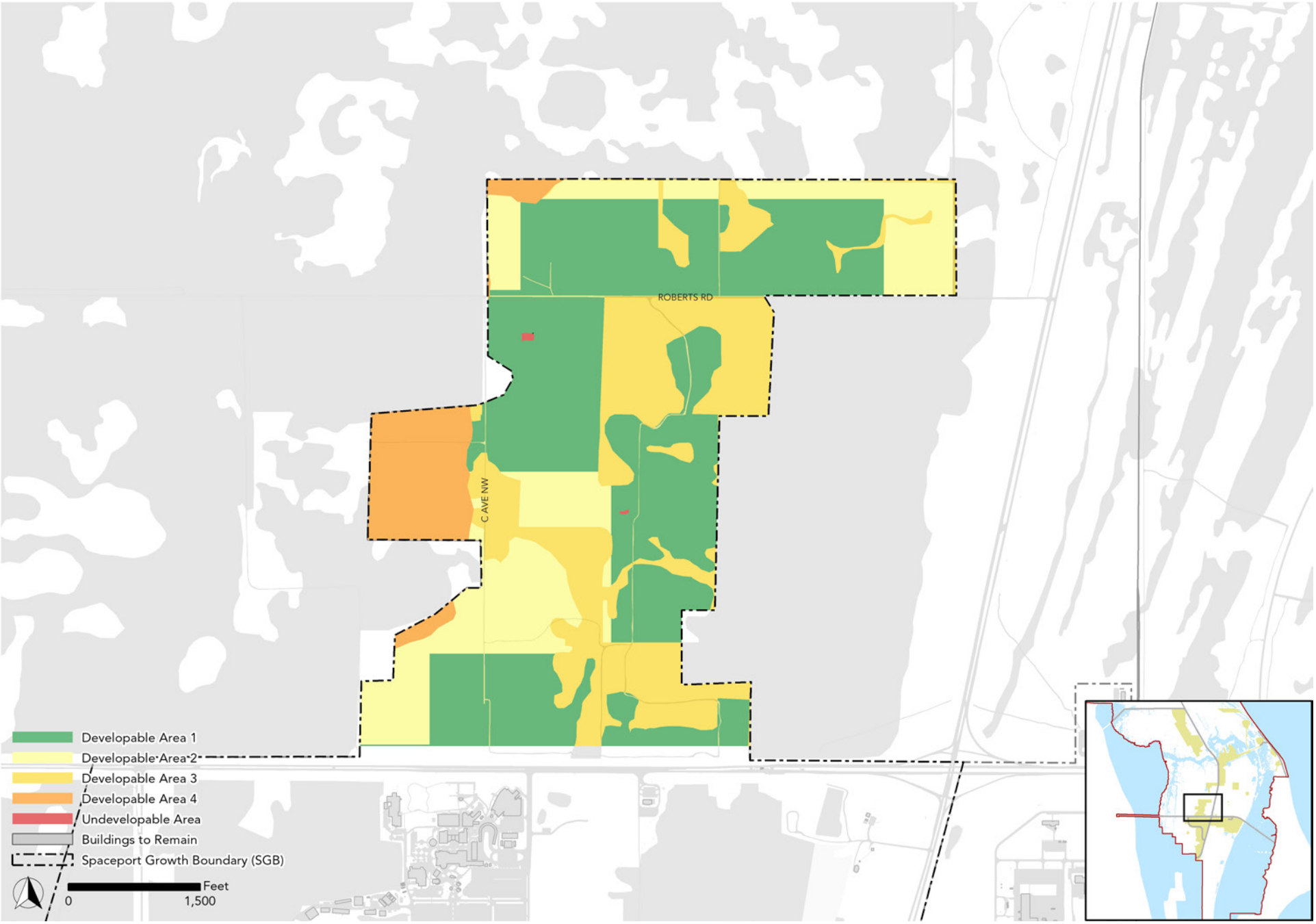
# DEVELOPABLE AREA

EXPLORATION LAUNCH DISTRICT



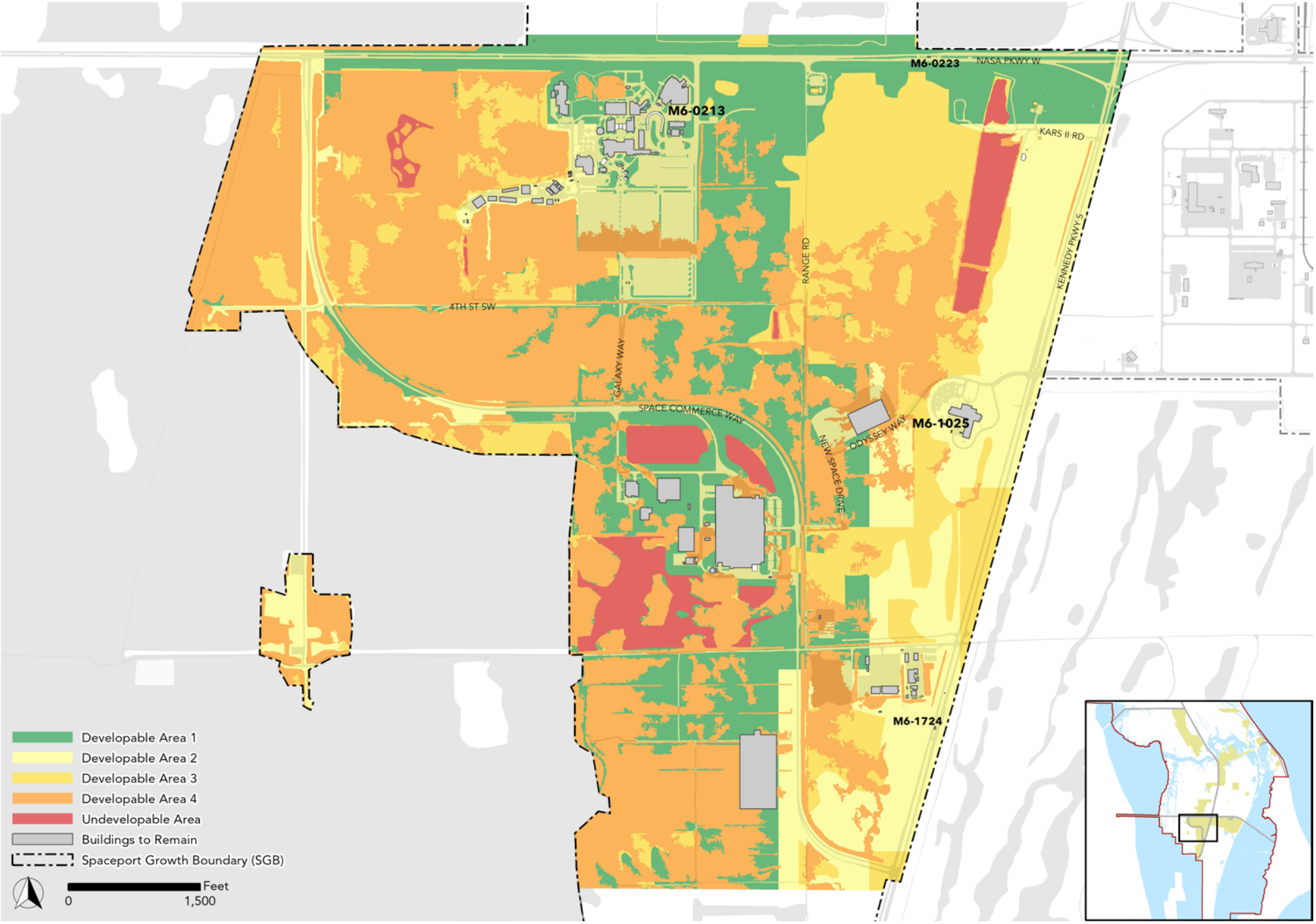
# DEVELOPABLE AREA

SPACE COMMERCE DISTRICT SGB - NORTH



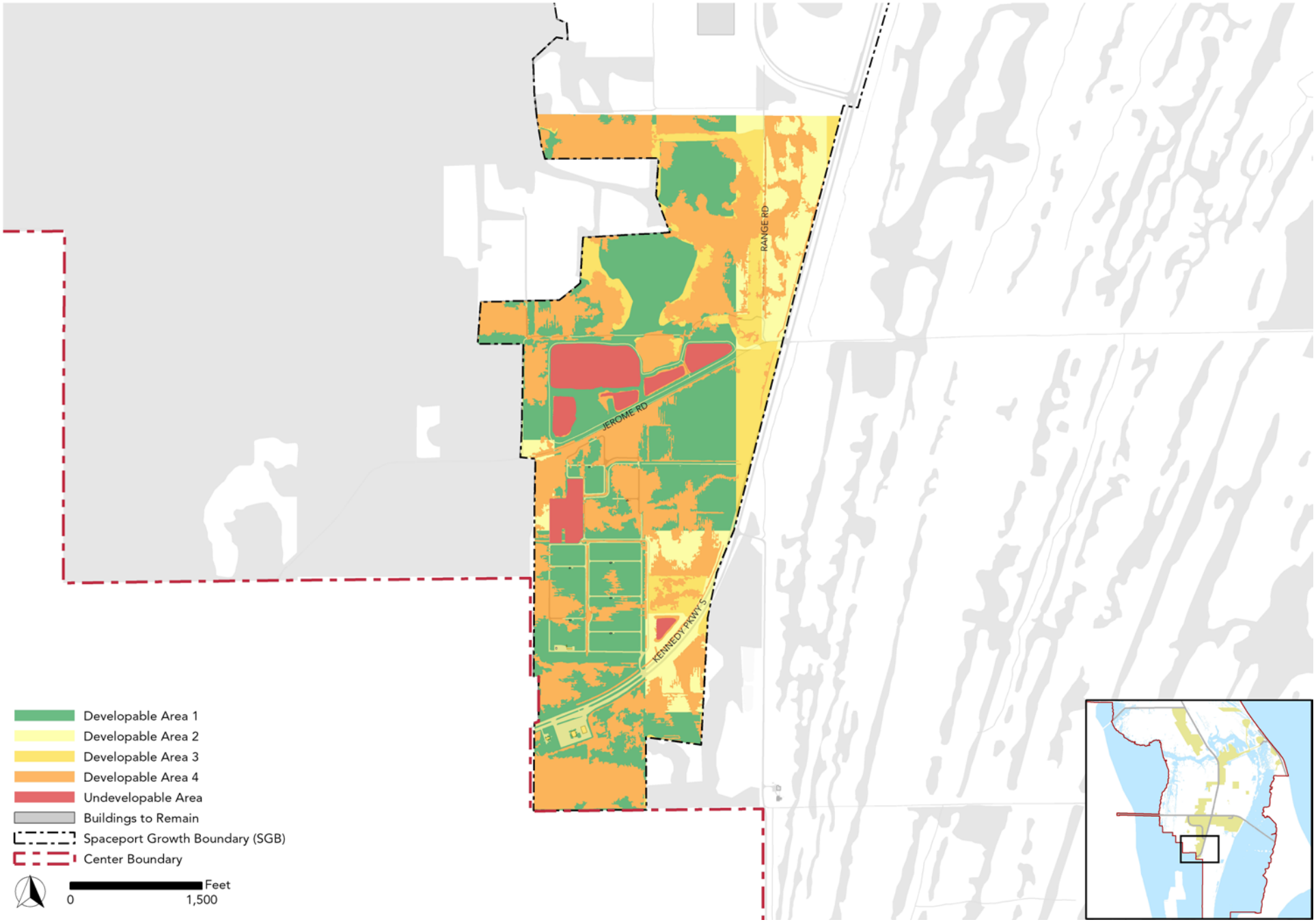
# DEVELOPABLE AREA

SPACE COMMERCE DISTRICT SGB - CENTRAL



# DEVELOPABLE AREA

SPACE COMMERCE DISTRICT SGB - SOUTH



# 5 FUTURE DEVELOPMENT PLAN

Like the planning vision, the Center's future development plan emerged out of a collaborative process where key stakeholders identified projects needed to support the critical missions of KSC. These are actual projects, prioritized by three broad funding streams: institutional funding, program funding, and non-NASA funding. Stakeholders also conducted a risk analysis to help with project prioritization. Stakeholders prioritized projects that significantly reduced the risk associated with executing mission operations.

# FUTURE DEVELOPMENT PLAN

The Summary Future Development Map reflects preliminary locations for future projects. Project locations were developed during the Center Vision Plan workshop using existing programmed project information as well as opportunities identified by stakeholders. The project list and locations were further refined by the Vision Plan Working Group and Center leadership.

The high-level map aligns with the KSC Vision, strategic plans, NASA Program needs, technical capability requirements, institutional space requirements, infrastructure requirements, and future space demands. It reflects the goals of the Master Plan to cluster compatible uses and separate hazardous and non-hazardous operations. This approach encourages infill development, synergy between users, efficiency in operations, safety for the multi-user workforce, and preservation of critical habitats at KSC.

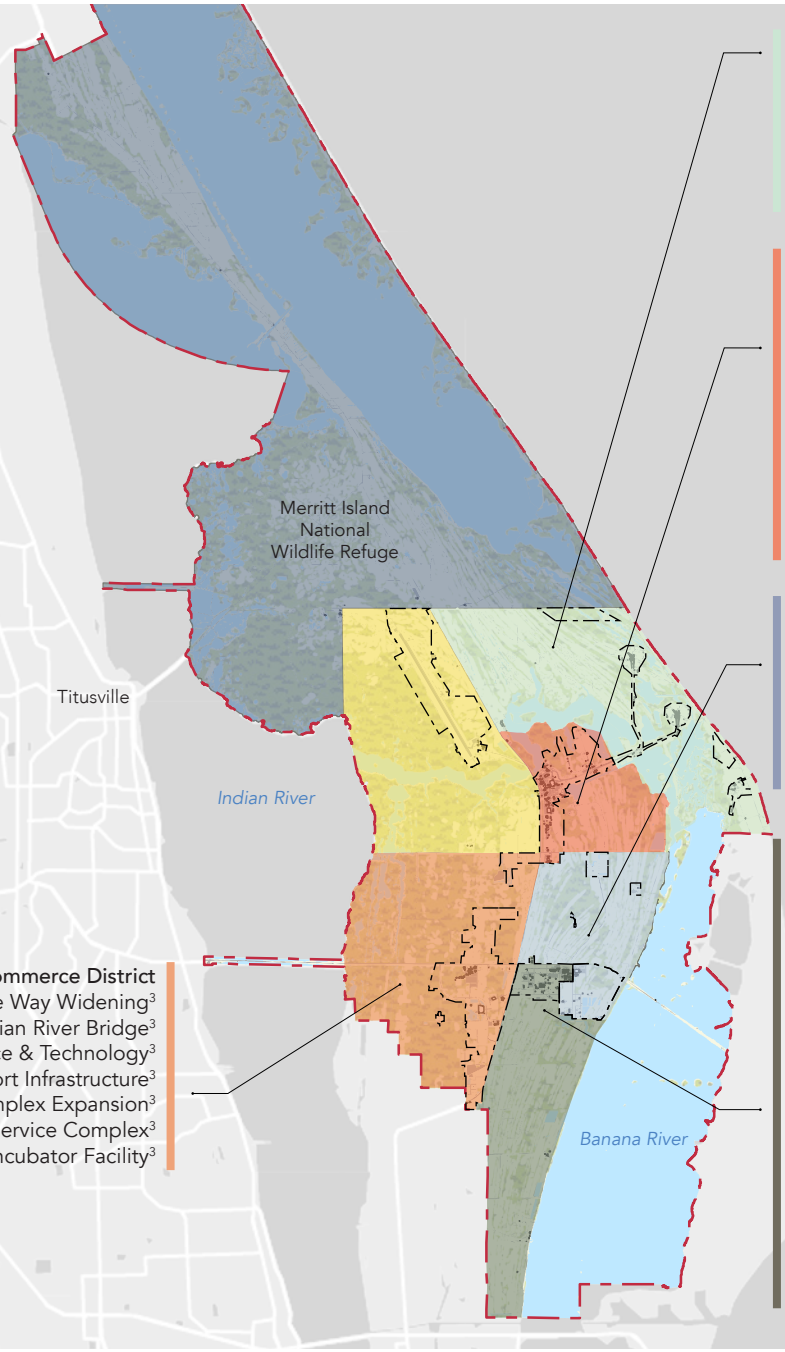
Stakeholders rated each project by priority depending on if it was required to achieve KSC's mission, needed but not required, or simply nice to have at some point in the future. This prioritization was refined as high, medium, or low priority projects. Low priority projects are not shown on the maps and are listed in Appendix C.

The projects and locations shown will be refined with KSC leadership and key stakeholders and justified using NASA planning guidance in future planning efforts as part of the 2020 Master Plan update.

# SUMMARY FUTURE DEVELOPMENT MAP

The Summary Future Development Map reflects development opportunities generated by stakeholders as well as projects already identified as part of strategic priorities for KSC. The future projects list on the following pages is organized by funding stream and is in alignment with projected funding and footprint reduction initiatives to demonstrate affordability.

New facilities listed aim to consolidate and centralize functions within SGBs while replacing outdated facilities. Projects, prioritization, and locations will be further defined as part of the next steps in the Master Plan update.




**Exploration Launch District**
- KSC Multi-User Electrical Infrastructure Upgrades (LC-39 Feeder)[1]
- KSC Multi-User Electrical Infrastructure Upgrades (Emergency Power Plant)[2]
- Shoreline Resiliency Projects[1]
- Launch Complex-49 Development[3]

**VAB District**
- Communications, Press, and Public Engagement Facility (New Press Site)[1]
- Bio-Wastewater Treatment Facility in VAB Area[1]
- Expansion to Converter Compressor Facility, Phase 2[2]
- Converter Compressor Facility (CCF) Upgrades, Phase 3[2]
- New Electrical Substation[3]
- Alternative Power Generation and Storage Facility[1, 3]
- Expansion of Ordnance Storage[3]
- Commodity Storage Complex[3]
- Treatment, Storage and Disposal Facility (TSDF)[1]
- Centralized Consolidated Warehouse Facility[1]

**Central Processing District**
- Roy D. Bridges (Banana River) Bridge[1]
- Advanced Exploration Processing and Encapsulation Facility (MPPF/PHSF/SSPF Successor) (Processing and Encapsulation Complex, Ph1)[2]
- Next-Gen Animal Care Facility (Processing and Encapsulation Complex, Ph3) [2]

**Central Campus District**
- Mission Support Consolidation (Central Campus Phase 2)[1]
- Applied Science and Technical Analysis Facility (Central Campus Phase 3 Lab Consolidation)[1]
- Spaceport Command, Control, and Emergency Support Facility (Central Campus Phase 4)[1]
- Communication Distribution Switching Center[1]
- Modernize and Upgrade Physical Security Infrastructure, Phase 1 and 2[1]
- New Child Development Center[1]
- Parking Garage[1]
- Orion Processing Surge Facility[2]
- Lunar/Mars Surface Systems / In-Situ Resource Utilization (ISRU) Test and Checkout Facility (Processing and Encapsulation Complex, Ph2)[2]
- O&C South Wing Renovation - Phase 1[2]
- O&C South Wing Renovation - Phase 2[2]
- Fitness and Sports Center[3]

**Space Commerce District**
- Space Commerce Way Widening[3]
- Indian River Bridge[3]
- Magnet School for Science & Technology[3]
- Space Tourist Support Infrastructure[3]
- Public Outreach / Visitor Complex Expansion[3]
- Public/GOV Multi-Purpose Service Complex[3]
- Small Business Collaboration Incubator Facility[3]

**Funding Stream**
[1] Institutional
[2] Program
[3] Non-NASA

Spaceport Growth Boundary (SGB)
Center Boundary

0 Feet 23,000

# FUTURE PROJECTS

The future projects list was developed during the Center Vision Plan workshop and then refined by leadership and key stakeholders. This project list is organized into Short-, Mid-, and Long-term priorities for KSC and is in alignment with projected funding and footprint reduction initiatives to demonstrate affordability.

Institutional funding streams support the overall Center, Program funding is for a specific NASA mission, such as the Artemis Program. Project prioritization is subject to change as the Master Plan is updated and projects are refined.
Low-priority projects are listed in Appendix C.

## INSTITUTIONAL FUNDING

| Project | | Priority | Description |
|---|---|---|---|
| 1 | KSC Multi-User Electrical Infrastructure Upgrades (LC-39 Feeder) | Short-term | Additional feeder from C-5 switch to Switch Station 900 to support SLS plus other commercial launches concurrent with LC39A processing |
| 2 | Mission Support Consolidation Ph2 (CC Ph2) | Short-term | Multi-use facility for non or minimally hazardous mission support functions with flexibility for a variety of both administrative and support uses |
| 3 | Applied Science and Technical Analysis Facility (CC Ph3 Lab Consolidation) | Mid-term | Facility to consolidate center-wide non- or minimally-hazardous lab capabilities from space within operational facilities and functionally obsolete facilities into a dedicated facility |
| 4 | Spaceport Command, Control, and Emergency Support Facility (CC Ph4) | Mid-term | Facility to serve as a spaceport command facility to serve as a central point for oversight and integration of spaceport processing and launch support activities and emergency operations as well as the replacement of Fire Station #1 and the Occupational Health Facility (OHF) |
| 5 | Communications, Press and Public Engagement Facility (New Press Site) | Mid-term | New Press Site that consolidates all public affairs facilities one building to better enable public and media engagement at KSC; Facility will provide increased capabilities to support TV broadcasts, space supporting the development of multimedia for NASA outreach, and increased space to support press/media for launch activities |
| 6 | Centralized Consolidated Warehouse Facility | Mid-term | A centralized warehouse and storage facility to consolidate center-wide warehouse capabilities into one facility to reduce warehouse inventory and increase storage efficiencies |
| 7 | Communication Distribution Switching Center | Mid-term | Facility to replace existing functionally obsolete center-wide communication and distribution hub to more efficiently meet the growing requirements of the multi-user spaceport |
| 8 | Modernize and Upgrade Physical Security Infrastructure, Ph1 | Mid-term | Updates to the horizontal Infrastructure (Fence, IDS, Canopies, etc.) |
| 9 | Shoreline Resiliency Projects | Mid-term | Project recommendations based on long-term climate change and sea level rise |
| 10 | Modernize and Upgrade Physical Security Infrastructure, Ph2 | Long-term | Updates to the vertical infrastructure (New HQ and Mail Sorting facility) |
| 11 | New Child Development Center | Short-term | Facility to replace and relocate the current functionally obsolete Child Development Center to better meet state and federal childcare facility requirements, provide support to the growing multi-user spaceport employee population, and relocate the facility to be closer proximity to the centralized workforce hub |
| 12 | Central Maintenance Complex | Long-term | A centralized maintenance complex to consolidate existing center-wide shop and maintenance facilities into one centralized complex to support NASA and partner needs |
| 13 | Treatment, Storage and Disposal Facility (TSDF) | Long-term | Need for one facility to handle treatment, storage, and disposal to reduce impact of local environmental waste |

# FUTURE PROJECTS

| | **Project** (Institutional Funding, continued) | **Priority** | **Description** |
|---|---|---|---|
| 14 | Roy D. Bridges (Banana River) Bridge | Long-term | Replacement of the Roy D. Bridges Bridge to provide an additional path to transport payloads from KSC to launch sites on CCAFS |
| 15 | Bio-Wastewater Treatment Facility in VAB Area | Long-term | Treatment facility in VAB area for bio-wastewater treatment |
| 16 | Alternative Energy Generation and Storage Facility | Long-term | Generate energy on-site from green sources and include energy storage capability (e.g. battery, flywheel, super-capacitor, thermal). Improve KSC resilience to natural and man-made disasters, accommodate spaceport growth, improve air and water quality, reduce electric bills for all NASA and hosted users. |
| 17 | Parking Garage | Long-term | Parking infrastructure facility to house the growing KSC population needs on a reduced land footprint |

## PROGRAM FUNDING

| | **Project** | **Priority** | **Description** |
|---|---|---|---|
| 1 | Expansion of Converter Compressor Facility, Phase 1 (helium; underway) | Short-term | Needed upgrade to facility to handle additional future program and mission needs |
| 2 | KSC Multi-User Electrical Infrastructure Upgrades (Emergency Power Plant) | Short-term | Construct a new emergency power generator plant in the Switch Station 900 area dedicated to LC-39A&B to free up EPP capacity |
| 3 | CCF Upgrades, Phase 3 | Short-term | Additional needed upgrade to facility to handle additional future program and mission needs |
| 4 | Orion Processing Surge Facility | Short-term | Processing surge facility for Orion program for future program and mission needs |
| 5 | O&C South Wing Renovation - Phase 1 | Mid-term | Needed updates to the current O&C to modernize and infrastructure to meet future needs at KSC; Requires CC Ph3 |
| 6 | O&C South Wing Renovation - Phase 2 | Mid-term | Needed updates to the current O&C to modernize and infrastructure to meet future needs at KSC; Requires CC Ph3 |
| 7 | Rehabilitate Jay Jay Railroad Bridge, H2-1198 | Mid-term | |
| 8 | Advanced Exploration Processing and Encapsulation Facility (MPPF/PHSF/SSPF Successor) (Processing and Encapsulation Complex, Ph1) | Long-term | This facility is designed to replace augment the current SSPF complex and provide increased capability to meet the demands of processing vehicles for future interplanetary missions |
| 9 | Lunar/Mars Surface Systems / In-Situ Resource Utilization (ISRU) Test and Checkout Facility (Processing and Encapsulation Complex, Ph2) | Long-term | Future mission and programmatic facilities needed for lunar operations |
| 10 | Next-Gen Animal Care Facility (Processing and Encapsulation Complex, Ph3) | Long-term | New large multi-payload facility to support NASA and NASA-related missions; Facility to support hazardous operations (integration, fueling, nuclear, and encapsulation) for a variety of spacecraft types and launch vehicle configurations (Commercial and Government) |

# FUTURE PROJECTS

## NON-NASA FUNDING

| | Project | Funding Stream |
|---|---|---|
| 1 | Space Commerce Way Widening | Non-NASA |
| 2 | New Electrical Substation | Non-NASA |
| 3 | Launch Complex-49 Development | Non-NASA |
| 4 | Indian River Bridge | Non-NASA |
| 5 | Small Business Collaboration Incubator Facility | Non-NASA |
| 6 | Magnet School for Science and Technology | Non-NASA |
| 7 | Alternative Power Generation and Storage Facility | Non-NASA |
| 8 | Fitness and Sports Center | Non-NASA |
| 9 | Space Tourist Support Infrastructure | Non-NASA |
| 10 | Expansion of Ordnance Storage | Non-NASA |
| 11 | Commodity Storage Complex | Non-NASA |
| 12 | Public Outreach / Visitor Complex Expansion | Non-NASA |
| 13 | Public / GOV Multi-Purpose Service Complex | Non-NASA |

# RISK ANALYSIS SUMMARY

Stakeholders conducted a risk analysis on all projects and opportunities identified during the Center Vision Plan workshop. These projects include those on the future projects list.

The level of risk was rated high, medium, or low for each category:

The risk to Mission assessed the threat to KSC's and NASA's mission if the project is not completed. For example, it would be detrimental to NASA's mission if the Spaceport Command, Control, and Emergency Support Facility is not completed because this support function is necessary for KSC to safely manage, develop, and sustain systems that enable access to space - a key part of the mission.

The other risk categories were assessed for the impact the project may have if completed.

Environmental risk addresses the impact the project may have on the natural environment, including risk to water, soil, and air quality, critical habitat, wetlands, and other impacts.

The risk to Budget was rated low for projects estimated to cost under $25 million, medium for projects estimated between $25 million and $75 million, and high for project costs over $75 million.

The risk to overall Resilience illustrates the impact on KSC's ability to respond to acute disasters, such as a hurricane or flooding from a storm event.

Sustainability risk addresses the impact the project may have on KSC's ability to avoid depletion of natural and economic resources over time. This includes effects such as sea level rise and diversity of funding streams.

Stakeholders assessed Political risk for the impact a project could have on public perception of NASA and KSC. Low risk in this category represents either positive public perception or simply having no public interest.

Future Development Considerations

The completed risk analysis (see Appendix D) will help decision-making in future planning documents. A project that is important for sustaining NASA's mission at KSC and has low risk or impact in the other categories could be completed with greater ease as it would have agency support while not causing a large impact on other areas. For example, the Communication Distribution Switching Center project is critical to supporting NASA's mission and will have a low impact environmentally, is relatively low cost, and is not politically sensitive. With this analysis, the project should move forward quickly to mitigate the risk to mission with a low impact to other factors.

Risk ratings can change over time and the project list and associated risks will continue to be assessed throughout the life of the Master Plan and project development.

# 6 PROGRAMMATIC ENVIRONMENTAL ASSESSMENT

The Programmatic Environmental Assessment presented in the following pages is a high-level look at the potential environmental impacts of development at KSC. The bottom line is that implementation of this Vision Plan would not have any significant adverse effects and would not contribute to a significant cumulative adverse effect when combined with projected, reasonably foreseeable future actions.

This section is part of the integrated Environmental Assessment (EA) prepared for the Kennedy Space Center (KSC) Vision Plan. This EA section is a tiered National Environmental Policy Act (NEPA) analysis from the 2016 Kennedy Space Center Center-Wide Operations Final Programmatic Environmental Impact Statement (PEIS), which evaluated the potential environmental impacts from proposed center-wide KSC operations, activities, and facilities as described in the 2014 Center Master Plan (CMP). To the extent practicable, this EA incorporates information and analyses presented in the 2016 PEIS, summarizes applicable analyses and outcomes from the 2016 PEIS, and provides unique analyses as needed.

Because the Vision Plan does not propose the details of future actions or projects, this EA has been prepared on a programmatic basis similar to the 2016 PEIS, meaning it evaluates the types of impacts that may occur as a result of implementing a program such as that described in the Vision Plan. Programmatic NEPA documents do not evaluate effects from specific projects; rather, they provide the framework that allows tiering of future NEPA review for specific projects.

This Vision Plan and programmatic EA is the first step in the planning process. For specific future actions identified through the master planning process, the National Aeronautics and Space Administration will review the details of future actions within the context of NEPA against information in this Vision Plan and determine the appropriate level of follow-on NEPA analysis required prior to any project approval. This programmatic EA is intended to facilitate that review. NASA may determine that future projects either fall within the scope of this programmatic analysis (in which case they could be categorically excluded) or require additional NEPA analyses within the context of another EA or an Environmental Impact Statement (EIS). Should an EA or EIS be required, the public and regulatory agencies would be afforded additional opportunities for involvement as required under NEPA.

## ENVIRONMENTAL CONSEQUENCES

This section describes and compares impacts from the No Action Alternative and Proposed Action plans for development on KSC. NASA's Preferred Alternative is the Proposed Action.

NASA has prepared this integrated EA to assess the potential effects of the Proposed Action on the human environment. The required elements of an EA have been integrated into other sections of this document, as follows:

- **Purpose and Need:** The purpose of and need for the Proposed Action is found in Section 1 of this Vision Plan, and reflects NASA mandates to comply with the National Aeronautics and Space Act and support the U.S. National Space Transportation Policy. Overall, the purpose and need supports achievement of NASA's programmatic mission objectives, while at the same time maximizing the provision of excess capabilities and assets in support of non-NASA access to space. In summary, the purpose of the Vision Plan is to serve as a framework for stewarding KSC's physical assets over the next 20 years and guide the development of the 2020 Master Plan update in support of these objectives. NASA last updated the KSC Master Plan in 2014, for a planning horizon of 2012 to 2032, and an update is needed to meet changing NASA and partner needs and address several newly proposed developments within KSC's property boundaries. The Vision Plan is needed to establish the guiding framework for this update and to ensure future development that minimizes adverse mission impacts and maximizes concurrent operations while preserving KSC's most environmentally sensitive areas and planning for resiliency.

- **Description of the Proposed Action:** The Proposed Action is to accept and implement the KSC Vision Plan as described in this document. Sections 2 and 3 of the Vision Plan describe the process through which the Proposed Action (i.e., Vision Plan) was developed. Section 5 identifies key projects needed to support the planning vision. Future planning efforts will provide details on thos projects regarding specific sizes and siting. This Section describes the No Action Alternative and summarizes the Proposed Action.

- **Resources Analyzed and Affected Environment:** The resource areas addressed in this EA consist of the following:

  - Air Quality
  - Biological Resources
  - Climate Change
  - Cultural Resources
  - Environmental Justice
  - Hazardous Materials/Waste
  - Land Use
  - Noise
  - Recreation
  - Soils and Geology
  - Socioeconomics
  - Transportation
  - Utilities
  - Water Resources

While Section 4 of the Vision Plan provides a limited description of the physical and biological conditions in the planning area, additional detailed information regarding the affected environment associated with KSC (e.g., detailed species and habitat descriptions) can be found in the 2016 PEIS and the 2015 KSC Environmental Resources Document (ERD), KSC-PLN-1911 Revision F. Currently, an update to the ERD is ongoing and should be completed in 2020.

## ALTERNATIVES

### No Action

Under NEPA, the No Action Alternative is assessed to determine the potential impacts of not implementing the Proposed Action and, in general, represents the baseline affected environment. In the case of this Vision Plan, the No Action Alternative would involve no changes from current management direction or level of management intensity. This does not mean that ongoing operational and management activities as described in the current CMP or 2016 PEIS would not occur under the No Action Alternative; rather, it means that the present course of action would continue until that action is changed. Therefore, the No Action Alternative provides a baseline against which the potential impacts of the Proposed Action can be compared.

Under the No Action Alternative, the proposed Vision Plan would not be adopted, and NASA would continue to manage KSC under the existing Master Plan according to the latest future land use map, as well as the 2016 PEIS. NASA would continue to maintain and upgrade existing facilities according to the 2014 Master Plan but would not implement any of the management and development actions specified in this Vision Plan. Therefore, the No Action Alternative would not meet the purpose and need of the Vision Plan, which are described as the vision and goals presented in Section 3.

### Proposed Action

The Proposed Action is the adoption and implementation of the Vision Plan as described in Section 5. The Proposed Action reflects future and preliminary concept development projects within identified developable areas (see Section 4). These projects were developed during the Center Vision Plan workshop using existing programmed projects as well as opportunities identified by stakeholders. This list was further refined by the Vision Plan Working Group and Center leadership. This process involved identifying planning constraints, which are man-made or natural elements that can create significant limitations to the operation or construction of buildings, roadways, utility systems, and launch support and other facilities. These constraints, when considered collectively with the Center's capacity opportunities, inform the identification of potential areas for development, as well as those areas that can be redeveloped to support growth. Identifying planning constraints addresses compatibility with installation operational aspects, natural and built resources, and land use compatibility and largely dictates the location/placement of a proposed facility. Planning constraints used as part of Vision Plan development are described in Section 4 of the Plan. The projects and locations shown in Section 5 of the plan will be refined with KSC leadership and key stakeholders and justified using NASA planning guidance in future planning efforts as part of the 2020 Master Plan update.

The projects and locations align with strategic plans, NASA program needs, technical capability requirements, institutional space requirements, infrastructure requirements, and future space demands as reflected in the future project list.

No changes to KSC land use classifications/designations are proposed. All proposed future projects would occur within the Spaceport Growth Boundaries (SGBs) identified in the Vision Plan.

From a programmatic perspective, proposed projects within the Vision Plan generally consist of the following action categories:

*Facility Construction* – Facility construction relates to building of new facilities and typically involves some amount of ground disturbance (e.g., land clearing, grading, pavement removal/addition), depending on the scope and location of the new facility. These activities may also involve heavy equipment.

*Facility Renovation* – Facility renovation can consist of renovation activities within or outside a particular building or facility and, depending on scope, could also involve some amount of ground disturbance.

*Facility Demolition* – Facility demolition includes removal of part or all of a building or facility, up to and including the foundation. This activity may involve land disturbance to some extent, as well as the use of heavy equipment.

*Infrastructure Improvements* – Infrastructure improvements can involve installation of new utilities and roadways, removal of old utility lines and roads, or improvements to existing utility lines and roadways. These activities typically involve ground disturbance activities.

*Operational Activities* – Operational activities would be associated with ongoing mission support activities as well as operational activities resulting from addition of new facilities (e.g., launch pads, maintenance facilities) or changes in mission, and would typically be associated with hazardous materials use and waste generation, utility consumption, and potential air emissions.

*Conservation/Restoration Actions* – Conservation and restoration actions are associated with activities aimed at conservation or restoration of natural resources, the goal being to improve environmental conditions at the Center. Examples include Florida scrub-jay habitat and shoreline restoration projects, revegetation of disturbed areas after construction or demolition projects, and wetland creation or enhancement as part of mitigation for impacts.

## POTENTIAL ENVIRONMENTAL CONSEQUENCES

This section analyzes the potential impacts associated with the Proposed Action with respect to the extent, context, and intensity of the impact in relation to relevant regulations, guidelines, and scientific documentation. The Council on Environmental Quality (CEQ) defines significance in terms of context and intensity in Title 40 Code of Federal Regulations (CFR) Section (§) 1508.27. This requires the significance of the action to be analyzed with respect to the setting of a proposed action and relative to the severity of the impact.

Resource areas and respective issues that are not significant or that have been covered by prior environmental review (40 CFR § 1506.3) are discussed briefly here, addressing why they would not significantly affect the human environment and/or where they have been covered under other environmental studies (if applicable). This approach ensures that resources and impacts are discussed in proportion to their significance, with only brief discussion of issues deemed not significant (40 CFR § 1502.2 [b] [Implementation]).

The geographic scope of the Vision Plan and projects evaluated in this EA are currently notional. As a result, this section provides a programmatic analysis that focuses on the interaction between "effectors" associated with different types of activities under the Proposed Action and resources ("receptors") present within developable areas as described in Section 4, rather than discrete affected environments for each project. An effector is an aspect of an activity that may have an influence on the environment, while a receptor is the resource that might be impacted by the effector.

### Methodology

In accordance with 40 CFR § 1501.7(3) (Scoping), the scoping method determines which resource areas and respective issues are to be carried forward for detailed analysis in this EA. The 2016 PEIS evaluated the potential environmental impacts from proposed center-wide KSC operations, activities, and facilities as described in the 2014 CMP, which used a planning horizon of 2012–2032. The CMP considered a range of future scenarios for repurposing existing facilities and recapitalizing infrastructure and reorganizing the management of KSC and its land resources. Scoping of environmental issues to be analyzed involves the following steps:

1) conducting a "gap analysis" between the activities addressed in the 2016 PEIS versus those activities associated with the Proposed Action in this Vision Plan to identify what activities in this Vision Plan fall within the scope of previous analyses; and

2) analyzing potential impacts of those activities under this 2020 Vision Plan that were not addressed within the scope of previous analyses.

### Gap Analysis

The gap analysis began by determining whether the action categories considered in this Vision Plan fall within the actions addressed under previous NEPA documentation—in this case the 2016 PEIS. Table 6-1 identifies the actions/activities addressed in the 2016 PEIS and whether those actions/activities fall within the Vision Plan action categories (e.g., construction, demolition) identified previously. As shown in Table 6-1, all activities and/or actions previously analyzed under the 2016 PEIS fall within the action categories addressed in this Vision Plan EA.

Table 6-1. 2016 PEIS Scope Versus 2020 Vision Plan Scope Comparison

| 2016 PEIS Action | 2020 Vision Plan Proposed Action Categories | | | | | |
|---|---|---|---|---|---|---|
| | Building Construction | Building Renovation | Building Demolition | Infrastructure Improvement | Operational Activities | Conservation/ Restoration |
| ***Land Use Plan, Future Development Plan, and Functional Area Plans*** | | | | | | |
| *Vertical launch pads and landing areas* | ✓ | ✓ | ✓ | | | ✓ |
| *Horizontal launch and landing areas* | ✓ | ✓ | ✓ | | ✓ | ✓ |
| *Launch operations and support areas* | ✓ | ✓ | ✓ | | | ✓ |
| *Assembly, testing, and processing areas* | ✓ | ✓ | ✓ | | ✓ | ✓ |
| *Utility systems areas and corridors* | | | | ✓ | | ✓ |
| *Administration facilities* | ✓ | ✓ | ✓ | | ✓ | ✓ |
| *Central campus facilities* | ✓ | ✓ | ✓ | | ✓ | ✓ |
| *Support services facilities* | ✓ | ✓ | ✓ | | ✓ | ✓ |
| *Public outreach facilities* | ✓ | ✓ | ✓ | | ✓ | ✓ |
| *Research and development facilities* | ✓ | ✓ | ✓ | | ✓ | ✓ |
| *Renewable energy areas* | ✓ | ✓ | ✓ | ✓ | | ✓ |
| ***Launch, Landing, Operations and Support*** | | | | | ✓ | ✓ |
| ***Future Transportation Plan*** | | | | | | |
| *Road improvements, repair, and resurfacing* | | | | ✓ | | ✓ |
| *Bridge replacement* | | | | ✓ | | ✓ |
| *Parking lot repurposing or demolition* | | | | ✓ | | ✓ |
| *Expansion of the horizontal launch and landing capability with a new runway* | | | | ✓ | | ✓ |

The action categories under this 2020 Vision Plan fall within the activities addressed in the 2016 PEIS and, therefore, scoping of environmental issues to be analyzed was determined by identifying key effectors based on the scope of each 2020 Vision Plan Proposed Action category described previously (e.g., construction, demolition). Each proposed activity includes these effectors in some form, some more than others. Once effectors are known, the resources that might be affected are identified as receptors. As an example, construction activities involve varying degrees of ground disturbance that interact with several different resources, such as soils and water resources. Ground disturbance is considered an effector, and each resource (e.g., soils, water) impacted by ground disturbance activities is considered a receptor. The following describes effectors associated with the Proposed Action categories identified previously (e.g., construction, demolition):

*Ground Disturbance* –The disturbance of the land surface from any activity. Typically, ground disturbance occurs from construction, demolition, and renovation activities (e.g., clearing and grading) and, to some extent, conservation and restoration activities. Ground disturbance can affect many resources depending on the scope and location of the activity; resources potentially impacted include air quality, soils, water resources, biological resources (e.g., wildlife habitat and wetlands), remediation sites, cultural resources, etc.

*Equipment and/or Vehicle Use* – Refers to use of heavy equipment during land disturbance activities, use of equipment during operations (e.g., boilers, air conditioning), and driving of vehicles by construction workers and personnel. Equipment and vehicle use typically affect air quality, (i.e., generate toxic air emissions or dust) and, depending on scope and location, could result in additional noise and transportation impacts.

*Hazardous Materials Use* – The use of materials such as fuels and chemicals either during construction or operation. Hazardous materials use can result in health and safety issues as well as potential impacts to natural resources from leaks or spills. Hazardous materials use is typically conducted under regulatory requirements and associated guidance documents (e.g., spill prevention, control, and countermeasures [SPCC] plan, hazardous materials management plan) to mitigate the potential for adverse impacts.

*Utility Use* – Associated with consumption of natural gas, electricity, water, and generation of wastewater as part of development activities and normal operations. Impacts from this effector are typically assessed in terms of anticipated increases (or decreases) in the amount of utility usage associated with the Proposed Action and the effects on the utility system. New construction and renovation, as well as infrastructure improvements, can have positive impacts on utility use through increased efficiency. Installation of utility systems is covered under ground disturbance and vehicle/equipment use.

*Hazardous Waste Generation* – Results from the use of hazardous materials during development activities or operations. Hazardous waste generation may affect health and safety as well as increase (or decrease) the regulatory burden at the facility. Similar to hazardous materials use, management of hazardous waste also falls under regulatory requirements and associated guidance documents (e.g., hazardous waste management plan).

*Increased Spending* – Refers to utilization of monetary resources during development or operational activities. Spending, or lack thereof, as a result of development and operations can result in socioeconomic impacts such as temporary or long-term employment associated with construction activities and mission changes, respectively.

Table 6-2 identifies the effectors associated with the Proposed Action based on an evaluation of the Proposed Action categories discussed previously (as previously discussed, there are no proposed land use classification changes):

Table 6-2. Effectors Associated with the Proposed Action

| Proposed Action Category | Effector | | | | | |
|---|---|---|---|---|---|---|
| | Ground Disturbance | Equipment / Vehicle Use | HazMat Use | Utility Use | HW Generation | Increased Spending |
| Building construction | ● | ● | ● | ● | ● | ● |
| Building renovation | | | | | | |
| Building demolition | | | | | | |
| Infrastructure improvement | | | | ● | | |
| Operational activities/ changes | | | | | | |
| Conservation/restoration | ● | | | | | |

Key: HazMat = Hazardous Materials; HW = Hazardous Waste.

Following the effector determination is the determination as to whether the effectors associated with this 2020 Vision Plan fall within the scope of those analyzed in the 2016 PEIS. Table 6-3 shows the relationship between the actions/activities analyzed in the 2016 PEIS and the effectors identified for action categories in this Vision Plan. Because the activities addressed in the 2016 PEIS fall within the action categories addressed in this Vision Plan EA, most of the effectors associated with the 2016 PEIS are the same.

Table 6-3. Relationship Between 2016 PEIS and 2020 Vision Plan Effectors

| 2016 PEIS Action | 2020 Vision Plan Effectors | | | | | |
|---|---|---|---|---|---|---|
| | Ground Disturbance | Equipment / Vehicle Use | HazMat Use | Utility Use | HW Generation | Increased Spending |
| Land Use Plan, Future Development Plan, and Functional Area Plans | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Launch, landing, operations, and support | | ✓ | ✓ | ✓ | ✓ | ✓ |
| Future Transportation Plan | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

Key: HazMat = Hazardous Materials; HW = Hazardous Waste.

Given that all the effectors associated with activities under the 2020 Vision Plan are within the scope of those analyzed in the 2016 PEIS, the next aspect in the scoping of environmental issues for this EA is assessing whether each of the effectors identified for this Proposed Action were similarly evaluated against KSC receptors in the 2016 PEIS. Table 6-4 identifies the receptors at KSC and whether they were analyzed in the 2016 PEIS with respect to the action categories identified under the 2020 Vision Plan.

Table 6-4. Effectors and Receptors Associated with the Proposed Action

| 2020 Vision Plan Effector | 2016 PEIS Receptor | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | S/G | WR | HM /W | AQ | CL | NO | BR | CR | LU | TR | UT | SO | REC | EJ |
| Ground disturbance | ✓ | ✓ | N/A | ✓ | ✓ | N/A | ✓ | ✓ | N/A | ✓ | N/A | | | |
| Equipment / vehicle use | N/A | | | ✓ | ✓ | ✓ | N/A | | | ✓ | N/A | | | |
| Hazardous materials use | ✓ | ✓ | ✓ | N/A | | | | | | | | | | |
| Utility use | N/A | | | | | | | | | | ✓ | N/A | | |
| Hazardous waste | ✓ | ✓ | ✓ | N/A | | | | | | | | | | |
| Increased spending | N/A | | | | | | | | | | | ✓ | N/A | |

Key: AQ = Air Quality; BR = Biological Resources; CL = Climate Change; CR = Cultural Resources; EJ = Environmental Justice; HM/W = Hazardous Materials/Waste; LU = Land Use; N/A = not applicable; NO = Noise; REC = Recreation; S/G = Soils and Geology; SO = Socioeconomics; TR = Transportation; UT = Utilities; WR = Water Resources.

As shown in Table 6-4, the effectors associated with this 2020 Vision Plan fall within the scope of the effector/receptor analysis conducted in the 2016 PEIS. Depending on the scope of the action category and the respective location, some resources are either likely or unlikely to be impacted. As an example, ground disturbance within developed locations of the Center would have minimal to no impact on biological resources because there would be no sensitive biological resources in these areas. Similarly, such projects are unlikely to have an impact on land use because there would be no administrative changes to land use.

Table 6-5 summarizes the results of impact analysis in the 2016 PEIS, based on the interaction between effectors and receptors. This summary is based on the effector categories identified for the 2020 Vision Plan, which are similar in scope to those analyzed in the 2016 PEIS.

Table 6-5. Summary of 2016 PEIS Analysis Versus 2020 Vision Plan Effectors

| 2020 Vision Plan Effector | 2016 PEIS Receptor | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | S/G | WR | HM /W | AQ | CL | NO | BR | CR | LU | TR | UT | SO | REC | EJ |
| Ground disturbance | ✓ | ✓ | N/A | ✓ | ✓ | N/A | ✓ | ✓ | N/A | ✓ | N/A | | | |
| Equipment / vehicle use | N/A | | | ✓ | ✓ | ✓ | N/A | | | ✓ | N/A | | | |
| Hazardous materials use | ✓ | ✓ | ✓ | N/A | | | | | | | | | | |
| Utility use | N/A | | | | | | | | | | ✓ | N/A | | |
| Hazardous waste | ✓ | ✓ | ✓ | N/A | | | | | | | | | | |
| Increased spending | N/A | | | | | | | | | | | ✓ | N/A | |

Key: AQ = Air Quality; BR = Biological Resources; CL = Climate Change; CR = Cultural Resources; EJ = Environmental Justice; HM/W = Hazardous Materials/Waste; LU = Land Use; N/A = not applicable; NO = Noise; REC = Recreation; S/G = Soils and Geology; SO = Socioeconomics; TR = Transportation; UT = Utilities; WR = Water Resources.

## Gap Analysis Results Summary

As shown by the gap analysis, the activities (effectors) proposed by the 2020 Vision Plan fall within the scope of analysis conducted previously under the 2016 PEIS. Additionally, the affected environment (receptors) under the 2020 Vision Plan are the same as those analyzed in the 2016 PEIS. Because the effectors and receptors associated with the 2020 Vision Plan and the 2016 PEIS are similar in scope, it can be reasonably assumed that the potential impacts identified in the 2016 PEIS would be similar in scope for the affected environment under the 2020 Vision Plan.

Potential Environmental Impacts

No Action

Under the No Action Alternative, KSC would not implement the Vision Plan or update the existing Master Plan and would continue Center development actions and operations as identified under the existing Master Plan. Potential environmental impacts associated with Center development and operational activities would be the same as those identified in the 2016 PEIS for the existing Master Plan. For context, impacts would generally be similar to those described under the Vision Plan Proposed Action, given that potential impacts under both scenarios are associated with development activities (e.g., construction, demolition, and renovation) and existing operational activities (e.g., launches and associated support activities). Although not substantive, the main difference between the No Action Alternative and the Proposed Action is the amount of land area potentially disturbed and the associated location of potential future projects. However, from a programmatic perspective, the potential impacts, constraints, and regulatory requirements would be the same under both the No Action Alternative and the Proposed Action.

Proposed Action

Based on the gap analysis, NASA has determined that a detailed analysis of impacts from the Proposed Action is not warranted because the activities identified under the Proposed Action fall within the scope of activities and analyses conducted for the KSC Master Plan in the 2016 PEIS.

However, the following subsections summarize potential impacts by resource area (based on previous analyses) for context to ensure the decision-maker understands the potential consequences of implementing the Proposed Action. For each receptor identified in Table 6-5, the analysis below identifies the associated effector, summarizes supporting impact information, and references the applicable section of the 2016 PEIS. Regulatory requirements, potential mitigations, and best management practices (BMPs) are also identified for each resource area. Because the Vision Plan is notional (as are potential projects), discussion of impacts is qualitative in nature. Additionally, discussion of impacts assumes no substantive changes in launch platforms or operational tempo. Such actions would require additional, more detailed NEPA analyses.

After the potential impacts associated with implementation of the Vision Plan by resource area are established, information regarding the relationship between resource areas and developable areas is provided. This provides the decision-maker with an understanding of what types of resources may be affected by development activities within each developable area and what types of regulatory requirements and BMPs and/or mitigations may be required to minimize or avoid adverse impacts.

Section 4 of the Vision Plan identifies the environmental constraints, sea level rise, and floodplains associated with KSC.

*Soils and Geology*

As shown in Table 6-5, the effector driving potential impacts under this resource area is ground disturbance associated with development activities. Development activities would result in impacts on upland and wetland soils and geology from clearing, grubbing, grading, excavating, filling, etc. Impacts would be the same as those described in the 2016 PEIS (Section 3.3) for similar activities. Ground-disturbing construction activities would occur in some areas where soils have been previously disturbed, but activities would also occur in previously undisturbed areas. In these disturbed areas, adverse impacts on soils would be considered minimal as soil structure and function have already been destroyed or altered. Additionally, some areas where project activities would occur are likely to consist of fill or road base material placed during previous construction, and thus, no natural soils would be present. Where disturbance of intact natural soils may occur as a result of project activities, the impacts would be greater.

The use of heavy equipment would be short-term during project activities, and the degree of soil impacts would depend on the types of soils occurring onsite (disturbed versus natural), site topography, and the size of the project area. Soil erosion from use of heavy equipment could occur, leading to detachment of soils and transport of freshly disturbed surfaces in wind and storm flow runoff. Severe soil compaction could also inhibit revegetation in denuded areas. Potential indirect effects of soil destabilization and erosion would be dust generation and offsite deposition. Additionally, tires and tracks of heavy equipment may potentially erode soils and carry sediment from construction sites to paved areas, which would drain into ditches and catch basins during rain events or cause dust during dry periods. Disturbance of soils could also create habitat for colonization by invasive species. Finally, spills and leaks of hazardous materials from vehicles or equipment during construction can lead to soil contamination and toxicity.

Under Florida Administrative Code 62-621.300(4)(a), a National Pollutant Discharge Elimination System (NPDES) stormwater construction generic permit is required for any construction activities that disturbs 1 or more acres of land or disturbs less than 1 acre of land but is part of a common plan of development that disturbs more than 1 acre. This requires filing a notice of intent (NOI) with the Florida Department of Environmental Protection (FDEP) and development of a Stormwater Pollution Prevention Plan (SWPPP) in accordance with the generic permit and consistent with the guidelines contained in the State of Florida Erosion and Sediment Control Designer and Reviewer Manual.

Impacts of proposed project activities on soils and geology would be short-term and long-term, direct, adverse, and minor to moderate, depending on the extent of the project, site topography, types of soils occurring onsite, and whether impervious surfaces would be placed over soils and geological materials. Depending on project size, KSC natural resource management protocols and/or NPDES permit requirements, BMPs would be implemented during project activities to prevent or reduce soil erosion and minimize adverse soil impacts. Additionally, disturbed areas would be re-sodded and revegetated with grasses or other vegetation to further minimize erosion over the long-term.

*Water Resources*

As shown in Table 6-5, the primary effectors driving potential impacts under this resource area are ground disturbance and vehicle/equipment use associated with development activities and operations. Impacts to water resources can result from several types of proposed activities and would be comparable in scope to those analyzed in the 2016 PEIS (Section 3.4). Non-point sources could potentially impact surface and groundwater quality, such as oil and grease from paved street and road surfaces that wash into a water body or are absorbed into the water table. Over the long-term, surface drainage during storms would still occur, but new construction or repurposing of existing facilities can lead to potential changes in the surface drainage pattern system. Under the proposed activities, impervious or semi-impervious surfaces would likely contribute to more surface drainage than at present. Section 438 (Storm Water Runoff Requirements for Federal Development Projects) of the Energy Independence and Security Act of 2007 (EISA) identifies requirements to limit the offsite impacts of stormwater runoff. Impacts of concern include water pollution, environmental damage, and impacts on local infrastructure, as well as property loss and risk to public safety from flooding. Although for its development projects, NASA is encouraged to manage stormwater in ways that also reduce potable water usage, Section 438's purpose is to prevent non-point source stormwater runoff impacts. So, while potential reuse of captured stormwater may be part of an overall design strategy, a project's inability to harvest stormwater for use would not reduce the amount of stormwater the project must manage onsite.

Energy Independence and Security Act Section 438 guidance is applicable if more than 5,000 square feet of land is being redesigned, reconfigured, or reconstituted in any manner that diverges from the area's present day use and composition. Maintenance activities, such as pavement resurfacing, parking restriping, or similar activities conducted to ensure that facilities are in good working condition, are excluded from complying with this standard.

The use of heavy equipment for construction could result in substantial ground disturbance, increasing the likelihood of soil erosion and sediment delivery to nearby surface waters and wetlands. This may result in localized turbidity increases and mobilization of fine sediments. Repeated disturbance of vegetation and soils (i.e., due to vehicle passes) during project activities may also cause surface erosion. Elevated levels of turbidity from erosion could also lead to decreases in primary production and dissolved oxygen levels. There could also be a short-term increase of fine sediment and loss of benthic food resources. The effects to local water quality and hydrology during construction would be adverse and short-term; the degree of effect would depend on the extent of the disturbance and proximity to water.

Depending on size and scope, construction projects may require FDEP NPDES Stormwater Construction Permits and/or St. Johns River Water Management District (SJRWMD) Environmental Resource Permits (ERP). These permits typically require employment of BMPs such as silt fences, turbidity barriers, and stormwater management systems in order to reduce impacts to surface waters and offsite runoff to wetlands.

Once new facilities become operational, surface water discharges from these sites would be managed according to requirements of the SJRWMD conditions for issuance of ERPs. The Applicants Handbook for Management and Storage of Surface Waters, Chapter 10.3 states: "The post-development peak rate of discharge must not exceed the pre-development peak rate of discharge, and the peak discharge requirement shall be met for the 25-year frequency storm. In determining the peak rate of discharge, a 24-hour duration storm is to be used." Water quality impacts would be minimized by the design, operation, and maintenance of stormwater management systems that would meet or exceed all requirements of the SJRWMD. Additionally, disturbed areas would be revegetated with vegetation to further minimize erosion to surface waters over the long-term. As under soils and geology, KSC natural resource management protocols and/or NPDES permit requirements BMPs (e.g., silt fencing, hay bales) would be implemented during project activities to prevent or reduce soil erosion into water surfaces and minimize adverse soil impacts.

Fuel spills or leaks from vehicles or operational equipment could adversely affect water quality if these were to enter groundwater or surface water. Use of BMPs would prevent accidental fuel or chemical spills, and no refueling would occur near surface waters. Vertical and horizontal launches may result in local adverse impacts on freshwater and marine systems from deposition associated with rocket engine emissions, the deposition of spent launch vehicle equipment, or landing of a reentry vehicle or its associated equipment. Impacts from hydrogen chloride (formed during rocket launches) on surface waters would be restricted to the area immediately adjacent to the launch pad, although these impacts would be expected to be minimal (2016 PEIS, Section 3.4). No substantial impacts on surface waters of nearby oceans, lagoons, or large inland water bodies would occur due to the natural contaminant buffering capacities of these bodies. Launch accidents could also result in impacts on local water bodies due to contamination from rocket propellant; however, emergency spill response procedures are in place to minimize this potential.

Wastewater would be processed through the existing wastewater handling and treatment systems. In general, water/wastewater use is associated with changes in personnel, which is not part of this Proposed Action, but may also occur due to changes in industrial practices. For example, an increase in launches associated with new or upgraded facilities may increase water use. At launches, deluge and washdown water would be supplied by the existing water distribution system and would have a negligible impact on system capacity or surface and groundwater resources.

Overall, impacts of proposed project activities on water resources would be short-term and long-term, direct, adverse, and minor to moderate depending on the scope and location of development activities, frequency of launches and landings, and the proximity of water to the development, launch, or landing sites. Impacts on water resources from development activities would be minimized with implementation of SWPPP requirements and adherence to NPDES construction permit conditions.

*Hazardous Materials and Waste*
The primary effectors driving potential impacts under this resource area are use of hazardous materials and generation of associated wastes related to equipment use during development activities and operations (Table 6-5). Overall, impacts associated with hazardous materials and hazardous waste are similar in scope to those described in the 2016 PEIS (see Section 3.5). KSC currently handles many types of solvents, surface coatings, propellants, and fuels. Impacts associated with hazardous materials and waste would be related to an increase in usage of and waste generation rather than an influx of new materials that would be connected with new missions. Risks associated with exposure to these materials may also slightly increase with any increased use.

Hazardous material (e.g., fuels) handling and storage and hazardous wastes (e.g., waste paint, adhesives, solvents, etc.) generation at industrial facilities are subject to applicable management requirements. These include meeting reporting requirements under the Emergency Planning and Community Right-to-Know Act and management and disposal requirements under the Resource Conservation and Recovery Act. Although the frequency at which hazardous materials and waste are used, handled, transported, etc., may increase, KSC has procedures for handling, transporting, storing, and disposing of hazardous materials and waste. These procedures are regularly reviewed and updated to ensure they capture current operations, regulatory requirements, and changes to best practices. Additionally, emergency response plans, such as the SPCC plan, would need to be updated to reflect new existing conditions.

The KSC SPCC Plan (KSC-PLN-1920) outlines the criteria to prevent, respond to, control, and report spills of oil. Various types and quantities of oil are stored, transported, and handled to support the operations of KSC. The primary objective of the SPCC Plan is to serve as a guide for personnel that are responsible for the prevention, response, control, and reporting of all oil spills. The SPCC Plan describes both the facility-wide and site-specific approaches for preventing and responding to spills. These procedures may include containing and cleaning up smaller spills using appropriately trained personnel and available spill response equipment. For larger spills, emergency response personnel would be contacted by calling 911. Based on the size and impact of the spill, the National Response Center may also be notified. The Environmental Management Office would be also be contacted in all cases regarding a spill.

While the probability of an accidental release may increase due to increased activities and quantity of materials, use of BMPs would ensure this risk is small, with the probability of a major spill kept at a minimum. The severity of an unplanned event is unlikely to increase.

Overall, adverse impacts of proposed activities under the Vision Plan related hazardous materials and waste management would be negligible to minor in magnitude. Increases in hazardous materials use and waste generation are likely to be long-term, depending on the duration of the activity involving material use and waste generation. Adherence to proper safety procedures would continue to be a top priority for future operations to minimize the risks of accidental release and personnel exposure. Additionally, implementation of new or existing engineering and administrative controls would minimize the risks associated with the presence of these materials.

*Air Quality*
Currently, all components of the proposed activities are completely within an attainment area and would not inherently lead to a violation of any Federal, state, or local air regulation. Therefore, a general conformity analysis is not required at this time.

The primary effectors driving potential impacts under this resource area are ground disturbance and equipment use during development activities and operations (Table 6-5). Proposed activities could affect air quality in several ways. These potential impacts are the same as those described in the 2016 PEIS (Section 3.6). Short-term effects from new construction or demolition of aging or obsolete facilities would result from airborne dust and other pollutants, while long-term effects would result from introduction of new stationary sources such as heating boilers and generators as well as increases in transportation-based emissions such as launches and automotive traffic. The Executive Summary of the Vision Plan provides projections of launch activity through 2030. Within the context of this EA, these projections are used qualitatively to discuss potential air quality impacts from a programmatic perspective because quantitative analysis of launch-related air emissions would require launch-specific parameters such as vehicle and fuel types and quantities.

In addition to criteria pollutants, the products of combustion from solid rocket boosters would also include other common products of combustion such as aluminum oxide, hydrogen, carbon dioxide, and water. Other chemicals produced during combustion, in much smaller quantities, may include nitrous oxides, chlorine, sulfuric compounds, and other trace gases. These components are predominately inert and would be emitted in limited amounts. Future launches at KSC could possibly result in an increase in the production of criteria pollutants over levels that have been emitted under past KSC operations. However, vehicle launches alone would only exceed de minimis levels if many Super Heavy Class Launch Vehicle launches, coupled with numerous other classes of vehicle launches, were to be conducted during the calendar year.

Kennedy Space Center maintains a Clean Air Act Title V operating permit issued by the FDEP Central District, which is valid for a period of five years and requires a renewal application to be submitted six months prior to the date of expiration. Future development activities that include additional stationary sources of air emissions (e.g., boilers, generators) would need to be added to the installation's Title V permit and would have to meet all requirements therein. In addition, new air emission sources would be subject to New Source Performance Standards (NSPS) and National Emission Standards for Hazardous Air Pollutants (NESHAP) requirements.

*Climate Change*
Similar to air quality, potential impacts related to climate change are associated with vehicle/equipment use during development and operational activities (Table 6-5). Global climate change impacts include overall warmer temperatures, rising sea levels, a melting polar ice cap, changes in rainfall patterns, a greater frequency of extreme weather events (e.g., droughts, deluges, severe storms, floods, prolonged heat waves), and other associated, and often interrelated, effects. CEQ guidance advises that actions subject to NEPA compliance should be evaluated across two dimensions relative to climate change impacts: 1) the effects of greenhouse gas (GHG) emissions from a Proposed Action on global climate change and 2) the effects of climate change to a Proposed Action, including the relationship to proposal design, environmental impacts, mitigation, and adaptation measures.

Potential impacts associated with climate change are similar to those described in the 2016 PEIS (Section 3.7). Operational impacts include the release of greenhouse gases from energy used to support ground operations and launch operations. Emissions associated with ground operations include employee vehicle emissions, emissions from heavy machinery, emissions from electric power generation, and intentional and unintentional venting or discharges of volatile components of aircraft and rocket fuels. Emissions from launch operations are the result of byproducts generated from the combustion of rocket fuels. As stated previously, quantitative analysis of launch-related air emissions would require launch-specific parameters such as vehicle and fuel types and quantities.

Executive Order (EO) 13514 (2009) requires that each agency "evaluate agency climate-change risks and vulnerabilities to manage the effects of climate change on the agency's operations and mission in both the short- and long-term." KSC would continue to implement its Strategic Sustainability Performance Plan (SSPP), established in 2010, to meet the requirements of EO 13514. The SSPP established a program to reduce facility energy intensity and associated greenhouse gas emissions as well as expanding the use of renewable energy for facilities and operational activities.

The 2016 PEDS shows NASA has been successful in reducing its agency-wide emissions of greenhouse gases. Also, NASA emissions represent collectively less than 0.02 percent of projected annual U.S. GHG emissions, and KSC represents less than 20 percent of total NASA emissions. Therefore, despite the potential for increased emissions from rocket exhaust due to greater launch activity, as well as from construction activities, land clearing, and activities related to transportation infrastructure, these potential increases would be expected to be minimized on a net basis by KSC efforts to consolidate into a smaller geographic footprint and modernize energy production and energy conservation. Given these indicators of relative scale, and the potential to minimize net emissions (as discussed above), it is expected that the Proposed Action would add a negligible amount to the U.S. emissions contributing to global climate change.

Regarding the effects of climate change to the Proposed Action, sea level rise would be the single largest hazard to continued operations and regional land management activities; pages 101 through 108 of the Vision Plan provide an analysis of projected sea level rise at KSC by 2080. Sea level rise may cause loss of usable land and inundation of coastal ecosystems. Hardening, improving, or moving facilities in adaptation to potential climate change impacts would require financial investment and funding, which might reasonably be considered impacts of climate change on the Proposed Action. More frequent and extreme high temperatures and humidity may cause increased risk of heat-related ailments among outdoor workers, higher cooling costs, decreased utility reliability, and damage to buildings. Also, more frequent and intense droughts and seasonal shifts in the water cycle may cause reduced water availability, higher water costs, saltwater intrusion, more frequent flooding of low-lying areas, and groundwater changes.

*Noise*
The primary effectors driving potential impacts under this resource area are related to vehicle/equipment use during development activities and operations (Table 6-5). Noise impacts associated with the Proposed Action would be similar in scope to those analyzed in the 2016 PEIS (Section 3.8). Short-term noise impacts would result from the continuation of many types of operations presently occurring at KSC (i.e., launches, landings, general operations and support activities) but potentially in greater amounts. Short-term increases in noise would also result from the use of heavy equipment during construction and demolition. Long-term effects would result from the addition of stationary sources of noise such as standby generators and changes in both vertical and horizontal launch activities. Additionally, increases in traffic volumes and changes

in traffic patterns would result in higher noise levels; however, these effects would be insignificant when compared to the overall noise environment. Overall, proposed development activities would not result in the violation of applicable Federal, state, or local noise ordinances.

Noise levels generated by individual launches and landings would vary, depending on the type of launch vehicle, its trajectory, and weather conditions during launch. Launch noise would be from the initial rocket ignition and sonic booms as the launch vehicle ascended down range. Noise levels from the rocket ignition would can be characterized as very loud in some areas; however, they would occur infrequently, and are very short in duration (about 20 seconds of intense sound per launch). Sonic booms generated by launch vehicles would normally occur down range, well off the Florida coast. Flight trajectories would normally be in an easterly direction, and as such, the resulting sonic boom would be inaudible over coastal areas. For landing activities, sonic booms generated by vehicles would normally occur up range, over Florida. Typically, the sonic boom would last no more than a few hundred milliseconds.

Although the exact nature of future vertical launch and landing activities is unknown, future location of operational components, such as launch and landing sites, as well as substantive changes in launch platforms or operational tempo, would need to be evaluated to identify areas with sensitive noise receptors to determine land use compatibility and potential for noise levels loud enough to impact sensitive receptors. It is not expected that future vertical launch activities would violate any Federal, state, or local noise ordinance, create incompatible land uses for nearby areas, or be loud enough to harm human health.

*Biological Resources*

Effectors driving potential impacts under this resource area are related to ground disturbance and vehicle/equipment use during development activities and operations (Table 6-5). Impacts to biological resources from effectors associated with the Proposed Action would be similar in scope to those described in the 2016 PEIS (Section 3.9).

Disturbance from construction may allow invasive plant establishment, soil erosion or compaction, a lessened litter layer, decreased soil microbial activity, reduced plant biomass and cover of native species, decreased reproductive success, changes in genetic structure of plant populations, and alteration of wildlife habitats. Impacts of proposed activities on native upland vegetation would be short-term and long-term, direct, adverse, and negligible to moderate, depending on whether the site is already disturbed or not, extent of the project area, and type of vegetation occurring onsite.

Impacts of proposed project activities on native wetland vegetation would be short-term and long-term, direct and indirect, adverse, and minor to moderate. Actions involving impacts to wetlands and waters of the U.S. would fall under Section 404 of the Clean Water Act. The U.S. Army Corps of Engineers (USACE), which holds permitting authority, would require avoidance or compensatory mitigation for construction in wetlands on

this scale. Section 4 of the Vision Plan discusses the wetland mitigation banking and compensatory mitigation process at KSC. Impacts of proposed project activities on wetland special status species would either not occur or would be short-term and long-term, direct and indirect, adverse, and minor to moderate.

Construction in previously undisturbed areas would result in removal of native vegetation communities (both upland and wetland) and wildlife habitat. However, the potential areas of disturbance would be a small percentage of the total existing acreage of undeveloped lands and future nonwater land uses at KSC. Thus, construction in undisturbed areas would cause a substantive but likely minor, adverse, long-term impact on KSC habitats in general for wildlife species whose populations are currently well distributed and not stressed by other factors across KSC.

Habitat quality changes would result where new facilities are sited in previously unbroken areas of uniform habitat. Fragmentation would be greatest where linear features such as roads or pipeline/cable rights-of-way are cut through larger areas of relatively uniform habitat. Over time, some benefit would be derived in terms of habitat recovery as well as improvements in habitat quality from reducing the footprint of administration and support services facilities, resulting in a net gain of unused land that could be restored to wildlife habitat. Special status terrestrial species may be adversely impacted by development under the proposed activities including the federally protected eastern indigo snake, Florida scrub-jay, southeastern beach mouse, piping plover, and roseate tern.

Vertical and horizontal launches at KSC may result in local adverse impacts on native upland and wetland vegetation. Such impacts would result from the deposition of rocket engine emissions but would not likely result in the permanent removal or loss of a

vegetative community. Although launches could cause short-term effects on protected species, the launches would not be likely to adversely affect the long-term well-being, reproduction rates, or survival of these species. However, launches could disrupt ongoing sea turtle and endangered species bird monitoring activities and studies due to the potential for increased operations and related beach closures. Launches would also continue to have recurring, short-term, localized, minor to moderate, adverse impacts to aquatic habitats and fish for the duration of the Vision Plan and updated CMP. Aquatic habitats and wildlife have proved resilient in the face of these environmental stresses over the past 50 years.

The Endangered Species Act (ESA) of 1973 (PL-93-205) provides guidance regarding the management and protection of certain species based on determinations made regarding their relative ability to survive. The U.S. Fish and Wildlife Service (USFWS) is responsible for determining which species are listed as either threatened or endangered and for maintaining this listing. In addition, Section 7 of the statute provides for a consultation process between the USFWS and any Federal agency that may, through one of its proposed actions, impact one of these species or their critical habitat. Table 6-6 provides a list of special status and protected species associated with KSC.

Currently, KSC operates under two programmatic Biological Opinions (BO): Biological Opinion for Impacts to Sea Turtle Nesting from artificial lighting associated with the 2016 PEIS (USFWS, 2017), and the Biological Opinion for the Florida Scrub-Jay Compensation Plan (USFWS, 2013). Both BOs identify Conservation Measures, Reasonable and Prudent Measures, and Terms and Conditions that are required to be implemented to avoid or minimize potential impacts to these resources from associated activities. Additionally, numerous mission-specific ESA Section 7 consultations for various launch activities have been completed by both KSC and Cape Canaveral Air Force Station (CCAFS), to include an April 2019 consultation (FWS Log No. 2019-1-0544) for launching the Vulcan Centaur launch vehicles from CCAFS and consultation in January 2020 (FWS Log No. 20-I-0274) for the Mars 2020 launch. KSC will continue to conduct consultations as required for mission-specific activities. Should implementation of any of the projects identified under the Proposed Action potentially impact federally listed species or critical habitat, NASA would be required to consult with the USFWS under Section 7 of the ESA.

The Migratory Bird Treaty Act (16 United States Code [USC] 703-712) prohibits the intentional take of migratory birds, nests, and eggs, except as permitted by the USFWS Migratory Bird Office. Assessment of a project's effect on migratory birds places an emphasis on "species of concern" as defined by EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds. The Bald and Golden Eagle Protection Act (16 USC 668-668d) provides additional protections to both the bald eagle and golden eagle, in particular, making it unlawful to disturb eagles. The potential for impacts to migratory birds and eagles from KSC development activities and operations would be similar in scope to those addressed in the 2016 PEIS. Potential impacts are minimal and further detailed in Section 3.9 of the 2016 PEIS.

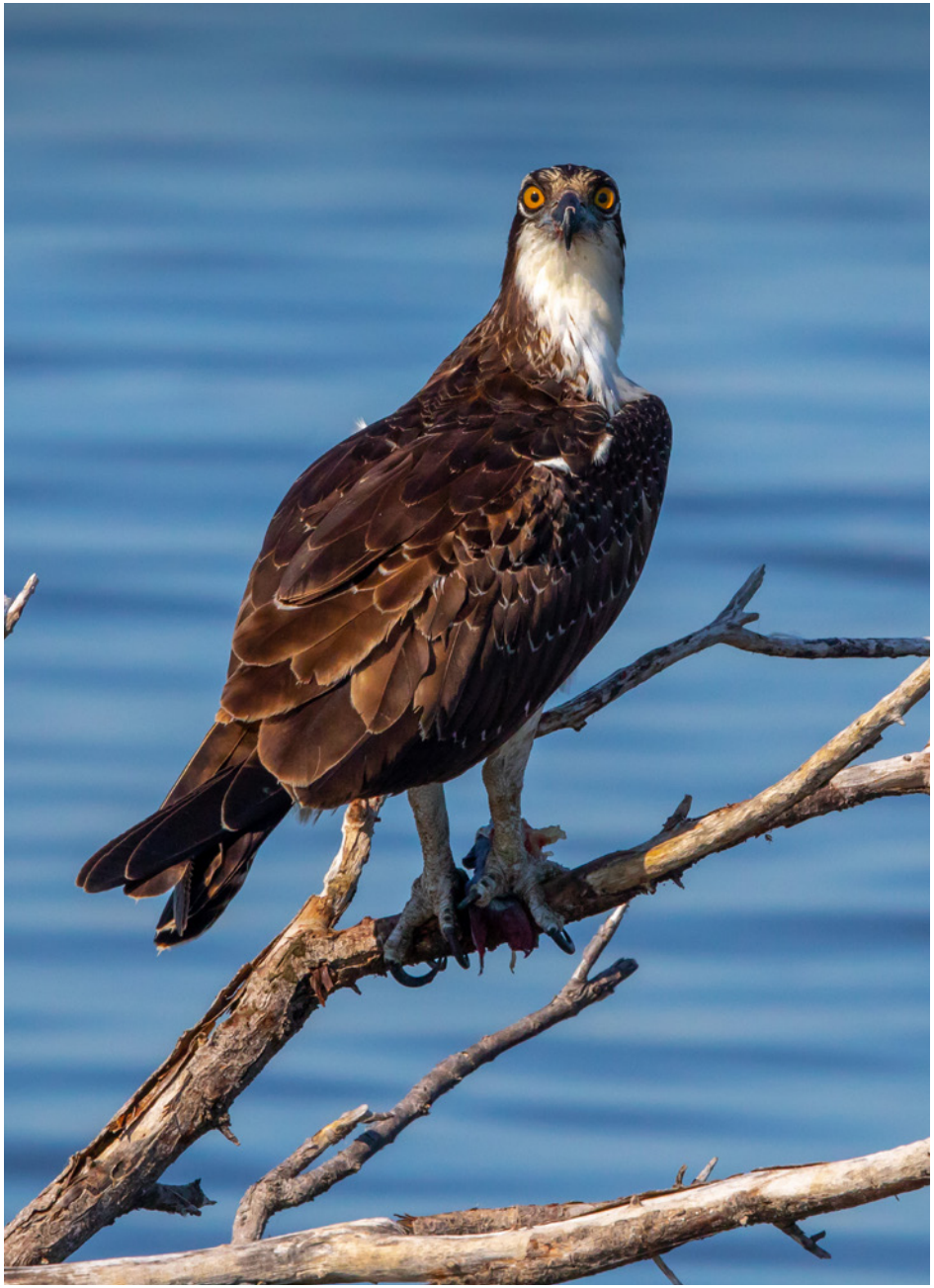


Table 6-6. Special Status and Protected Species Associated with KSC

| SCIENTIFIC NAME | COMMON NAME | LEVEL OF PROTECTION | |
|---|---|---|---|
| | | STATE | FEDERAL |
| Amphibians and Reptiles | | | |
| Lithobates capito | Florida gopher frog | Delisted | |
| Alligator mississippiensis | American alligator | | T(S/A) |
| Caretta | Loggerhead | | T |
| Chelonia mydas | Atlantic green turtle | | E |
| Dermochelys coriacea | Leatherback sea turtle | | E |
| Gopherus polyphemus | Gopher tortoise | T | C |
| Drymarchon couperi | Eastern indigo snake | | T |
| Pituophis melanoleucus mugitus | Florida pine snake | T | |
| Birds | | | |
| Pelecanus occidentalis | Brown pelican | Delisted | |
| Egretta caerulea | Little blue heron | TC | |
| Egretta rufescens | Reddish egret | TC | |
| Egretta thula | Snowy egret | Delisted/C | |
| Egretta tricolor | Tricolored heron | TC | |
| Mycteria americana | Wood stork | | E |
| Eudocimus albus | White ibis | TC | |
| Ajaia ajaja | Roseate spoonbill | TC | |
| Haliaeetus leucocephalus | Bald eagle | | P |
| Falco sparverius paulus | Southeastern American kestrel | T | |
| Aramus guarauna | limpkin | Delisted/C | |
| Grus canadensis pratensis | Florida sandhill crane | T | |
| Charadrius melodus | Piping plover | | T |
| Haematopus palliatus | American oystercatcher | TC | |
| Calidris canutus rufa | Rufa red knot | | T |
| Sterna antillarum | Least tern | T | |
| Sterna dougallii | Roseate tern | | T |
| Rynchops niger | Black skimmer | TC | |
| Aphelocoma coerulescens | Florida scrub-jay | | T |
| Mammals | | | |
| Peromyscus polionotus | Southeastern beach mouse | | T |
| Podomys floridanus | Florida mouse | Delisted | |
| Trichechus manatus | West Indian manatee | | E |

Key: SSC = Species of Special Concern; T(S/A) = threatened because of similarity of appearance to another protected species; T = threatened; E = endangered; P = Bald and Golden Eagle Protection Act; C = under consideration.

*Cultural Resources*

Similar to biological resources, the primary effectors driving potential impacts under this resource area are associated with ground disturbance and vehicle/equipment use during development activities and operations (Table 6-5). Potential impacts to cultural resources from proposed activities may occur by physically altering, damaging, or destroying a cultural resource and would be the same as those described for similar actions in the 2016 PEIS (Section 3.10). For construction, demolition, and renovation activities, the National Historic Preservation Act consultation and evaluation process, and coordination with interested Native American tribes in accordance with EO 13175, Consultation and Coordination with Indian Tribal Governments, would be initiated. NASA would determine the area of potential effects (APE) and potentially affected cultural resources within the APE.

In compliance with KSC's Integrated Cultural Resource Management Plan, appropriate surveys and studies would be conducted so that the effect of the undertaking on the cultural resources can be determined. Consultations would be undertaken on a project-by-project basis with the State Historic Preservation Officer (SHPO) or Tribal Historic Preservation Officer and interested or affected Native American tribes. Should previously undiscovered artifacts or features be unearthed during any of the proposed projects, work would be stopped in the immediate vicinity of the find, the KSC Cultural Resources Manager would be notified, and an evaluation of the find would be made. Depending on the results of the evaluation, a consultation with the Florida SHPO may be required before work can resume.

*Land Use*

The Proposed Action would have a mostly neutral or positive effect on this resource area, and the scope of land use impacts associated with implementation of the Vision Plan would be comparable to those described in the 2016 PEIS (Section 3.11). Overall, under the Proposed Action the area within KSC Spaceport Growth Boundaries (SGBs) would increase from that identified in the 2018 Future Land Use map by approximately 212 acres; the 2018 Future Land Use Map accounts for 8,650 acres shown as developable, while the Vision Plan identifies 8,862 acres within KSC SGBs. However, the 2018 Future Land Use map did not account for "undevelopable areas" and associated constraints within the SGBs as identified in Section 4 of this plan, which consist of approximately 1,533 acres. As a result, there would be approximately 7,329 acres of "developable" area on KSC.

The consolidation of operations into a smaller geographic footprint would, over time, allow NASA to recapitalize functions and capabilities into more efficient facilities on a smaller footprint and combine spread out, nonhazardous functions into a smaller, more efficiently secured geographic footprint. Some possible land use and land cover changes (e.g., demolishing unused parking areas and developing former orange groves for renewable energy uses) would be minor or moderate in scope, of small extent in terms of area, and beneficial overall.

Road easements and expansions would also occur, and operational buffer areas would experience development that would include the construction of infrastructure, operations of low impact, or small footprint facilities that may be required for support of space launch or landing operations. Over the long-term, as the market and emerging technology may demand, additional horizontal launch infrastructure may be constructed.

As implementation of the Vision Plan and CMP update occurs, NASA would work closely with the USFWS and National Park Service to determine the appropriate methods for, locations of, and mitigations pertaining to proposed projects. This would include coordinating with the USFWS regarding their prescribed fire management activities at the Merritt Island National Wildlife Refuge (MINWR). Overall, project planning and updates to the CMP would be consistent with the goals and objectives of the Vision Plan and land use planning guidelines. Impacts to land use are anticipated to be minor to moderate, depending on the acreage impacted, land cover to be changed, and number or type of projects to be carried out in that area. Environmental impacts related to land use would also be minimized or mitigated through consistency with the environmental stewardship objectives described in the Vision Plan.

Federal activity in a coastal zone requires preparation of a Coastal Zone Consistency Determination in accordance with the Coastal Zone Management Act (CZMA) of 1972 as implemented by National Oceanic and Atmospheric Administration through state coastal zone management offices. Any activities, which directly affect the state's coastal zone are subject to a determination of consistency with the state's Coastal Management Program (15 CFR 930.30-44). NASA is required to review their activities with regard to direct effects on the coastal zone and is responsible for making the final coastal zone consistency determinations. Florida's statewide coastal management program, executed by FDEP, oversees activities occurring in or affecting the coastal zone and is based on a network of agencies implementing 24 statutes protecting coastal resources. Florida's coastal zone is the area encompassed by the entire state and its territorial seas.

The review of consistency with the Coastal Zone Management Program is coordinated through the Florida State Clearinghouse as part of the NEPA process. NASA has determined that the Proposed Action to implement the Vision Plan is consistent with the Florida Coastal Management Program and would result in no substantive impact to coastal resources. As part of the CZMA determination process, this EA will be sent to FDEP and the Florida State Clearinghouse for review and concurrence.

*Transportation*

The primary effectors driving potential impacts under this resource area are related to vehicle/equipment use during development activities and operations (Table 6-5). Proposed activities would result in the continuation of many transportation modes presently occurring at KSC but potentially in greater amounts. Impacts to the transportation system on KSC would be comparable to those described in the 2016 PEIS (Section 3.12). Short-term increases in traffic would occur as a result of proposed construction activities. These effects would be primarily due to construction worker commutes and delivery of equipment and materials to and from the construction sites. In addition, road closures or detours to accommodate utility system work may occur. Some components could affect the level of service at intersections or roadways both on and off the facility; however, the roadway infrastructure would be sufficient to support the increases from construction vehicle traffic. If additional transportation infrastructure (such as future roadways, access control points, etc.) would be required, further analyses such as traffic studies may also be required.

Long-term effects would be primarily due to additional worker commutes and potential traffic associated with increased launch activities, and changes in traffic patterns near the more centralized activities at KSC. Increased traffic volumes, changes in traffic patterns, and changes in both vertical and horizontal launch activities would have minor effects, and there would be some long-term beneficial effects from upgrades in transportation infrastructure.

*Utilities*

Use of utilities is the main driver of potential impacts to utility systems (Table 6-5). The construction of new facilities or sites within KSC may require the development of new utilities rights-of-way (ROWs), installation of new utility lines or extensions for power, water, and telecommunications, and installation or modification of stormwater management systems. Impacts associated with utility use would be similar in scope to those described in the 2016 PEIS (Section 3.13) and are associated with increased consumption and/or benefits associated with use of renewable energy sources and increased efficiency. Addition of new, or alteration of existing, stormwater management systems may require modification of the KSC NPDES stormwater permit for industrial activities and associated SWPPP. The land clearing, trenching, excavation, and other activities associated with the preparation of ROWs and installation of utilities could have direct and indirect environmental impacts associated with ground disturbance and vehicle/equipment use, as described previously under other resource areas.

Over time, the site may consume less energy and water due to the achievement of greater efficiency and right-sizing. Therefore, it is not anticipated that the capacity of existing utility service providers linked to the KSC site would be exceeded. Any decisions pertaining to the expansion or creation of utility corridors would be made in accordance with KSC's energy management policy and planning process.

Overall, impacts from the installation and expansion of utility systems are anticipated to be beneficial due to increased efficiency, minor to moderate, and of small to medium extent. The magnitude and extent of the impacts would depend on the specifics of the utility systems installed and the extent of use. Impacts would be expected to be long-term, lasting the duration of the utility system until removed or upgraded.

*Socioeconomics*

Increased spending, either associated with development activities or employment from new or increased operations, primarily drive impacts to socioeconomics (Table 6-5).

Proposed activities would potentially create beneficial impacts of minor to moderate magnitude due to the creation of jobs and labor income. Similar to impacts described in the 2016 PEIS (Section 3.14), the extent of impacts would be medium (localized), since most of the jobs would be filled by area residents. These impacts are probable, since the relationship between an infusion of capital in the local aerospace industry and the resulting economic impact is well established. Indirect and long-term impacts from non-NASA (e.g., SpaceX, Blue Origin) projects on the local economy depend on external factors such as interest and financial commitment from non-NASA entities. The precedence and uniqueness of the impact would be minor due to historical and ongoing NASA activities at KSC.

In the long-term, with KSC having leveraged its position as a multi-user spaceport and positioned itself to attract new tenants, indirect economic impacts would be beneficial. Future employees from non-NASA projects at KSC would represent new purchasing power that would support additional jobs and payroll at local retail and service establishments in the region. There is a larger multiplier effect associated with the consumer spending of employees directly supported by KSC (though these future employees would not directly be employed by NASA). Through this spending, proposed activities could indirectly support thousands of indirect and induced jobs.

*Recreation*

Impacts to recreation on and around KSC would be comparable to those described in the 2016 PEIS (Section 3.15) and are associated with placement of facilities and operations. Recreation impacts are not necessarily tied to any specific effector, as indicated in Table 6-5. However, changes in KSC's land use, actions to meet KSC's mission and core competencies, and future development, transportation facilities, and activities may have both adverse and beneficial impacts on recreational resources.

Depending on placement, development of horizontal launch infrastructure could hinder or delay access to recreational areas, and construction activities may conflict with natural attributes that contribute to aesthetic qualities or the cultural services that recreational areas provide.

During operations (including launches and landings), there is a possibility of temporary closures to portions of KSC property managed by USFWS (MINWR) and National Park Service (Canaveral National Seashore [CNS]). Closures due to safety hazards are dependent upon the risk assessment performed by the U.S. Air Force Range Safety office and the Federal Aviation Administration (for commercially licensed launches) using the specific launch trajectory and fuel loads on the rocket prior to launch. These closures pose an impact for public access to these areas. Note: the current annual visitation estimate for MINWR is 1.6 million visitors while for CNS it is 1.7 million visitors, with 1.2 million of those visiting Playalinda Beach.

Merritt Island NWR and CNS closures might also occur due to the volume of visitor traffic, because launch activity on KSC has historically attracted people to the area,

including these areas, enhancing the visitor experience and public enjoyment. Such closures are coordinated between KSC security, Spaceport Integration and Services, USFWS, and National Park Service by monitoring to ensure parking lot thresholds are not exceeded, and roadways allow for emergency egress for any form of emergency associated with large crowds. An established allows KSC Security Police, and Brevard County Sheriff's Office support when necessary, to extend badge checkpoints at the KSC boundary on State Roads 402, 405, and 3-South. Additionally, the Base Operations Spaceport Services contractor raises the Haulover Canal Bridge, making access from State Road-3 North impassable.

Public access is restored once the launch and/or landing event is over. All closures, whether dictated by public safety concerns (i.e., the Range or Federal Aviation Administration require the closure) or due to visitor volumes exceeding capacity, would be temporary, lasting approximately three to six hours each time.

*Environmental Justice and Protection of Children*

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations, and EO 13045, Protection of Children from Environmental Health Risks and Safety Risks, require evaluation of potential impacts to minority and low-income populations and identification of any special health or safety risks to children, respectively.

Similar in scope to that described in the 2016 PEIS (Section 3.16), proposed activities are not expected to produce any adverse consequences related to environmental justice or protection of children. Neither Brevard County nor Volusia County constitutes an environmental justice population because 1) neither county has more than 50 percent minorities or a substantially higher percentage of minorities than the state, and 2) poverty levels coupled with median household income levels are lower or comparable with the rest of Florida. Additionally, given the scope of the Proposed Action, disproportionate impacts to the health and safety of children in Brevard and Volusia Counties would not occur.

### Developable Areas

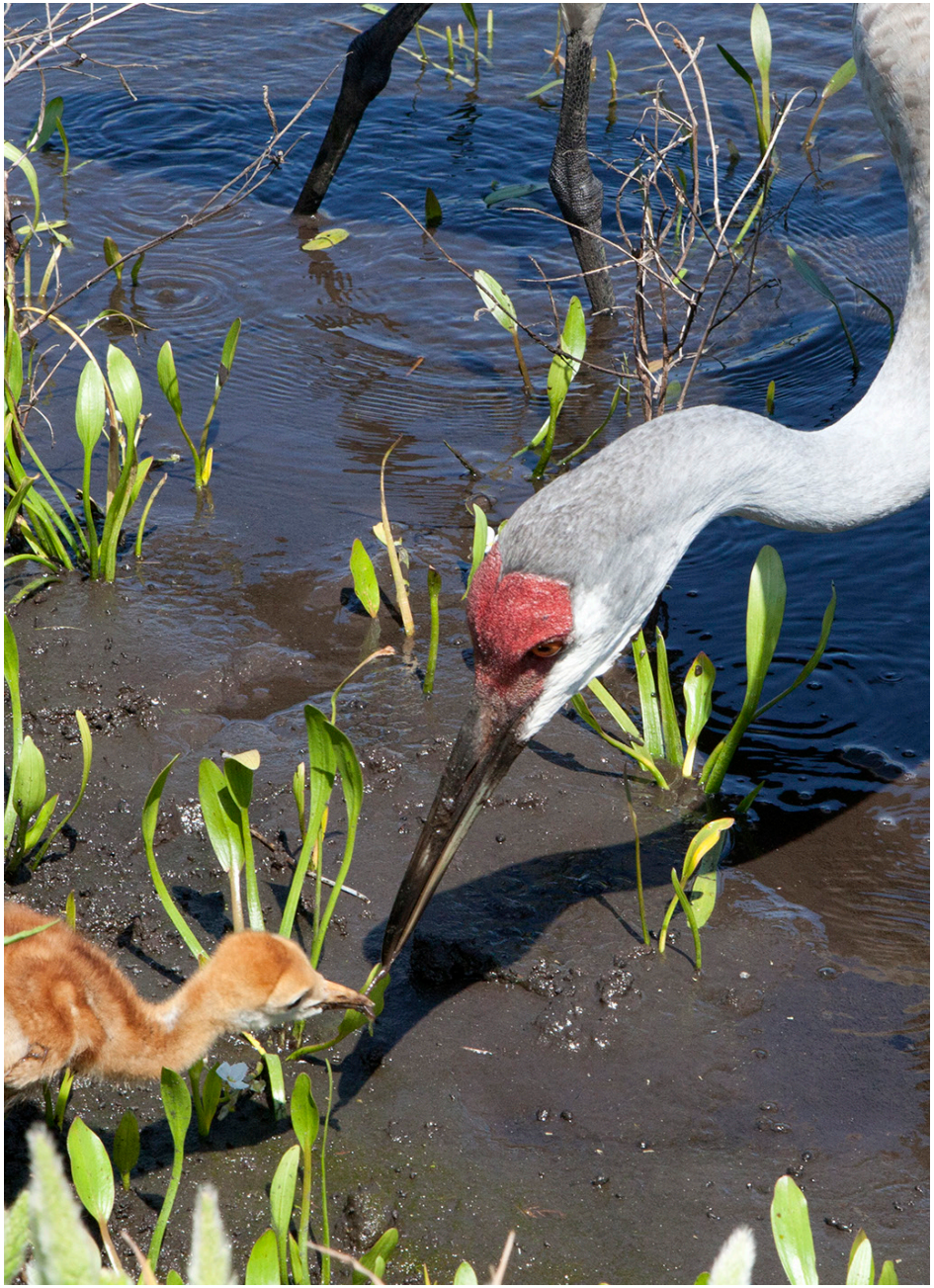
This section discusses the effector/receptor relationship under the Proposed Action for each developable area. This is presented by first identifying the scope of impacts common to the resources regardless of location/developable area, as well as any potential regulatory requirements (e.g., permits); these are referred to as "commonalities" under each resource. An example of a commonality regardless of developable area is the requirement for an NPDES construction permit and associated SWPPP for any ground disturbance activity that covers 1 or more acres. This applies regardless of the location of activity or developable area at KSC. After commonalities are identified across developable areas, individual constraints/issues are addressed by developable area.

### Commonalities

*NPDES Permitting*: As discussed previously, an NPDES stormwater construction generic permit is required for any construction activities that disturbs 1 or more acres of land or disturbs less than 1 acre of land but is part of a common plan of development that disturbs more than 1 acre. This requires filing an NOI with FDEP and development of a SWPPP in accordance with the generic permit and consistent with the guidelines contained in the State of Florida Erosion and Sediment Control Designer and Reviewer Manual. These projects would require an ERP, issued by SJRWMD. All impacts would be lessened with the implementation of BMPs required by these permits. Additionally, the KSC NPDES stormwater permit for industrial activities and associated SWPPP may require modification to address new stormwater management systems, alteration of existing systems, or addition of new facilities that affect stormwater management.

*Threatened and Endangered Species:* All activities on KSC would be required to comply with the Conservation Measures, Reasonable and Prudent Measures, and Terms and Conditions associated with the existing BOs identified previously. Additional ESA Section 7 consultation with the USFWS would be required for any activities (such as ground/habitat disturbance, launches, etc.) that may potentially impact listed species outside the scope of these BOs.

*Stormwater Management:* Regardless of location, if more than 5,000 square feet of land is being redesigned, reconfigured, or reconstituted in any manner that diverges from the area's current use and composition, Section 438 of the EISA would be applicable. Maintenance activities, such as pavement resurfacing, parking restriping, or



similar activities that are being carried out to ensure that facilities are in good working condition, are excluded from complying with this standard. Once new facilities become operational, surface water discharges from these sites would be managed according to requirements of the SJRWMD conditions for issuance of ERPs.

*Clean Air Act Compliance:* Any future development activities that include additional stationary sources of air emissions (e.g., boilers, generators) would need to be added to the installation's Title V permit and would have to meet all requirements therein. In addition, new air emission sources would be subject to NSPS and NESHAP requirements. This applies to all developable areas.

*Cultural Resources:* Should previously undiscovered artifacts or features be unearthed during any of the proposed projects, work would be stopped in the immediate vicinity of the find, a determination of significance made, and a mitigation plan formulated. This requirement is common to all developable areas.

*Noise:* Regardless of developable area, future location of operational components, such as launch and landing sites, as well as substantive changes in launch platforms or operational tempo, would need to be evaluated to identify the potential for noise levels loud enough to adversely affect sensitive noise receptors.

Developable Area 1

Developable Area 1 would comprise areas with minimal natural and manmade constraints, free of buildings, roads, and parking. This area designation would be subject to general potential impacts described previously, as well as the requirements above under "Commonalities." For example, if the development site is more than 1 acre in size, NPDES permitting requirements would apply. In general, development projects within this area would only require a planning-level environmental review to determine any project or facility-related permit requirements, and additional NEPA-level analysis would not be required provided actions are within the scope of those addressed in this document and/or the 2016 PEIS. Significant changes in mission may require additional NEPA analysis depending on scope.

Developable Area 2

Developable Area 2 would comprise areas with some natural and manmade constraints and may include existing horizontal infrastructure, auxiliary areas for potential Florida scrub-jay habitat, significant vegetation, sidewalks, driveways, hardstands, and most pavement unless denoted as a road or bridge. General potential impacts associated with development in this area would be the same as those described previously, and the requirements specified above under "Commonalities" would apply. Similar to Developable Area 1, development projects within this area would only require a planning-level environmental review to determine any project or facility-related permit requirements, and additional NEPA-level analysis would not be required provided actions are within the scope of those addressed in this document and/or the 2016 PEIS. Significant changes in mission within this area may require additional NEPA analysis depending on scope.

*Threatened and Endangered Species:* Ground disturbance in Developable Area 2 may be subject to Section 7 of the ESA if auxiliary Florida scrub-jay habitat areas cannot be avoided. The Florida scrub-jay is a federally protected threatened species that was elevated from subspecies status in 1997. Although activities in Developable Area 2 would only potentially impact auxiliary areas for potential Florida scrub-jay habitat, proposed development activities may result in indirect impacts (e.g., disturbance from construction/operational noise) to this species. Under ESA Section 7 ESA, KSC would be required to initiate informal consultation with the USFWS regarding any potential impacts. However, informal consultation with the USFWS would not necessarily drive additional NEPA-level analysis.

Developable Area 3

This designation includes more constraints, including land with existing buildings that may need to be demolished or areas that require significant environmental or cultural mitigation, core and support areas for potential Florida scrub-jay habitat, buildings, and wetlands in the 500-year floodplain. In addition to general potential impacts described previously, as well as the requirements specified above under "Commonalities," activities in Developable Area 3 may be subject to additional NEPA-level analysis (e.g., an EA) if not within the scope of previous NEPA analysis, as well as other regulatory requirements depending on the scope of the undertaking.

*Threatened and Endangered Species*: Development activities within Developable Area 3 may pose direct impacts to Florida scrub-jay habitat if the habitat cannot be avoided. If proposed actions would disturb Florida scrub-jay habitat and are not within the scope of previous consultations with the USFWS, activities may require formal consultation with the USFWS under Section 7 of the ESA. This would include the preparation and submittal of a biological assessment. The Section 7 process must be completed, and the results incorporated into the final NEPA document, before release of a NEPA decision document (i.e., finding of no significant impacts [FONSI] or record of decision [ROD]).
Cultural Resources: Demolition of existing structures within this area would require an evaluation to identify historical structures that are older than 50 years of age, eligible for listing in the National Register of Historic Places (NRHP), or listed in the NRHP. Consultations would be required with the SHPO on a project-by-project basis regarding the presence of any such structures.

*Wetlands:* Wetlands are protected by Section 404 of the Clean Water Act and EO 11990, Protection of Wetlands. The act requires that dredge and fill activities affecting wetlands must be authorized by a permit issued by USACE. If the presence of a wetland is suspected in the proposed project area and the wetland is likely to be affected by the Proposed Action, the wetland boundaries must be delineated prior to taking any action. For proposed activities that may affect wetlands, KSC would need to initiate consultation with the USACE district office to confirm the existence of the wetlands, identify potential alternatives to the Proposed Action, and initiate the permit application

process, if appropriate. In addition, if impacts to wetlands cannot be avoided, the NEPA decision document (i.e., FONSI or ROD) shall identify and explain why there is no practicable alternative to avoid wetland impacts.

*Floodplains:* EO 11988, Floodplain Management, directs Federal agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of floodplains. EO 11988 requires each Federal agency to determine whether a Proposed Action would involve construction in a floodplain and consider alternatives to avoid adverse effects and incompatible development. While the 500-year floodplain is of concern and should be avoided, typically impacts within the 100-year floodplain are of greatest concern. If impacts to floodplains cannot be avoided, the decision document (i.e., FONSI or ROD) shall identify and explain why there is no practicable alternative to avoid floodplain impacts (i.e., finding of no practicable alternative).

### Developable Area 4

Development in this area should be largely avoided. In addition to impacts and requirements described above for other developable areas, activities in Developable Area 4 would involve disturbance of the 100-year floodplain and wetlands in the 100-year floodplain. Depending on the scope of the action and associated disturbance, activities in this developable area would require additional EA or environmental impact statement-level NEPA analyses, as well as significant mitigation.

### Undevelopable Area

Undevelopable areas identified in the Vision Plan are areas with significant constraints and/or are outside the designated development boundary. Such constraints include railroad infrastructure, protected species areas (e.g., eagle's nest), archeological sites, quantity-distance arcs, and water bodies. Due to significant constraints, these areas are not considered for development activities within this Vision Plan. Because these areas are not included within the scope of analyses in this Vision Plan, any future planning efforts involving development of these areas would require additional NEPA-level analysis.

## CUMULATIVE IMPACTS

The approach taken in the analysis of cumulative impacts follows the objectives of NEPA as well as CEQ regulations and guidance. Cumulative impacts are defined in 40 CFR § 1508.7 as "the impact on the environment that results from the incremental impact of the action when added to the other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."

Cumulative impacts are most likely to arise when a relationship exists between a proposed action and other actions expected to occur in a similar location or during a similar time period. Actions overlapping with or in close proximity 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. Since the Proposed Action is a long-term plan, other plans, projects, and programs could be implemented, but their timing is unknown and their effects cannot be specifically determined or quantified. In addition, in general, impacts from past and present actions are reflected in the existing conditions of the affected environment. As a result, the approach for cumulative impacts for this EA is a summary versus identification of specific past, present, and reasonably anticipated future projects resulting in cumulative impacts. Relevant projections in adopted general plans or planning documents that evaluated regional conditions were reviewed for potential cumulative impacts (see Vision Plan, Section 2 and other external documents). In addition, Brevard and Volusia County Planning and Development Offices maintain comprehensive plans that provide guidance for each county's growth management.

### Cumulative Effects Analysis

The Vision Plan provides goals for resource management, flexible space infrastructure, and sustainment practices to optimize developable areas. The plan considers affordability, environmental and safety constraints, historical conditions, applicable Federal laws and directives, stakeholder inputs, and regional plans and goals.

The Proposed Action would not have any significant adverse effects and would not contribute to a significant cumulative adverse effect when combined with projected, reasonably foreseeable future actions. Land development/construction projects typically result in short-term impacts to soil, air, noise, water quality, hazardous materials and waste, cultural resources (where present), recreation, socioeconomics, and environmental justice that primarily occur only for the duration of the project. The presence of biological resources in the developable areas are identified in the Vision Plan as environmental constraints; existing management plans and strategies have been designed to minimize long-term impacts on these resources. Operation impacts on biological resources, such as a reduction of control burns, may result in long-term impacts that require updates to management practices for biological resources. These management practices should be reviewed to determine the need for updating prior to implementation of specific development projects. Land use, transportation, and utilities generally experience cumulative benefits from improved development plans, and the Vision Plan is designed to increase efficiencies in these areas.

Merritt Island NWR, CNS, and KSC have a long standing partnership which prioritizes NASA's space mission while coexisting with and supporting MINWR and CNS ecological, historical, cultural and public recreation centered missions. Successfully balancing nature and technology has always been the cornerstone of this partnership. As such, KSC regularly coordinates with the USFWS and MINWR regarding operations at KSC to ensure there are minimal impacts to the management of MINWR, including fire management operations, restrictions to the prescribed burning program, potential impacts to federally listed and candidate species and migratory birds, closures and restrictions to MINWR refuge management activities, closures to the Refuge and Seashore visiting public, potential impacts of launch viewing visitors on natural and cultural resources, crowd control issues related to launch viewing visitors, and cumulative impacts. Recognizing the importance of the management and preservation of these resources KSC will continue to engage both CNS and MINWR in the planning and environmental analysis and evaluations for current and future projects.

## OTHER ENVIRONMENTAL CONSIDERATIONS UNDER NEPA

In accordance with 40 CFR § 1502.16(c), analysis of environmental consequences shall include discussion of possible conflicts between the Proposed Action and the objectives of Federal, regional, state, and local land use plans, policies, and controls. Table 6-7 identifies the principal Federal and state laws and regulations applicable to the Proposed Action, and where they are addressed in this EA.

Table 6-7. Principal Federal and State Laws Applicable to the Proposed Action

| *Federal, State, Local, and Regional Land Use Plans, Policies, and Controls* | *Status of Compliance* |
|---|---|
| Clean Air Act | Section 7.2.2.2 |
| Clean Water Act | Section 7.2.2.2 |
| Coastal Zone Management Act | Section 7.2.2.2 |
| National Historic Preservation Act | Section 7.2.2.2 |
| Endangered Species Act | Section 7.2.2.2 |
| Migratory Bird Treaty Act | Section 7.2.2.2 |
| Bald and Golden Eagle Protection Act | Section 7.2.2.2 |
| Resource Conservation and Recovery Act | Section 7.2.2.2 |
| Energy Independence and Security Act of 2007 (EISA) | Section 7.2.2.2 |
| Executive Order 11988, Floodplain Management | Section 7.2.2.2 |
| Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations | Section 7.2.2.2 |
| Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks | Section 7.2.2.2 |
| Executive Order 13175, Consultation and Coordination with Indian Tribal Governments | Section 7.2.2.2 |
| Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds. | Section 7.2.2.2 |

### Unavoidable Adverse Impacts

Section 102(C)(ii) of NEPA [42 USC § 4332] requires a NEPA evaluation to list "any adverse environmental effects which cannot be avoided should the proposal be implemented." Many unavoidable adverse impacts are associated with development (e.g., soil erosion, stormwater runoff) and operational activities (e.g., air emissions, use of hazardous materials) as described in the existing CMP and the 2016 PEIS. Table 3.17-1 (Unavoidable Adverse Impacts) of the 2016 PEIS identifies the unavoidable adverse impacts associated with development and operational activities at KSC. Some of these adverse effects can be mitigated to some extent, and many of these adverse effects are not considered significant adverse effects even without mitigation.

### Relationship Between Short-Term Uses of the Environment and Maintenance and Enhancement of Long-Term Productivity

Section 102(C)(iv) of NEPA [42 USC § 4332] and 40 CFR § 1502.16 require NEPA to address: "the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity." This involves the consideration of whether a proposed action is sacrificing a resource value that might benefit the environment in the long-term for some short-term value to the project proponent or the public.

NASA acknowledges that there are tradeoffs inherent in any allocation of land and natural resources. In the present instance, implementation of the Proposed Action would involve long-term conversion of some of KSC's designated open space, operational buffer/conservation, and operational buffer/public use areas to more developed uses.

Implementation of the Proposed Action would also involve construction and operational activities that would affect natural habitats including wetlands. Effects on wetlands, in any case, as mandated by Section 404 of the Clean Water Act, would require a permit from USACE. Before such a permit could be issued, any activity involving dredging or filling in waters of the United States would need to be evaluated using the Section 404(b)(1) guidelines developed by the U.S. Environmental Protection Agency in conjunction with the Department of the Army. These guidelines are heavily weighted toward preventing environmental degradation of waters of the United States (including wetlands) and so place additional constraints on Section 404 discharges.

Efforts on the part of NASA and KSC to adapt to climate change and sea level rise, as well as control and reduce KSC's own GHG emissions (thereby limiting NASA's contribution to this long-term, cumulative environmental challenge), can be interpreted as pursuing maintenance and enhancement of long-term productivity.

### Irreversible and Irretrievable Commitment of Resources

Section 102(C)(v) of NEPA [42 USC § 4332] requires NEPA documents to address "any irreversible and irretrievable commitments of resources which would be involved in the Proposed Action should it be implemented." Irreversible and irretrievable commitments of resources mean losses to or impacts on natural resources that cannot be recovered or reversed.

More specifically, "irreversible" implies the loss of future options. Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species, removal of mined ore or pumped oil and gas, permanent conversion of wetlands, loss of cultural resources, soils, wildlife, agricultural, and socioeconomic conditions. The losses are permanent, incapable of being reversed. "Irreversible" applies mainly to the effects from use or depletion of nonrenewable resources, such as minerals or cultural resources, or to those factors, such as soil productivity, that are renewable only over long periods of time.

"Irretrievable" commitments are those that are lost for a period of time, such as the temporary loss of timber productivity in forested areas that are kept clear for use as a right-of-way, road, or recreational site. The lost forest production is irretrievable, but the action is not irreversible. If the use changes back again, it is possible to resume timber production.

### Irreversible Commitment of Resources

Under the Proposed Action the following would constitute essentially irreversible commitments of resources:

- consumption of the fossil fuels (primarily diesel) and lubricants by the heavy construction equipment (bulldozers, graders, scrapers, excavators, loaders, trucks, etc.) used both for demolition of existing obsolete facilities and the excavation and construction of proposed facilities;
- materials used to construct all proposed facilities, including cement/concrete, soil cement, steel, slurry material, clay, sand, gravel, iron, and other metallic alloys, copper wiring, PVC piping, and so forth;
- energy, supplied by fossil fuels or some other source of electricity, used over the operational life of the existing and proposed facilities at KSC;
- chemical propellants used to launch rockets and payloads, which require fossil fuels and energy in their synthesis and manufacture;
- wetlands eliminated due to construction;
- existing wildlife habitat that would be eliminated by newly developed areas; and
- possible undiscovered archeological, cultural, or other heritage resources within the footprint of newly developed sites.

### Irretrievable Commitment of Resources

As noted above, "irretrievable" commitments of resources are those that are lost for a period of time but not permanently. The Proposed Action would entail the following irretrievable commitments:

- short-term impacts on water quality and aquatic biota during periods of construction; and
- sites containing natural habitats that are developed with facilities but later decommissioned and abandoned or allowed to return to natural habitat either passively through natural succession or actively through restoration efforts.

# 7 CONCLUSION

Implementation of the Vision Plan presented here will help meet the mission needs of Kennedy Space Center. The Programmatic Environmental Assessment shows that implementation of the plan would not have any significant or cumulative adverse effects to the environment. The projects outlined in the Future Projects listing in Section 5 address critical operational requirements while respecting the myriad of operational, environmental and fiscal constraints found across the Center. These projects also help implement the planning vision and when more fully detailed in follow-on planning efforts will incorporate the planning patterns needed to ensure success. Taken together this vision and the identified projects will continue to ensure Kennedy Space Center remains ready to meet the critical space needs of our nation and the world.

# NEXT STEPS

This Vision Plan is the first step in the development of a comprehensive Center Master Plan. The Vision Plan subdivides the Center into the following seven districts that require more detailed planning in the future in the following priority:

1. Central Campus District
2. Central Processing District
3. Space Commerce District
4. VAB District
5. Exploration Launch District
6. SLF District
7. Mosquito Lagoon District

And this Vision Plan includes a Summary Future Development Plan with clear growth boundaries shaped to protect mission functions and environmental resources in order to identify locations for prioritized future projects needed to support the KSC mission.

The **NASA Handbook for Master Planning** outlines the processes, principles, and products for Center Master Plans. To maintain alignment with the Handbook, the next steps for KSC are as follows:

Step 1: Preparation of **Area Development Plans** (ADPs) for each district. These ADPs shall be detailed plans for each district that include phased Illustrative Plans, Regulating Plans, and standards for buildings, streets, and landscapes within the district. ADPs will help KSC meet the following strategies from the Handbook (this level of detail is achievable at the ADP level not at the Vision Plan level):

**Compact, Mixed-Use Development**. "Centers should conserve their land resources (which) can be achieved with multistory buildings, mixed land uses, limited building setbacks, reducing spacing between buildings, and flexible parking requirements."

**Health and Safety Campus Planning**. "Pedestrians and cyclists require continuous pathways that connect origins and destinations. The master plan should incorporate wide sidewalks (minimum five feet) separated from the vehicle traffic by a tree-lined buffer or planning strip (minimum five feet)."

**Protection Planning**. "To enhance physical security, buildings should be sited and oriented to allow for natural surveillance of the built environment. Entry placements and window locations can be designed to give occupants opportunities to observe the built environment. Buildings should be sited within view of other occupied facilities."

**Capacity Planning and Area Development Planning**. "As part of the NASA master planning process, Center campuses will be divided into identifiable and connected

districts based on geographical features, land use patterns, building types, and/or transportation networks. An ADP should then be prepared for each district. This leads to developing the master plan in logical planning increments. By focusing on districts, planners can identify areas that need planning attention due to changes in mission, requirement, or other priority. With the introduction of form-based coding, Illustrative and Regulating Plans will be developed for each ADP."

Step 2: Preparation of **Sustainability Component Plans** (SCPs) for each district that 1) set framing goals, baseline use rates, and target use rates for energy and water consumption, waste generation, and stormwater management, and 2) identify appropriate energy, water, waste, and stormwater efficiency measures that can, when applied, help the Center meet its framing goals. This is done through field research, modeling, and project development. SCPs will help KSC meet the following strategies from the Handbook:

Resource Management. "Campus energy planning should look at the supply and demand sides of energy use. Center plans should address how energy demand should be reduced and how renewable sources can provide supply. Water management should be planned at the individual building level and at the plant wide level. Master plans should outline how Centers should reduce the amount of waste delivered to local landfills."

Low Impact Development (LID). "NASA Centers are encouraged to plan and design using LID principles where feasible."

Step 3: Preparation of a **Center Development Plan** (CDP). The CDP integrates the ADPs and Network Plans into one useable document. The CDP will help KSC meet the following strategy from the Handbook:

Horizontal Infrastructure Network Planning. "Once ADPs have been completed for the priority districts at the Center, the relevant information can be easily combined into appropriate Network Plans. Network Plans show the future development of the Center as a whole, and should, at a minimum, consist of a Center Illustrative Plan, Regulating Plan, Street and Transit Plan, Sidewalk and Bikeway Plan, Green Infrastructure Plan, and Primary Utility Plan."

Step 4: Preparation of **Center Design Standards** that address the following strategy from the Handbook:

Campus Design Standards. The Handbook calls for Design Standards that include Illustrative Plans, Regulating Plans, Building Standards, Circulation Standards, and Landscape Standards. These can be consolidated into one document from the ADPs once those are completed.

# NEXT STEPS

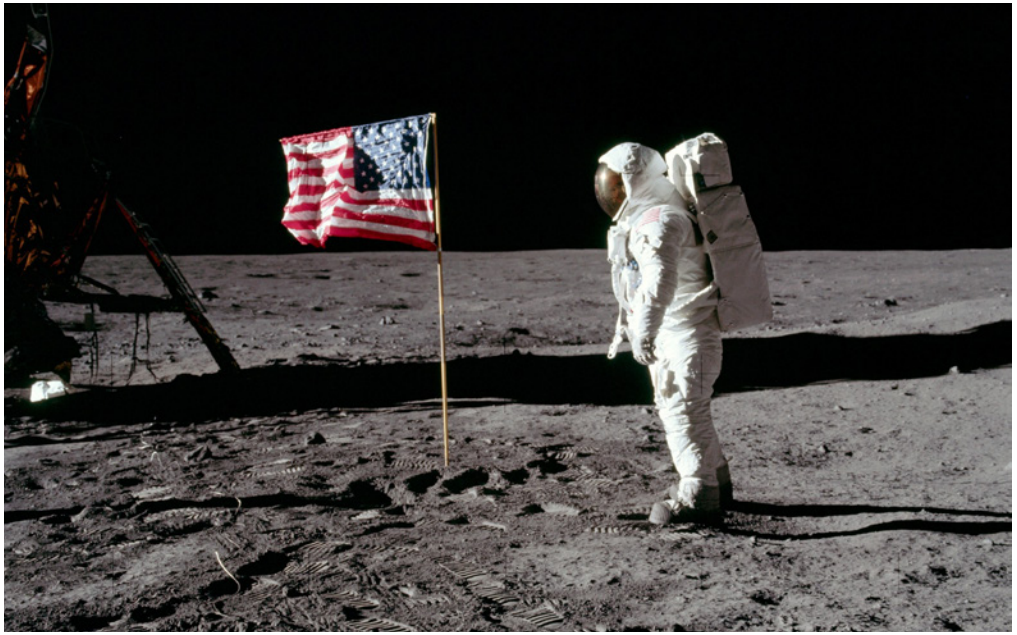
Step 5: Preparation of **Area Development Execution Plans** (ADEPs) that graphically show all projects needed to build out each ADP. These projects are not just buildings but also the horizontal work needed that includes roads, parking areas, sidewalks, and landscape elements. The output of the ADEPs should be integrated into the Center's CIPP to meet the following strategy:

> Development Program. The Handbook calls for a Development Program that "… is the overall Center strategy for using and investing in real property. Program requirements include all facility needs required to enable mission support. Facilities and projects should be validated against the master plan and the planning strategies before they are programmed."

Step 6: Preparation of a plan **Digest** that concisely and graphically summarizes all elements of the master plan – from the Vision Plan to the CIPP.

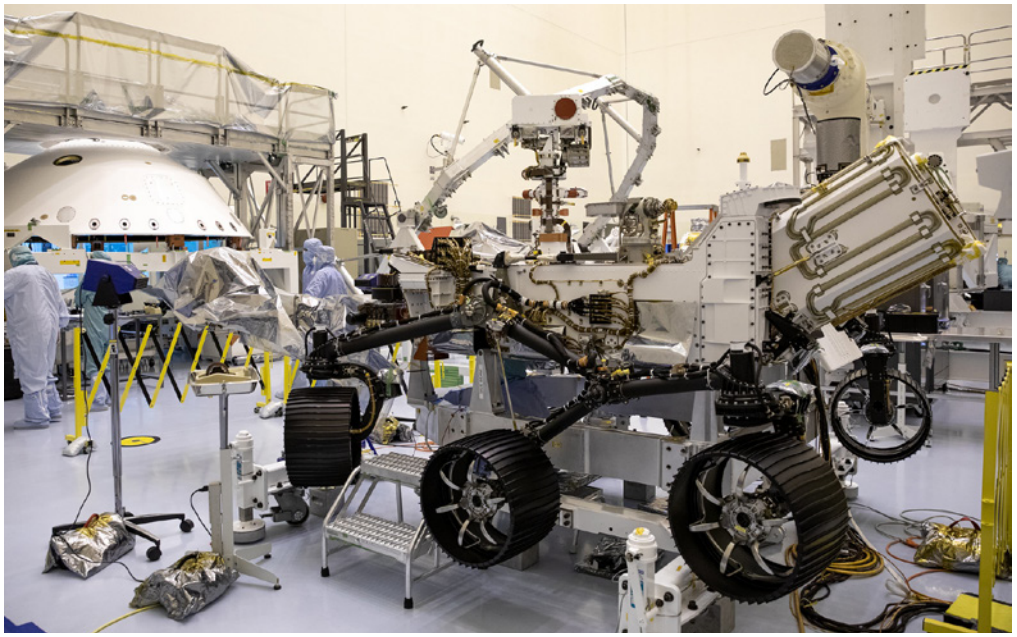
Step 7: Preparation of **Customer Concept Documents** (CCDs) for key short and mid-term buildings that can be inserted into Design-Build or Design-Bid-Build RFPs. Although not addressed in the Handbook, these 15% designs are quite beneficial because, when used, they can reduce change orders in construction projects by up to 44% and design fees by up to 30%. CCDs typically include detailed programs, conceptual site plans (tied to the ADPs), floor plans, elevations, sections, system narratives, energy and stormwater modeling (tied to the SCP), and renderings (tied to the Center Design Standards).

# CONCLUSION



## *In 1969, mankind took a "giant leap" demonstrating American triumph and inspiring the world.*

Just as it did in 1969, KSC will serve as the gateway to destinations outside of earth orbit, sending the first woman and next man to the Moon and then Mars. In the decade since the end of the Shuttle Program, KSC's transition to a multi-user spaceport continues to flourish. Provisioning of KSC's unique capabilities and assets for commercial use has contributed to significant cost avoidance for NASA in the short-term and, long-term, these efforts have better enabled the commercial space industry to pursue the innovations and capabilities that will be required to push the boundaries of mankind in support of NASA missions.



## *Today, the multi-user spaceport serves as a gateway to destinations outside of earth orbit.*

Accomplishing NASA's exploration mission, including making humankind a multi-planetary species, is complemented by the continued growth of commercial launch capabilities at KSC. Commercial operations are complemented by NASA's history of success, unique infrastructure and resources to get the job done. Future growth of commercial operations at KSC must be implemented strategically to ensure a balance is maintained between the needs of NASA Programs, the preservation of our natural resources, and the ability of KSC's service infrastructure to meet demand. It will take a combined effort between NASA, the state of Florida, commercial partners, and local governments to ensure KSC meets the needs of its users and continues to be the world's gateway to space.

# A APPENDIX

## STAKEHOLDER INTERVIEWS

# STAKEHOLDER INTERVIEWS

SENIOR LEADERSHIP

## *What makes KSC unique?*

- NASA uses KSC as a showcase for the Agency

> *KSC has a mission that is compelling and exciting that makes people want to be here*

## *How can senior leadership objectives be better supported?*

- Plan new development to directly support the KSC mission
- Understand how KSC can better use existing facilities
- Build a new, energy efficient consolidated facility that combines emergency, health clinic, and fire station facilities to support future needs
- Provide a new media/press site that supports the mission message

## *What types of growth will ensure future success?*

- Continued evolution of the Center, a challenging work environment, and provision of the right tools needed for projects that are attractive for employees
- Be adaptable to change
- Remain ahead of the technology curve
- Identify more permanent means to fortify our shoreline to protect our critical launch infrastructure from storm events and sea level rise
- Maintain maximum flexibility
- Combine like activities in the same region to be more efficient
- Be cognizant of impacts of growth that limits other future options
- Be able to meet our nation's spaceflight requirements at KSC
- Provide a reasonable path and framework to grow within
- Accommodating government, commercial, and tourism activities in a competitive environment

# STAKEHOLDER INTERVIEWS

EXPLORATION GROUND SYSTEMS (LX)

## *What makes KSC unique?*

- KSC is unlike other NASA Centers, it embodies the "big idea" space programs
- KSC is both commercial and government
- KSC is the nation's multi-user spaceport

## *How can the functions of LX be better supported?*

- Build and maintain existing infrastructure, experience, location, and people
- 21st-century funding to enable commercial activities and all spaceflight
- Support for small launch vehicles, including small launch pads to build new partnerships
- Diversify commercial customers
- Improve the logistics support system

## *What growth will ensure future success?*

- Ability to work with next generation propulsion at KSC
- Opportunity to work with Congress to support programs such as Gateway and Artemis missions
- Increase advocacy to build government customers and support to pursue future programs
- Funding and cost-sharing with commercial and other partners

# STAKEHOLDER INTERVIEWS

EXPLORATION RESEARCH AND TECHNOLOGY (UB)

## *What makes KSC unique?*

- Space Coast will be the Silicon Valley of space
- KSC supports research and development technologies that may not be profitable but benefit the space industry and multi-user spaceport

## *How can the functions of UB be better supported?*

- Build a multi-user facility for technology located on the fenceline
- Develop needed state-of-the-art research lab space, processing facilities, office space, and community meeting space for transient teams and customers
- Additional co-location of offices and labs to facilitate collaboration and open communication
- Attract more young talent to fill the age gap and change the professional environment to accelerate progression

## *What types of growth will ensure future success?*

- Expanding from ground operations to ground and surface operations that are not limited to just Earth
- Create a central campus layout with more employee amenities
- Actively advertise KSC's capabilities and technologies to commercial users
- Develop broad partnerships with universities, private companies, and facilitate programs that bring in new ideas and new talent
- Reduce bureaucratic boundaries to maintain KSC's long history of doing new things and pushing boundaries
- Diversify programs
- Flexible infrastructure

# STAKEHOLDER INTERVIEWS

LAUNCH SERVICES PROGRAM (VA)

## *What makes KSC unique?*

- People are KSC's greatest asset
- KSC is where "the rubber meets the road" and new solutions are found
- KSC has valuable, unique assets that enable spaceflight
- Amenities such as KARS Park, camping, sports fields, boat ramps, and meeting facilities open to employees
- Logistics assets for shipping and receiving
- Offline labs to help resolve problems
- Transportation for heavy equipment

## *How can the functions of VA be better supported?*

- Increase physical and digital security, limiting access to protect commercial partners and their knowledge
- Additional office and administrative space
- Additional launch viewing areas for visitors and guests
- Conference room space and technologically equipped conference facilities

## *What types of growth will ensure future success?*

- Development that ensures the mission is achieved efficiently and effectively
- A central campus model with emphasis on public transport to and from the Center to reduce reliance on POV commuting
- Dedicated space for LSP programs
- Expand launch capabilities to provide for additional programs and partners

# STAKEHOLDER INTERVIEWS

COMMERCIAL CREW PROGRAM (FA)

## *What makes KSC unique?*

- KSC can leverage years of spaceflight and operations experience
- CCP is establishing crew operations and capabilities with partners
- A culture of sharing in learning environments which combines talent of the collective KSC workforce and partners
- KSC's commercialization model

## *How can the functions of FA be better supported?*

- Maintain lean, small programs
- Establish permeable organizations that can cross-train with other programs and partners, remain flexible, and take on missions even with non-NASA entities
- Create a repository of specialist knowledge and data for public use that everyone can build from
- Keep our skills fresh to remain relevant and attract the high talent of the new workforce
- Streamline bureaucracy to keep up with the pace of our partners
- Identify critical technical skills and understand how to sustain them

## *What types of growth will ensure future success?*

- Develop even broader visions than going to the Moon or Mars
- Facilitate more cross-program integration
- Ensure the success of our partners through improved infrastructure and staffing
- Be flexible and eliminate barriers to create a fast-paced environment
- Share knowledge between partners to support everyone's success
- Upgrade servers to protect data and ensure cyber security
- Provide crew quarters to accommodate all users
- Create a flexible, modular, partitionable, weather-resistant facility with the proper amenities and security that supports all missions across the Center

# STAKEHOLDER INTERVIEWS

INFORMATION TECHNOLOGY & COMMUNICATIONS (IT)

## *What makes KSC unique?*

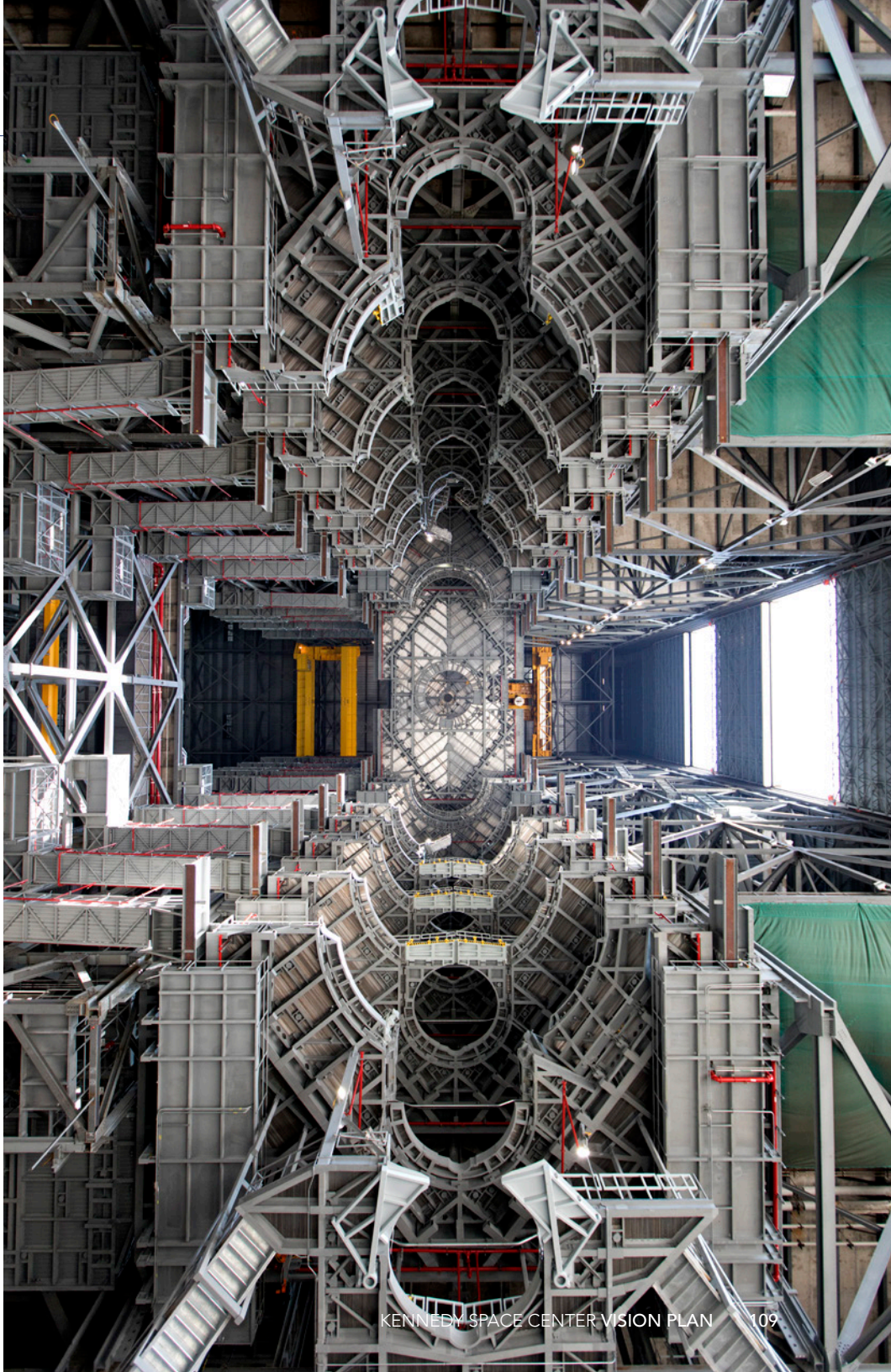
- Investments in quality IT infrastructure
- Onsite, permanent IT service provider to all customers

## *How can the functions of IT be better supported?*

- Create a cache of institutional knowledge before senior staff retire
- Advertising and marketing: produce an abbreviated version of Master Plan to share with people and educate them on the services, security, and maintenance IT offers
- Stay on top of the increasing tempo of operations as it results in more requests for services
- Communicate well with all organizations to understand or predict future needs for infrastructure requirements, layout, capacity, and be informed of construction/ device installations to prevent potential security threats
- Regular maintenance of the M6-0138 Communication Distribution and Switching Center
- Identify and mitigate cybersecurity threats and risks

## *What types of growth will ensure future success?*

- Always be looking for a better way to do things
- Being adaptable to change is critical
- Support a multi-user spaceport with a single center IT as the premier service provider
- Mitigate risk of adapting new technology too quickly



# STAKEHOLDER INTERVIEWS

SPACEPORT INTEGRATION & SERVICES (SI)

## *What makes KSC unique?*

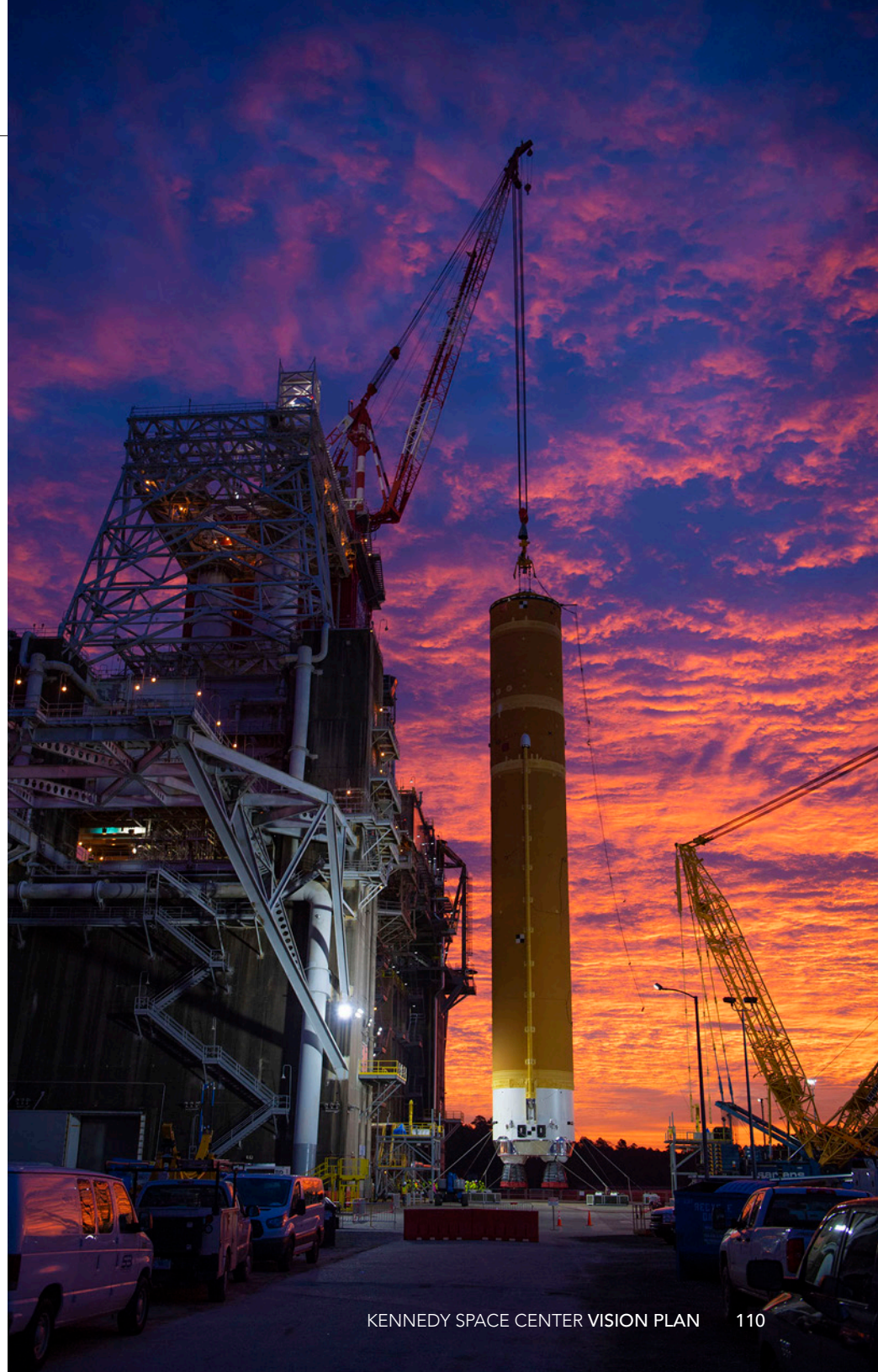
- KSC's multi-user spaceport will be a robust high-tech corridor for central Florida
- KSC's launch infrastructure, physical location, secured barrier, barrier territory, and buffer zone are unmatched
- Fully accessible through rail, airstrips, launch, roads, and boats

## *How can the functions of SI be better supported?*

- Contract directly with service providers to be as easy and efficient as possible
- Develop a more efficient means of real-time communication to integrate and deconflict operations across all spaceport users
- Address inability to keep up with growth due to infrastructure

## *What types of growth will ensure future success?*

- Commercial development should be market driven
- Respecting stewardship of wildlife
- Intentional, strategic, and respectful development of environmental sensitivities and avoiding rampant growth
- Develop partnerships with universities as a tech hub
- Implementable action plan to be financially stable and healthy



# STAKEHOLDER INTERVIEWS

ENGINEERING (NE)

## *What makes KSC unique?*

- Layout of KSC has purposeful locations and allows for collaboration
- Four human spaceflight opportunities in the same location
- KSC has unique facilities all under a single management chain and can be used together to solve problems
- KSC has a talented workforce and strong center culture in a great location

## *How can the functions of NE be better supported?*

- Two walkable campuses with increased human amenities such as a hotel near the Visitor's Center to better support the idea of a multi-user spaceport
- Greater proximity between similar functions
- Improved landscaping with more shade trees
- New facilities that support "Rocket U" training, vacuum chambers, prototype development, metrology, rapid-response, payload processing, and secure propulsion processing
- Solar power capability growth – be a "green space center"
- Transportation, parking, and infrastructure upgrades
- Upgrade of Converter Compression Facility (Helium, Nitrogen high pressure gases)
- Lab overhead cost reduction

## *What types of growth will ensure future success?*

- Increased infrastructure to accommodate multiple entities
- Remain flexible and continue working with partners
- Ensure government and commercial partners can do as much of their work at KSC as necessary – physically and contractually
- Provide autonomy to partners to make modifications and excel
- Create adaptable and flexible labs

# STAKEHOLDER INTERVIEWS

CENTER PLANNING & DEVELOPMENT (AD)

## *What makes KSC unique?*

- Location
- Infrastructure
- Quinti-modal transportation
- The drive to make things successful (providing help to all customers when and where they need it)
- Workforce expertise

## *How can the functions of AD be better supported?*

- Need to be willing as a Center and agency to let go of certain responsibilities while continuing to meet their mission
- Successfully and progressively moving forward with the Vision Plan
- Reduce limitations imposed by federal law
- Visionary management thinking
- Development that is focused on KSC's missions of getting to the Moon and Mars

## *What types of growth will ensure future success?*

- Continue to grow multi-use spaceport through partnerships and guide its Center through development
- Support partnership growth, continue to diversify, develop programs, support companies, enable manufacturing, launch vehicles and satellites, diversify classes of launch vehicles, and bring in supply chains
- Need a community vibe with more common space to enjoy amenities that don't exist yet

*If you don't like change, you'll like irrelevancy even less*

# STAKEHOLDER INTERVIEWS

GATEWAY DEEP SPACE LOGISTICS (DS)

## *What makes KSC unique?*

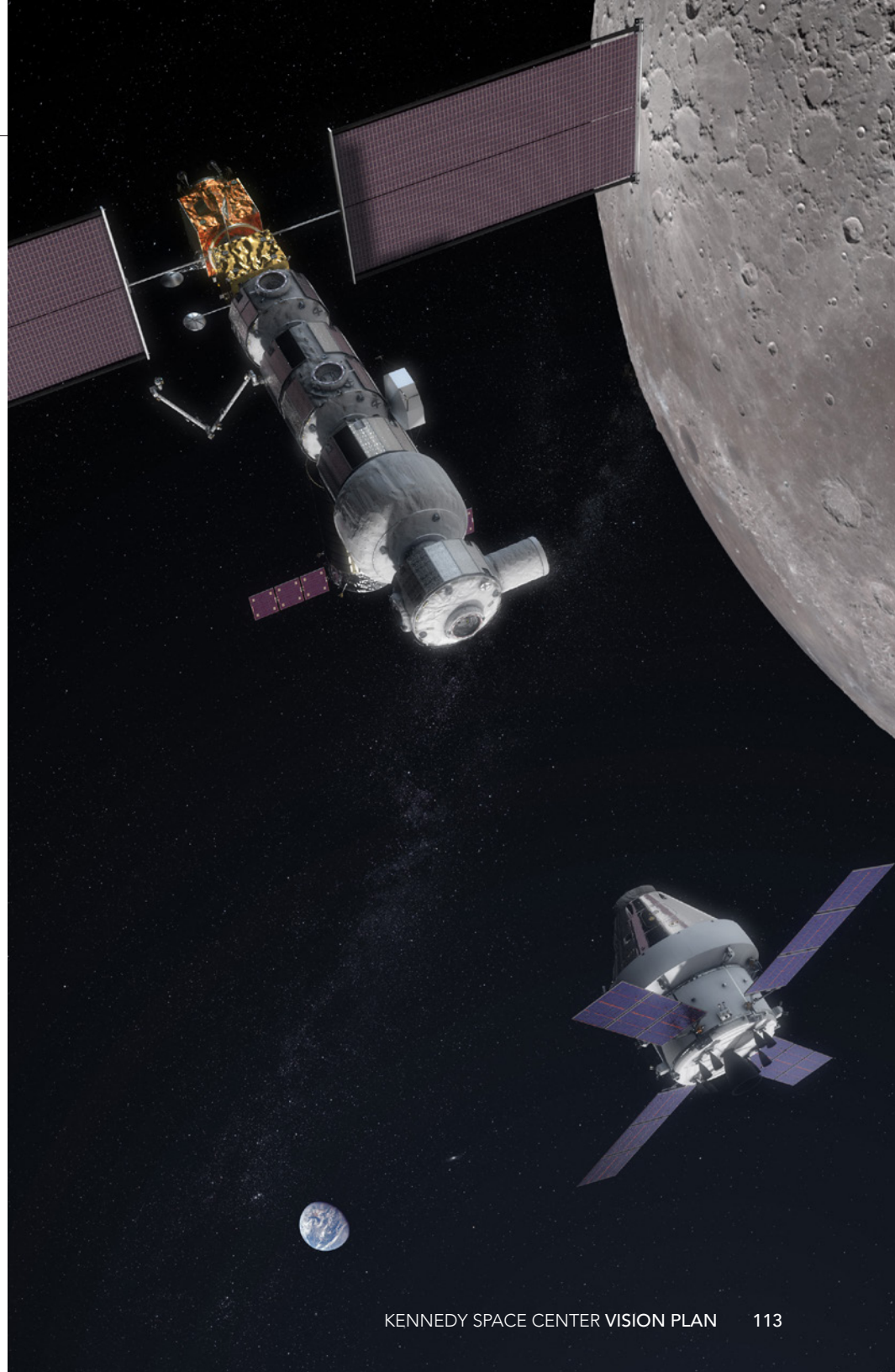
- KSC's Payload Processing Capabilities including the Payload Hazardous Servicing Facility (PHSF), Hangar AE, and Operations & Checkout Building
- The Thermal Protection System Facility at Cape Canaveral and the expertise at KSC to support this facility are an asset for NASA and its partners
- KSC's expertise in Ground Systems
- KSC's expertise in commercial acquisitions

## *How can the functions of DS be better supported?*

- Challenging for international partners to work on Center due to security protocols
- Federal property has a lot of rules for private companies that can make it challenging to act quickly
- Continue to maintain office space directly adjacent to R&D lab space
- Preserve lab space in the SSPF for Artemis as demand increases from commercial customers

## *What types of growth will ensure future success?*

- Partnerships will continue to be important in the future: international partners, universities, and commercial partners
- Collaboration facilities where NASA employees can work together with international and commercial partners
- Improve transportation and compact development around the center, currently too spread out with no public transportation
- Gateway will need facility space for mockups of lunar and martian bases, some may be at Johnson Space Center
- Show tourists more of KSC for public outreach to increase visibility and excitement, including the VAB if it can be done safely and securely
- The Public Affairs Facility is important for telling KSC's story and is outdated
- Amenities to attract and support the workforce including childcare, doctor's office, hotel, fitness center, and dry cleaner



# STAKEHOLDER INTERVIEWS

FEDERAL GOVERNMENT PARTNERS

## *What makes working with KSC unique?*

- Government partners overcome possibilities of conflicting mission interests and find ways to be complementary of each other
- KSC's ownership of the land which allows for unique management opportunities
- Unique and undeveloped wildlife habitat areas
- Availability of land
- KSC has many successful partnerships with organizations that aren't related to spaceflight

## *How can the functions of your agency be better supported?*

- Create more opportunities to highlight achievements of additional accomplishments that may not be related to spaceflight
- Reducing policy and other red-tape that slows internal development and growth of the Center
- Continuing great support from NASA
- Possible merging of funds to solve problems faster
- Combining storage to reduce Quantity Distance (QD) arc areas
- Preservation of DoD testing capability to launch, test, and fly rockets

## *What types of growth will ensure future success?*

- Create a more direct transportation route for launch infrastructure
- Development for greater support of horizontal launches
- Ensuring availability of limited resources in the future
- Address environmental threats and balance recreational, environmental, and mission-essential uses of the land

# STAKEHOLDER INTERVIEWS

STATE & LOCAL GOVERNMENT PARTNERS

## *What makes working with KSC unique?*

- Land availability
- Economic development opportunities
- Nearby world-class attractions
- KSC is flexible and easy to work with
- Unique environmental features

> *Working with KSC feels like a real partnership*

## *How can the functions of your agency be better supported?*

- Expand services to meet needs of growing spaceport and workforce
- Support development of solutions and technologies complementary to and related to spaceflight
- Develop a strong relationship with the state and local communities that stimulates the economy
- To keep KSC relevant and keep the community strong, don't ignore progress, push towards and facilitate change

## *What types of growth will ensure future success?*

- Be more persistent with marketing all the great opportunities at KSC and sell the idea of the vibrant community that surrounds KSC to bring in more people
- Focus on community development in addition to spaceport development
- Ensure growth of housing, amenities, and transportation options
- Work with local partners to attract more young talent and stay relevant

# STAKEHOLDER INTERVIEWS

COMMERCIAL PARTNERS

## *What makes working with KSC unique?*

- KSC provides space transportation for government and commercial users
- All partners are interested in advancing human space flight in the next five years
- Strong incentive for industry to come together for the spaceport
- Emphasis on modernizing utilities for the multi-user spaceport

## *How can the functions of commercial partners be better supported?*

- Need greater processing capacity for projects
- Cohabitation with KSC as much as possible
- Speed up transactions and lower costs of operating
- Open all KSC services to all users
- Create a more efficient and cohesive government-commercial relationship
- Maintain promoting space exploration programs to the public
- Update and enhance infrastructure to support growth
- Long-term planning support and additional infrastructure
- Provide greater regulatory certainty
- Need one single authority for decision making at the spaceport
- Deconflict shared infrastructure amongst all spaceport entities

## *What types of growth will ensure future success?*

- Marketing campaigns to build excitement and drive more people here
- Formation of a panel of high-level stakeholders to discuss spaceport topics
- Attract projects to KSC and provide the adequate infrastructure to support
- Advocate for greater numbers of commercial entities to support more launches and drive up visitor numbers to fund more outreach and education programs
- Create a smaller and more efficient campus
- Upgrade current facilities rather than expansion

# B APPENDIX

## VPS, SWOT, & ADDITIONAL ANALYSIS

# VISUAL PREFERENCE SURVEY

The VPS is a method of finding a group's partiality towards different design aesthetics. It was developed by urban planner Anton Nelessen and is often used in planning forums. By viewing and rating images of comparable community environments, clear trends emerge as to the preference of the survey participants. The resulting data then guides planners in designing planning patterns for the built environment.

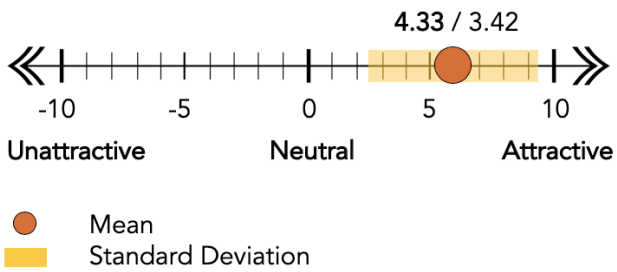
Workshop stakeholders used the VPS to recognize what aspects and qualities of the built environment are important to the people who work at KSC. Over 80 participants used comparisons of the positively and negatively rated images to establish planning patterns. These patterns help master planners ensure that subsequent designs reflect the collective opinion of the stakeholders.

Mean and standard deviations are statistical tools to examine data sets to define the commonality and spread of a large set of numbers. The mean shows the average of the data set and is found by dividing the sum of the scores by the number of inputs recorded. To determine the standard deviation, the mean is used as a base point to calculate how far from the average the majority of data points occur. This indicates the extent of deviation for the group as a whole.

# VISUAL PREFERENCE SURVEY

VPS Process
The results of the VPS were used to analyze what types of environments stakeholders preferred as a group. The VPS showed sixteen images showing similar elements of the built environment. By analyzing the results by pair, stakeholders were able to recognize the differences in two similar streets, buildings, parks, or plazas and determine what elements caused the preferred image to score better amongst participants. Elements that occurred repeatedly in the preferred images became design principles and are listed below each image pair. Once the design principles were established, they were then categorized and grouped into goals to inform vision statements for each sub-area.

The following pages summarize the results of the VPS. Each pair of images is shown in a column, with the higher-scoring image shown at the top. The lower-scoring image is shown faded. The scores (mean/standard deviation) are shown on the scale bar of each image as a graphic representation of the numbers (see diagram below).



# VISUAL PREFERENCE SURVEY

Key Lessons Learned

1) Street Lighting
2) Shade Trees
3) Wide Sidewalks
4) Wide Street
5) On-Street Parking

1) Landscaped Medians
2) Shade Trees
3) Angeled Parking
4) Sidewalks
5) Street Lighting

1) Shade Trees
2) Covered Walkways
3) Greenspace
4) Ample Glazing
5) Seating Areas
6) Appealing Architecture (Safe and Welcoming)

1) Modern / Clean Look
2) Ample Glazing
3) Natural Lighting
4) Seating Areas
5) Connected Walkways
6) Landscaping

1) Ample Lighting
2) Security
3) Connected Walkways
4) Modern Look
5) Greenspace
6) Distance from Parking

Highest-rated image

**4.72** / 3.08

**5.93** / 3.83

**-4.75** / 3.93

**4.34** / 3.40

**6.61**/ 2.00

**-5.97** / 3.66

**6.69**/ 2.12

**-3.54** / 3.79

**1.86** / 3.40

**4.72** / 4.10

# VISUAL PREFERENCE SURVEY

Key Lessons Learned

1) Outdoor Seating
2) Bike-Friendly
3) Clear Wayfinding
4) Wide Sidewalks
5) Shade Trees
6) Natural Light / Glazing
7) Landscaping

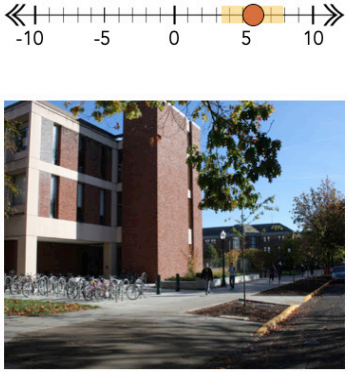
1) Shade Trees
2) Wide Sidewalks
3) Open Greenspace
4) Appealing Architecture
5) Seating Areas
6) Clear Entry

1) Shade Trees
2) Landscaped Areas
3) Seating Areas
4) Protected Walkways

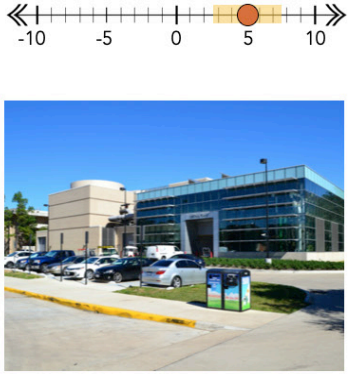
1) Appealing / Varied Design
2) Ample Lighting
3) Connected Walkways
4) Landscaping
5) Natural Light / Glazing

1) Appealing / Varied Designs
2) Modern
3) Open Greenspace
4) Shade Trees
5) Covered Walkway
6) Natural Light / Glazing
7) Clear Entry

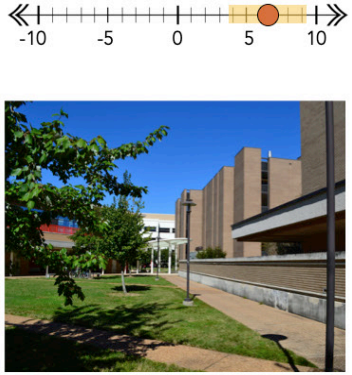
**5.82** / 2.49



**5.21** / 2.43

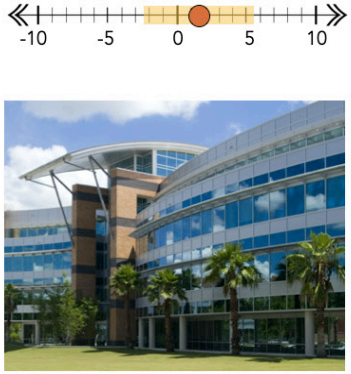


**6.65** / 2.71



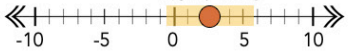
**3.44** / 4.41

**1.68** / 3.62



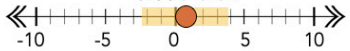



**2.52** / 2.90



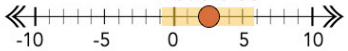



**0.65** / 3.32



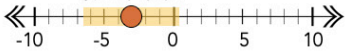



2.55 / 3.30



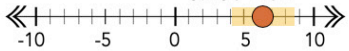



**-3.11** / 3.57



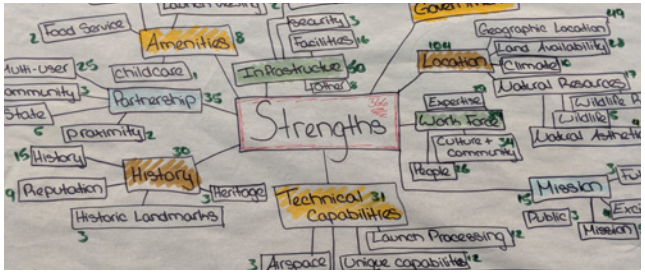


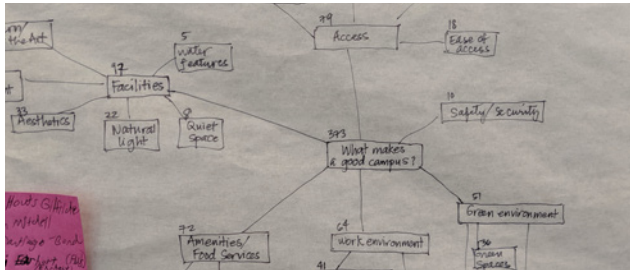

**6.28** / 2.32

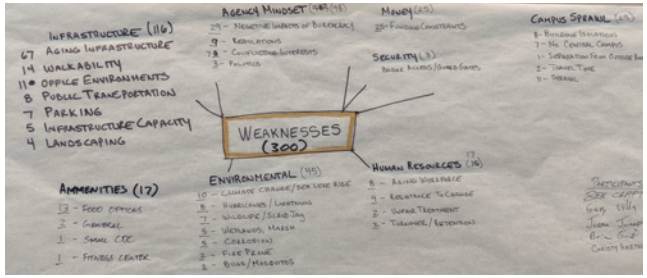


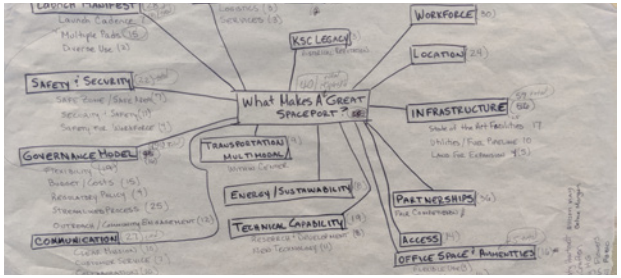
# SWOT ANALYSIS

Using a technique called the Crawford Slip Method, participants responded to a series of questions about Kennedy Space Center's **strengths**, **weaknesses**, **opportunities**, and **threats** for the campus. Vision Workshop participants were also asked "What makes a great campus?" and "What makes a great spaceport?" to solicit visionary principles for KSC. Participants were given three minutes for each question to come up with as many answers as possible, each written on a separate piece of paper. Once compiled, teams arranged the responses into a concept maps that visually depicted common themes. Each team then presented their concept map to the group.







# SWOT ANALYSIS

Strengths are current assets that should be preserved and replicated. The greatest strength at Kennedy Space Center is its location, followed by its work force, amenities, and infrastructure network.

## STRENGTHS

1. LOCATION & LAND AVAILABILITY
2. WORK FORCE
3. AMENITIES
4. INFRASTRUCTURE NETWORK
5. PARTNERSHIPS
6. TECHNICAL LAUNCH CAPABILITIES
7. NASA HISTORY & PUBLIC TRUST
8. QUINTI-MODAL TRANSPORTATION
9. GOVERNMENT
10. FLIGHT SUPPLY CHAIN

Weaknesses are liabilities that need to be addressed. Aging infrastructure and an insufficient workplace received more than a third of all responses. Agency mindset, environmental issues, and sprawl are some of the most identified weaknesses at Kennedy Space Center.

## WEAKNESSES

1. AGING INFRASTRUCTURE
2. AGENCY MINDSET
3. ENVIRONMENTAL
4. CAMPUS SPRAWL
5. BUDGET CONSTRAINTS
6. HUMAN RESOURCES
7. AMENITIES
8. IT/CYBER SECURITY
9. LACK OF FOOD OPTIONS
10. MAINTAINING BUFFER ZONES

# SWOT ANALYSIS

Opportunities are elements that Kennedy Space Center can capitalize on in the future. Increased partnerships, upgrading and improving facilities, campus design and focus on future missions are some of the largest identified opportunities.

## OPPORTUNITIES

1. PARTNERSHIPS
2. CAMPUS CONSOLIDATION
3. FUTURE MISSIONS
4. DEVELOPMENT OF LAUNCH PADS
5. SUSTAINABILITY
6. PUBLIC ACCESS/TOURISM
7. IMPROVE CAMPUS AMENITIES
8. INCREASE TRANSPORTATION OPTIONS
9. SOLAR ENERGY
10. FLEXIBLE LAB & WORK SPACES

Threats are elements that stand in the way of future development at Kennedy Space Center. Environmental concerns and climate change received the most responses. Management and workforce, funding, politics, and overloading infrastructure stand as the next largest threats.

## THREATS

1. CLIMATE/ ENVIRONMENTAL
2. WORKFORCE RETENTION
3. FUNDING/BUDGET
4. POLITICS & POLICY
5. CONSEQUENCES OF THE 25% REDUCTION TARGET
6. OVERLOADING INFRASTRUCTURE
7. ENCROACHMENT ON KSC MISSIONS
8. SAFETY & SECURITY
9. CHANGING PUBLIC PERCEPTION
10. RESOURCE CAPACITY

# SWOT ANALYSIS

When asked, *What makes a Great Campus*, stakeholders identified elements which they thought compose a great campus. Common answers included accessible location, safety, inviting greenspaces and additional ecological considerations, and a good work environment.

CAMPUS

1. ACCESS
2. SAFETY & SECURITY
3. GREEN ENVIRONMENT
4. WORK ENVIRONMENT
5. AMENITIES/FOOD SERVICES
6. FACILITIES

When asked, *What makes a Great Spaceport*, stakeholders identified elements which they thought compose a great spaceport. Common answers included an accessible and secure location, a talented workforce, geographic location, and KSC's legacy of successful missions.

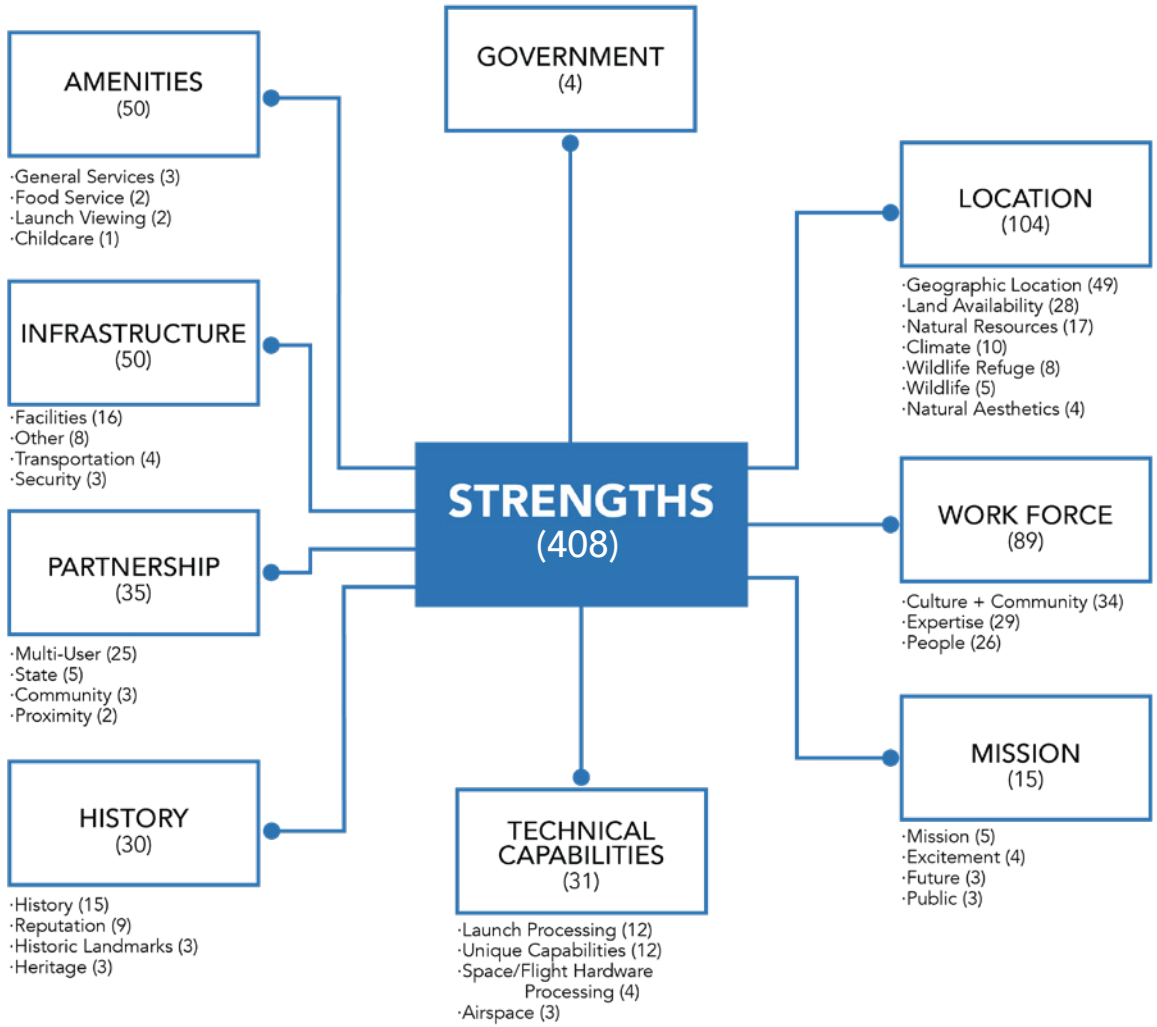
SPACEPORT

1. ACCESS
2. WORKFORCE
3. LOCATION
4. SECURITY
5. KSC LEGACY
6. LOGISTICS/SUPPLY CHAIN
7. INFRASTRUCTURE
8. PARTNERSHIPS
9. COMMUNICATION
10. LAUNCH MANIFEST
11. GOVERNANCE MODEL
12. TECHNICAL CAPABILITY
13. ENERGY/SUSTAINABILITY
14. TRANSPORTATION
15. MULTIMODAL
16. OFFICE SPACE & AMENITIES

# SWOT ANALYSIS - STRENGTHS

Strengths are current assets that should be preserved and replicated. The greatest strength at Kennedy Space Center is its location, followed by its work force, infrastructure, and amenities.

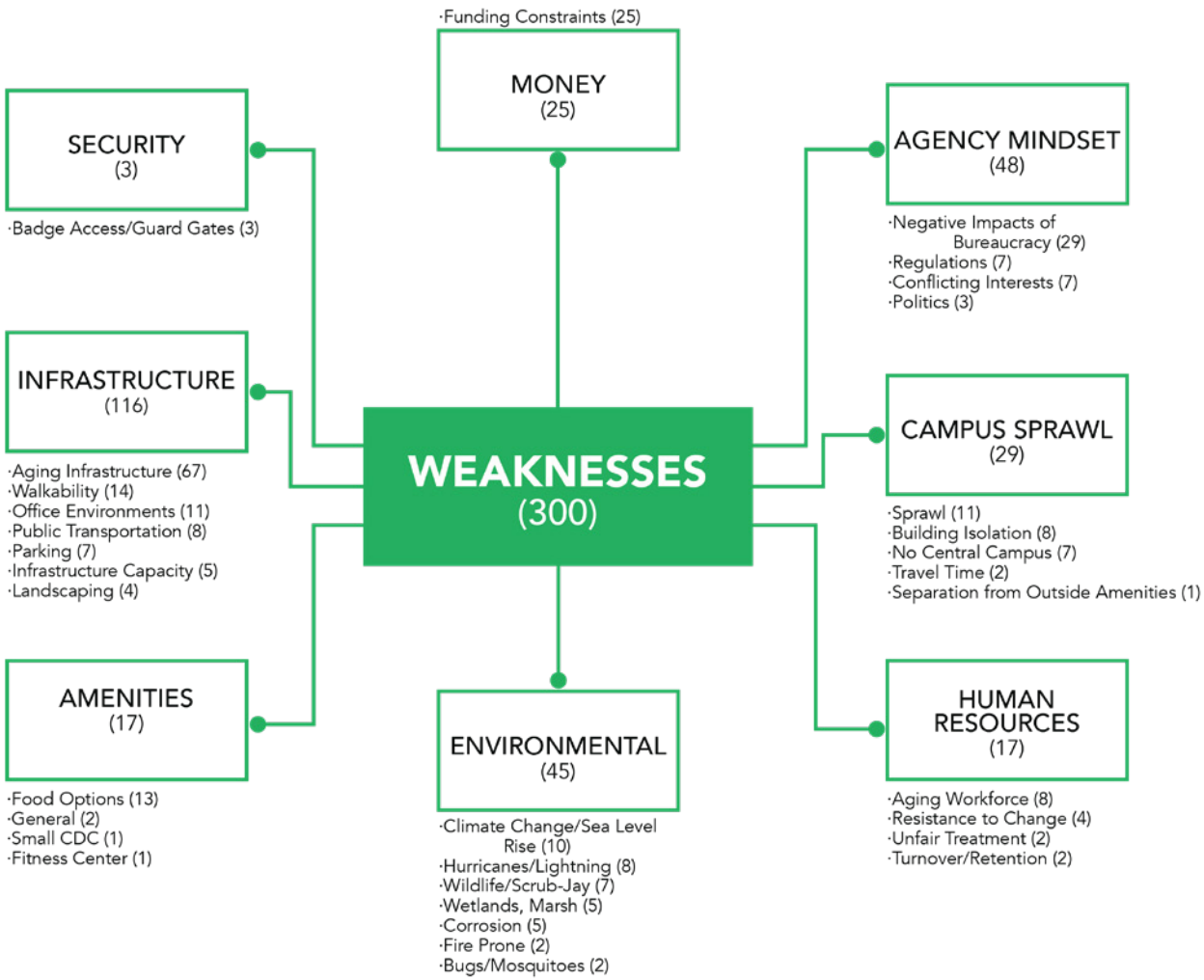
The numbers following the title represent the number of responses that aligned with each concept.



# SWOT ANALYSIS - WEAKNESSES

Weaknesses are liabilities that need to be addressed. Aging infrastructure and an insufficient workplace received more than a third of all responses. Agency mindset, environmental issues, and sprawl are some of the most identified weaknesses at Kennedy Space Center.

The numbers following the title represent the number of responses that aligned with each concept.



# SWOT ANALYSIS - OPPORTUNITIES

Opportunities are elements that Kennedy Space Center can capitalize on in the future. Increased partnerships, upgrading and improving facilities, campus design and focus on future missions are some of the largest identified opportunities.

The numbers following the title represent the number of responses that aligned with each concept.

# SWOT ANALYSIS - THREATS

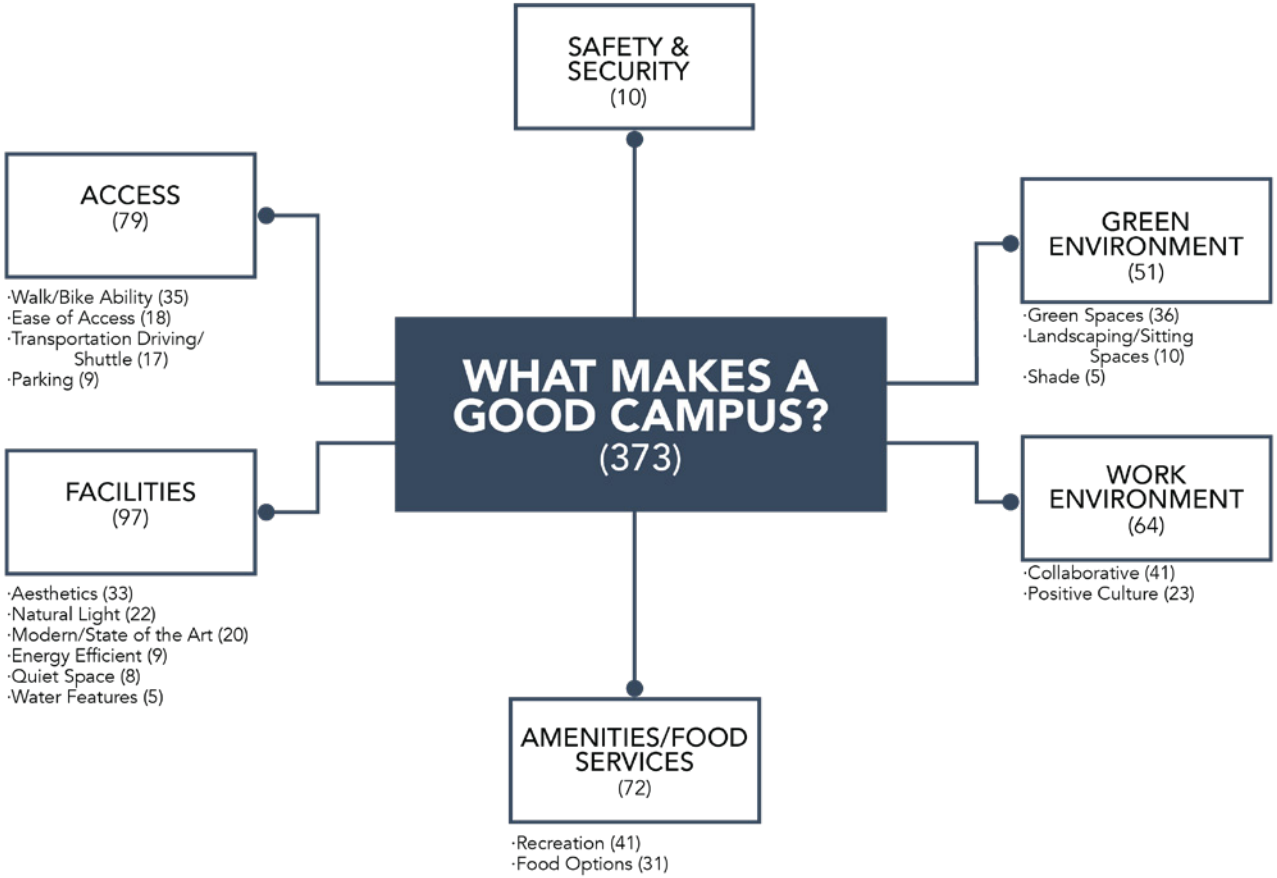
Threats are elements that stand in the way of future development at Kennedy Space Center. Environmental concerns and climate change received the most responses. Management and workforce, funding, competition, and aging infrastructure stand as the next largest threats.

The numbers following the title represent the number of responses that aligned with each concept.

# SWOT ANALYSIS - GOOD CAMPUS

A good campus incorporates planning elements that enhances working at or visiting Kennedy Space Center. Access, facilities, and amenities/food services gathered the most responses for what makes a good campus. Work environment, green environment, and safety and security were identified as important elements to a good campus as well.

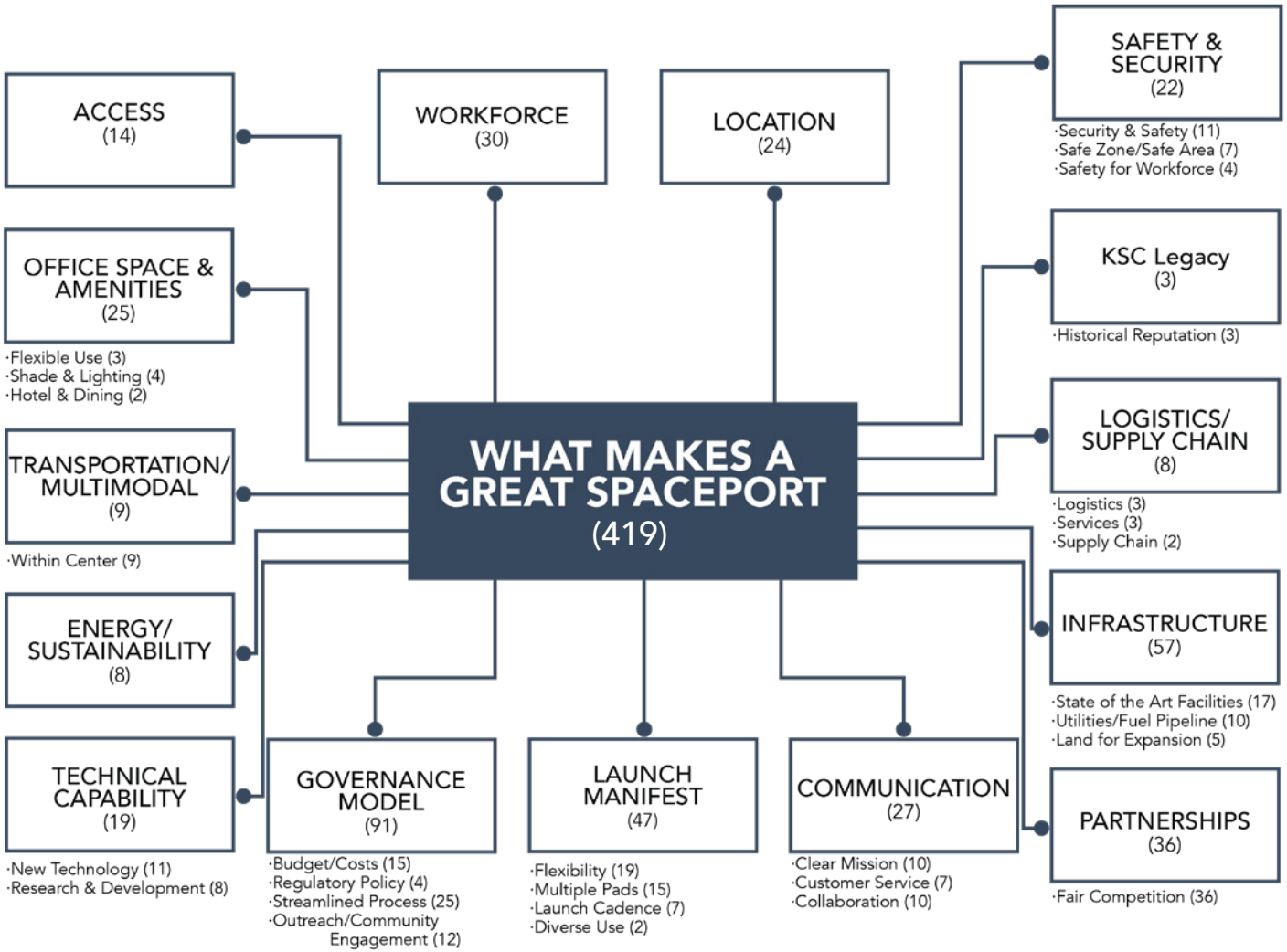
The numbers following the title represent the number of responses that aligned with each concept.

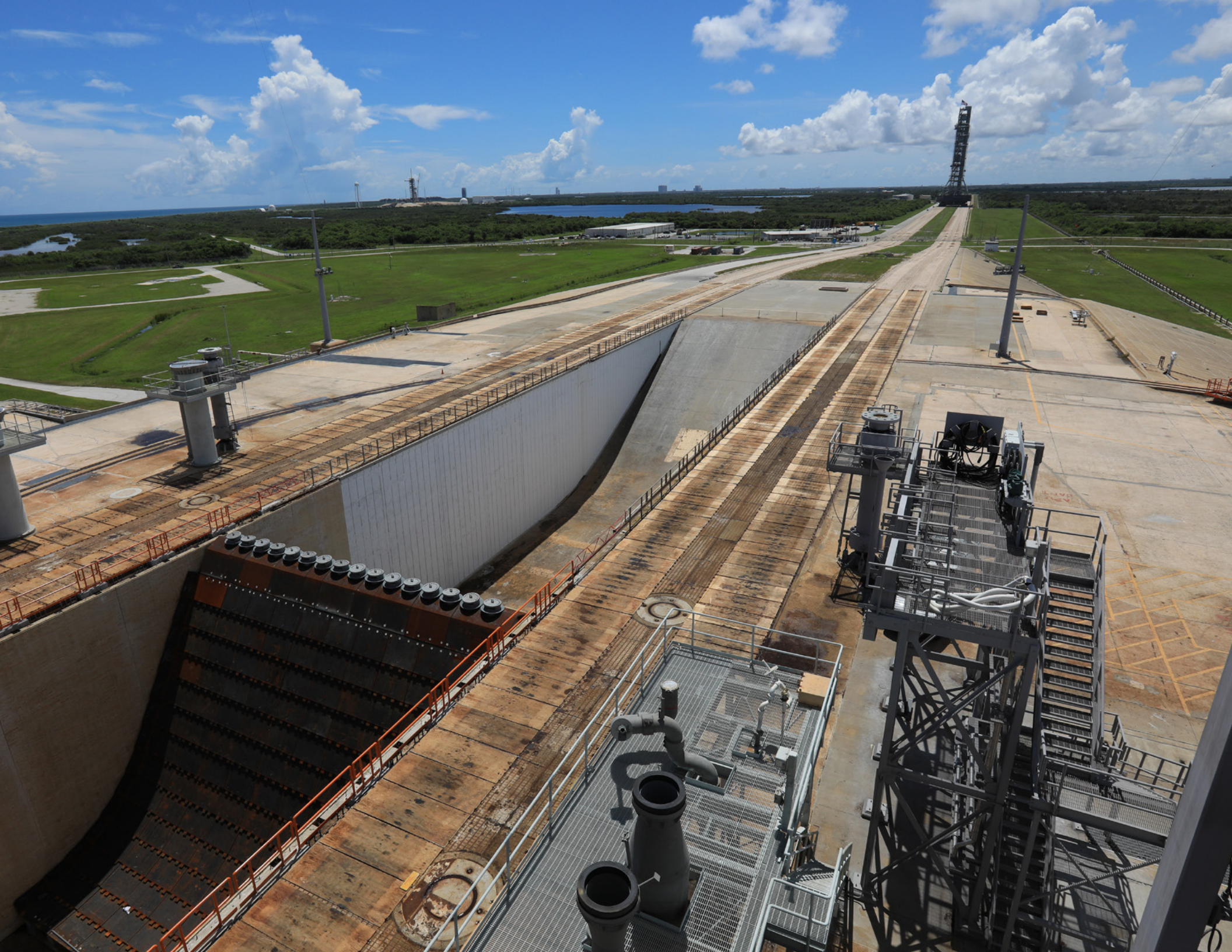


# SWOT ANALYSIS - GREAT SPACEPORT

A great spaceport will enhance the capabilities, work environment, and visitor experience at Kennedy Space Center, and will enable KSC to continue to meet its mission and vision. Governance model, infrastructure, launch manifest, partnerships, workforce, communication, and office space and amenities account for the most responses when stakeholders considered what makes a great spaceport. Location, safety and security, technical capability, access, transportation/ multi-modal, logistics/supply chain, and legacy were also identified as important factors that lead to a great spaceport.

The numbers following the title represent the number of responses that aligned with each concept.





# C APPENDIX

## FUTURE DEVELOPMENT - LOW PRIORITY PROJECT LIST

# FUTURE PROJECTS - LOW PRIORITY

The future project list was developed during the Vision Plan workshop and then refined by leadership and key stakeholders. It reflects development opportunities generated by stakeholders as well as projects already identified as part of strategic priorities for KSC. This project list includes the low-priority projects that were not listed or located with the High and Medium-priority projects in Section 5. This includes projects of all funding types that are not mission critical.

A corresponding risk analysis was completed for these projects.

| Project | | Priority | Type |
|---|---|---|---|
| 1 | Stormwater System Upgrades Ph 1 - 4 | LOW | Institutional |
| 3 | Haulover Canal Bridge | LOW | Institutional |
| 4 | Expanded Kennedy Learning Center (KLC) | LOW | Institutional |
| 5 | Expanded Food Court | LOW | Institutional |
| 6 | Covered Walkways OSB/OSB II/LCC | LOW | Institutional |
| 7 | Solar Covered Walkways | LOW | Institutional |
| 8 | Pedestrian Overpasses | LOW | Institutional |
| 9 | Replace Sheds by the Power Substation (ORSINO) | LOW | Institutional |
| 10 | Borrow Pit Redevelopment/Re-Use | LOW | Institutional |
| 11 | Recreational Center with Amenities (Pool Table, Ping Pong, Lounge, Social Event Area) | LOW | Institutional |
| 12 | Consolidate Barber Shop and Massage Rooms from Business Area to Rest/Health/Space/Amenity Areas | LOW | Institutional |
| 13 | Nature Trails in Areas that Stay Undeveloped/Outskirts of KSC | LOW | Institutional |

| Project | | Priority | Type |
|---|---|---|---|
| 14 | Fire Rescue Training Site Expansion | LOW | Institutional |
| 15 | Compost Area in Central Campus | LOW | Institutional |
| 16 | Virtual KSC Tour (New employees, partners) | LOW | Institutional |
| 17 | Roundabout at State Road 3 and NASA Parkway | LOW | Institutional |
| 18 | Walkway near Vapor Containment Facility (VCF) Operations | LOW | Institutional / Program |
| 19 | Shipping and Receivers at Pass & ID | LOW | Institutional / Program |
| 20 | Area Access Badging in VAB area | LOW | Institutional / Program |
| 21 | Area Access Badging in Central Campus | LOW | Institutional / Program |
| 22 | Intern Housing | LOW | Institutional/ Non-NASA |
| 23 | Upgrade Training Facility in VAB Area | LOW | Program |
| 24 | Additional Park Site for Additional Mobile Launcher | LOW | Program |
| 25 | Create a North Campus (like Central Campus) in VAB Area | LOW | Program |
| 26 | Housing/Hotel Near Visitor Center | LOW | Non-NASA |
| 27 | Amenities (Food, Drug Store, Dry Cleaners) Accessible to the Public | LOW | Non-NASA |
| 28 | Better Access to Visitor Center Maintenance Area | LOW | Non-NASA |
| 29 | Solar Roadways / Solar Windows | LOW | Non-NASA |
| 30 | Polygeneration Plant in VAB Area | LOW | Non-NASA |
| 31 | Autonomous Vehicle Routes | LOW | Non-NASA |
| 32 | New Exchange Warehouse | LOW | Non-NASA |
| 33 | Secure Parking Outside SR-3 Gate | LOW | Non-NASA |
| 34 | 2040 Siting for a Passenger "Flight Participant" Terminal | LOW | Non-NASA |

# D APPENDIX

## FUTURE DEVELOPMENT RISK ANALYSIS

# RISK ANALYSIS

Stakeholders conducted a risk analysis on all projects and opportunities identified during the Vision Plan workshop. These projects are also identified on the future projects list.

The level of risk was rated high (shown in red), medium (shown in yellow), or low (shown in green) for each category.

The risk analysis will help decision-making in future planning documents. For example, a project that is important for the mission of KSC and has low risk for the other categories could be completed with greater ease as it would have agency support while not causing a large impact on other areas.

The Mission risk assessment shows the risk to KSC's and NASA's mission if the project is not completed. All other assessment categories show the risk if the project were to take place.

Environmental risk addresses the impact the project may have on the natural environment, including risk to water, soil, and air quality, wetlands, and other impacts.

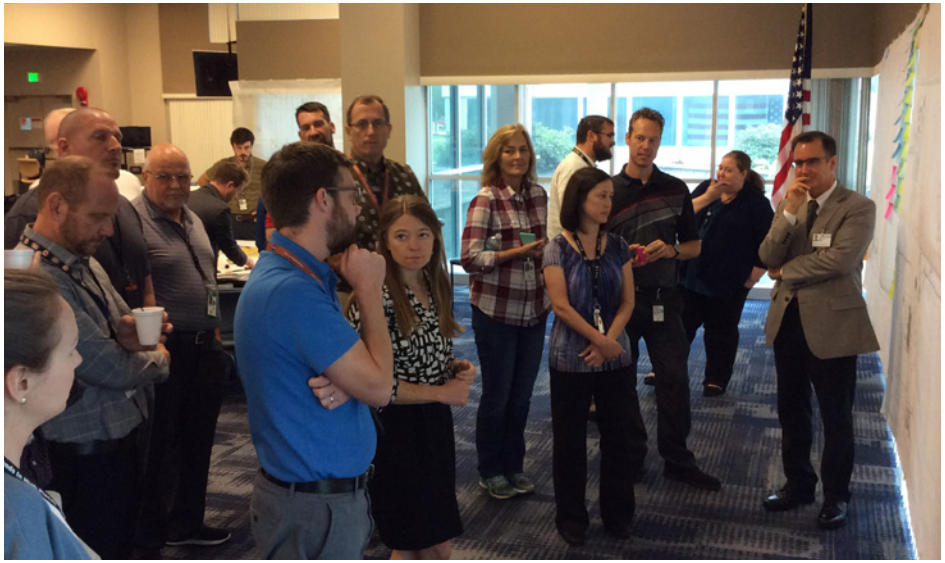
The risk to Budget was rated low for projects estimated to cost under $25 million, medium for between $25 million and $75 million, and high for project costs over $75 million.

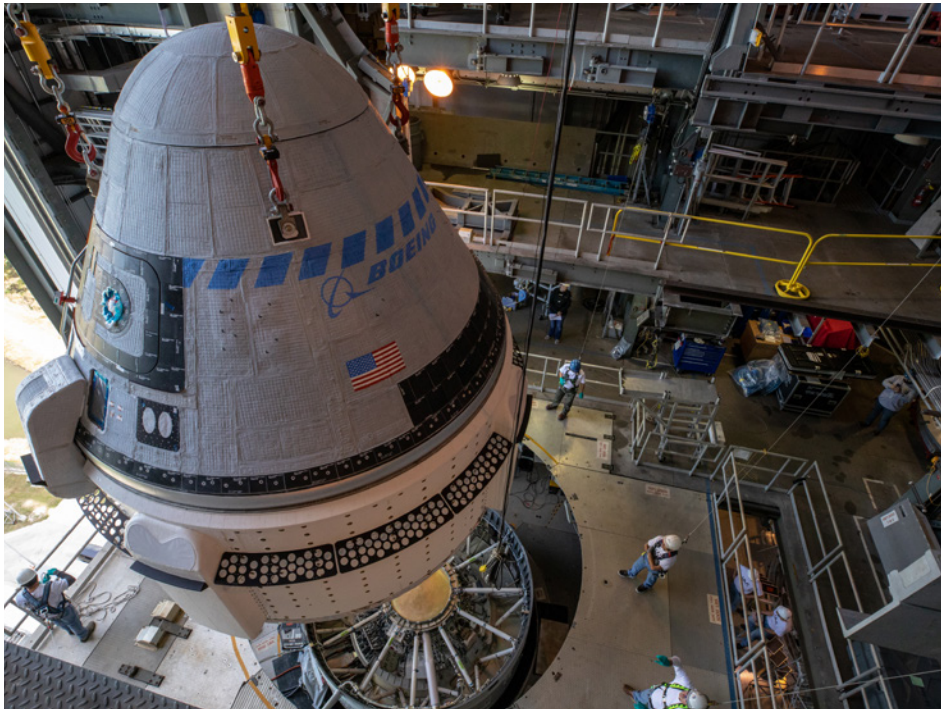
The risk to overall Resilience illustrates the impact on KSC's ability to respond to acute disasters, such as a hurricane.

Sustainability risk addresses the impact the project may have on KSC's ability to avoid depletion of natural and economic resources over time.

Political risk is the impact a project could have on public perception of NASA and KSC. Low risk in this category represents either positive public perception or no public interest.

- High risk
- Medium Risk
- Low risk





# RISK ANALYSIS

| Overall | Mission | | Environment | Budget | Resilience | Sustainability | Political |
|---|---|---|---|---|---|---|---|
| | Spaceport | NASA | | | | | |
| Mission Support Consolidation Facility | 🟡 | 🔴 | 🟢 | 🔴 | 🟡 | 🟢 | 🔴 |
| Applied Science and Technical Analysis Facility | 🟡 | 🔴 | 🟢 | 🔴 | 🟢 | 🟢 | 🟡 |
| Spaceport Command, Control, and Emergency Support Facility | 🔴 | 🔴 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 |
| Modernized Electrical Systems Ph1 - LC39 Area | 🔴 | 🟡 | 🟢 | 🟡 | 🟢 | 🟢 | 🟢 |
| Shoreline Resiliency Projects | 🔴 | 🔴 | 🔴 | 🔴 | 🟢 | 🟢 | 🔴 |
| Communication Distribution Switching Center | 🔴 | 🔴 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 |
| Wastewater Capacity and Collection Pumping | 🔴 | 🟡 | 🟢 | 🟢 | 🟢 | 🟢 | 🟡 |
| Treatment, Storage and Disposal Facility (TSDF) | 🟡 | 🟢 | 🟡 | 🟡 | 🟢 | 🟢 | 🟢 |
| Central Maintenance Complex | 🟡 | 🟢 | 🟢 | 🟡 | 🟢 | 🟢 | 🟢 |
| Centralized Consolidated Warehouse Facility | 🟡 | 🟡 | 🟢 | 🟢 | 🟢 | 🟢 | 🔴 |
| Communications and Public Engagement Complex | 🟢 | 🟢 | 🟢 | 🟡 | 🟢 | 🟢 | 🟢 |
| Roy D. Bridges (Banana River) Bridge | 🔴 | 🔴 | 🟡 | 🔴 | 🟢 | 🟢 | 🟢 |
| Parking Garage | 🟢 | 🟢 | 🟢 | 🟡 | 🟢 | 🟢 | 🟢 |
| Offline Processing Areas | 🔴 | 🔴 | 🟢 | 🟡 | 🟢 | 🟢 | 🟢 |
| Advanced Exploration Processing Facility (Replace Space Station Processing Facility (SSPF)) Complex | 🔴 | 🔴 | 🟡 | 🔴 | 🟡 | 🟡 | 🟢 |
| Orion Processing Surge Facility | 🟢 | 🟡 | 🟡 | 🟡 | 🟢 | 🟢 | 🟡 |
| Expand Vehicle Assembly Building (VAB) for Advanced Heavy Lift | 🟢 | 🔴 | 🟢 | 🔴 | 🟢 | 🟢 | 🟢 |
| Outfit VAB HB1 for SLS Block 1B | 🟢 | 🔴 | 🟢 | 🔴 | 🟢 | 🟢 | 🟡 |
| Expansion to Converter Compressor Facility II | 🔴 | 🔴 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 |
| Expansion to Converter Compressor Facility III | 🔴 | 🔴 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 |

| Overall | Mission | | Environment | Budget | Resilience | Sustainability | Political |
|---|---|---|---|---|---|---|---|
| | Spaceport | NASA | | | | | |
| HB1 Outfit for SLS Block 1B, Block 2 | 🟢 | 🔴 | 🟢 | 🔴 | 🟢 | 🟢 | 🟡 |
| VAB HB-3 Outfit Block 1B SLS (Exploration Ground Systems (EGS) program) | 🟢 | 🔴 | 🟢 | 🔴 | 🟢 | 🟢 | 🟡 |
| "New Large Multi-Payload Processing Facility/ Payload Hazardous Servicing Facility (MPPF/PHSF) (EGS, LSP, DoD, COMM programs)" | 🔴 | 🔴 | 🟡 | 🔴 | 🟢 | 🟢 | 🟢 |
| Lunar Surface Systems / In-Situ Resource Utilization (ISRU) Test and Checkout Facility | 🟡 | 🟡 | 🟡 | 🟡 | 🟢 | 🟢 | 🟢🟡 |
| Rail Spur Relocation | 🔴 | 🔴 | 🟡 | 🟢 | 🟢 | 🟢 | 🟢 |
| O&C South Wing Renovation - Phase 1 | 🟡 | 🟡 | 🟢 | 🔴 | 🟢 | 🟢 | 🟢 |
| O&C South Wing Renovation - Phase 2 | 🟡 | 🟡 | 🟢 | 🔴 | 🟢 | 🟢 | 🟢 |
| Space Commerce Way Widening | 🔴 | 🔴 | 🟡 | 🟡 | 🟢 | 🟢 | 🟡 |
| New Electrical Substation | 🟡 | 🟡 | 🟢 | 🟡 | 🟢 | 🟢 | 🟡 |
| Launch Complex-49 Development | 🟡 | 🟢 | 🔴 | 🔴 | 🟢 | 🟢 | 🟡 |
| Small Business Collaboration Incubator Facility | 🔴 | 🟡 | 🟢 | 🟡 | 🟢 | 🟢 | 🟢 |
| Multi-Purpose Conference Facility | 🟡 | 🟡 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 |
| Magnet School for Science & Technology | 🟢 | 🟢 | 🟢 | 🟡🔴 | 🟢 | 🟡 | 🟡🔴 |
| Alternative Power Generation and Storage Facility | 🟡 | 🟡 | 🟢 | 🟢 | 🟢 | 🟢 | 🟡 |
| Fitness and Sports Center | 🟡 | 🟡 | 🟢 | 🟡 | 🟢 | 🟢 | 🟢 |
| New Child Development Center | 🟡 | 🟡 | 🟢 | 🟡 | 🟢 | 🟢 | 🟢 |
| Space Tourist Support Infrastructure | 🟡 | 🟢 | 🔴 | 🟢 | 🟡 | 🟢 | 🟢 |
| Expansion of Ordnance Storage | 🔴 | 🔴 | 🟢 | 🟡 | 🟢 | 🟢 | 🟢 |
| Bio-Wastewater Treatment Facility in VAB Area | 🔴 | 🟡 | 🟢 | 🟢 | 🟢 | 🟢 | 🟡 |
| Commodity Storage Complex | 🔴 | 🟡 | 🟡 | 🟡 | 🟢 | 🟢 | 🟢 |
| Public Outreach / Visitor Complex Expansion | 🟡 | 🟢 | 🟡 | 🟡 | 🟢 | 🟢 | 🟢🟡 |
| Public/GOV Multi-Purpose Service Complex | 🟢 | 🟢 | 🟢 | 🟡 | 🟢 | 🟢 | 🟢 |
| Indian River Bridge | 🔴 | 🟡 | 🟡 | 🟢🔴 | 🟢 | 🟢 | 🟡 |

# RISK ANALYSIS - LOW PRIORITY

Stakeholders conducted a risk analysis on all low priority projects and opportunities identified during the Center Vision Plan workshop.

The level of risk was rated high (shown in red), medium (shown in yellow), or low (shown in green) for each category.

- High risk
- Medium Risk
- Low risk

| Overall | Mission | | Environment | Budget | Resilience | Sustainability | Political |
|---|---|---|---|---|---|---|---|
| | Spaceport | NASA | | | | | |
| Stormwater System Upgrades Ph 1 - 4 | Low | Low | Low | Low | Low | Low | Low |
| Haulover Canal Bridge | Low | Low | Medium | High | Low | Low | Medium |
| Expanded Kennedy Learning Center (KLC) | Low | Low | Low | Medium | Low | Low | Low |
| Expanded Food Court | Low | Low | Low | Medium | Low | Low | Medium |
| Covered Walkways OSB/OSB II/LCC | Low | Low | Low | Medium | Medium | Low | Low |
| Solar Covered Walkways | Low | Low | Low | Low/Medium | Low | Low | Low |
| Pedestrian Overpasses | Low | Low | Low | Low/Medium | Low | Low | Low |
| Replace Sheds by the Power Substation (ORSINO) | Low | Low | Low | Medium | Low | Low | Low |
| Borrow Pit Redevelopment/Re-Use | Low | Low | Medium | Medium | Low | Low | Medium |
| Recreational Center with Amenities (Pool Table, Ping Pong, Lounge, Social Event Area) | Low | Low | Low | Medium | Low | Low | Low |
| Consolidate Barber Shop and Massage Rooms from Business Area to Rest/Health/Space/Amenity Areas | Low | Low | Low | Low | Low | Low | Low |
| Nature Trails in Areas that Stay Undeveloped/ Outskirts of KSC | Low | Low | Low/Medium | Low/Medium | Low | Low | Low |
| Fire Rescue Training Site Expansion | Low | Low | Low | Low | Low | Low | Low |
| Compost Area in Central Campus | | | | | | | |
| Virtual KSC Tour (New employees, partners) | Medium | Low | Low | Medium | Low | Low | Low |
| Roundabout at State Road 3 and NASA Parkway | Low | Low | Low | Medium | Low | Low | Low |

# RISK ANALYSIS - LOW PRIORITY

| Overall | Mission | | Environment | Budget | Resilience | Sustainability | Political |
|---|---|---|---|---|---|---|---|
| | Spaceport | NASA | | | | | |
| Walkway near Vapor Containment Facility (VCF) Operations | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 |
| Shipping and Receivers at Pass & ID | 🟢 | 🟢 | 🟢 | 🟡 | 🟢 | 🟢 | 🟢 |
| Area Access Badging in VAB Area | 🟢 | 🟢 | 🟢 | 🟡 | 🟢 | 🟢 | 🟢 |
| Area Access Badging in Central Campus | 🟢 | 🟢 | 🟢 | 🟡 | 🟢 | 🟢 | 🟢 |
| Intern Housing | 🟢 | 🟢 | 🟡 | 🟡 | 🟢 | 🟢 | 🟡 |
| Upgrade Training Facility in VAB Area | 🟢 | 🟢 | 🟢 | 🟡 | 🟢 | 🟢 | 🟢 |
| Additional Park Site for Additional Mobile Launcher | 🟡 | 🟡 | 🟢 | 🟡🔴 | 🟢 | 🟢 | 🟡 |
| Create a North Campus (like Central Campus) in VAB Area | 🟢 | 🟢 | 🟢 | 🔴 | 🟢 | 🟢 | 🟢 |
| Housing/Hotel near Visitor Center | 🟢 | 🟢 | 🔴 | 🟡 | 🟡 | 🟢 | 🟡 |
| Amenities (Food, Drug Store, Dry Cleaners) accessible to the public | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 |
| Better Access to Visitor Center Maintenance Area | 🟢 | 🟢 | 🟡 | 🟢🟡 | 🟢 | 🟢 | 🟢 |
| Solar Roadways / Solar Windows | 🟢 | 🟢 | 🟢 | 🟡🔴 | 🟢 | 🟢 | 🟢 |
| Polygeneration Plant in VAB Area | 🟢 | 🟢 | 🟡 | 🟡 | 🟢 | 🟢 | 🟡 |
| Autonomous Vehicle Routes | 🟢 | 🟢 | 🟢 | 🟡 | 🟢 | 🟢 | 🟢 |
| New Exchange Warehouse | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 |
| Secure Parking Outside SR-3 Gate | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 |
| 2040 Siting for a Passenger "Flight Participant" Terminal | 🟡 | 🟢 | 🟡 | 🟡 | 🟢 | 🟡 | 🟡 |

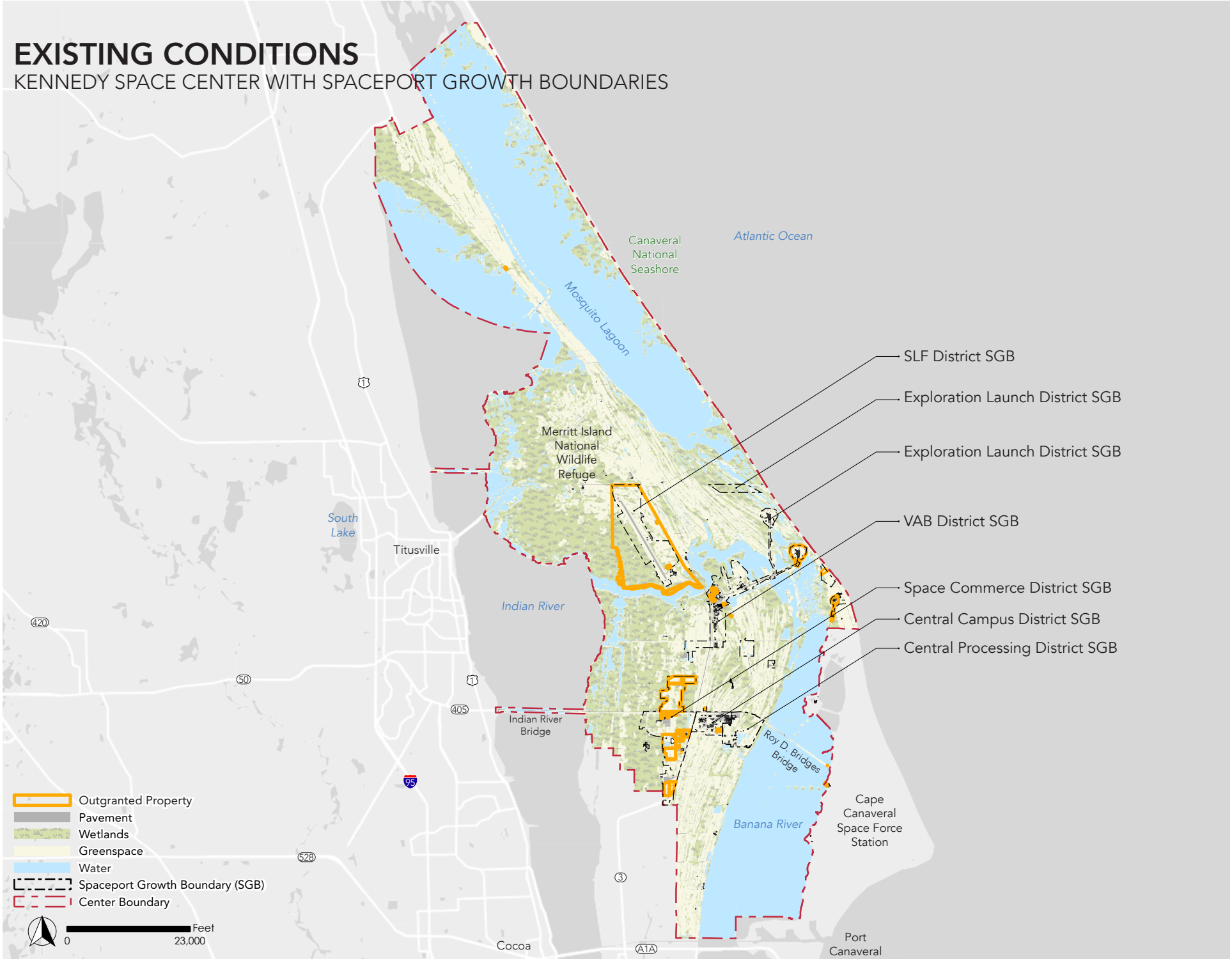
# E APPENDIX

## PLANNING RESOURCE MAPS

This appendix presents a series of more detailed maps that planners can use to guide future development within each district.

# EXISTING CONDITIONS

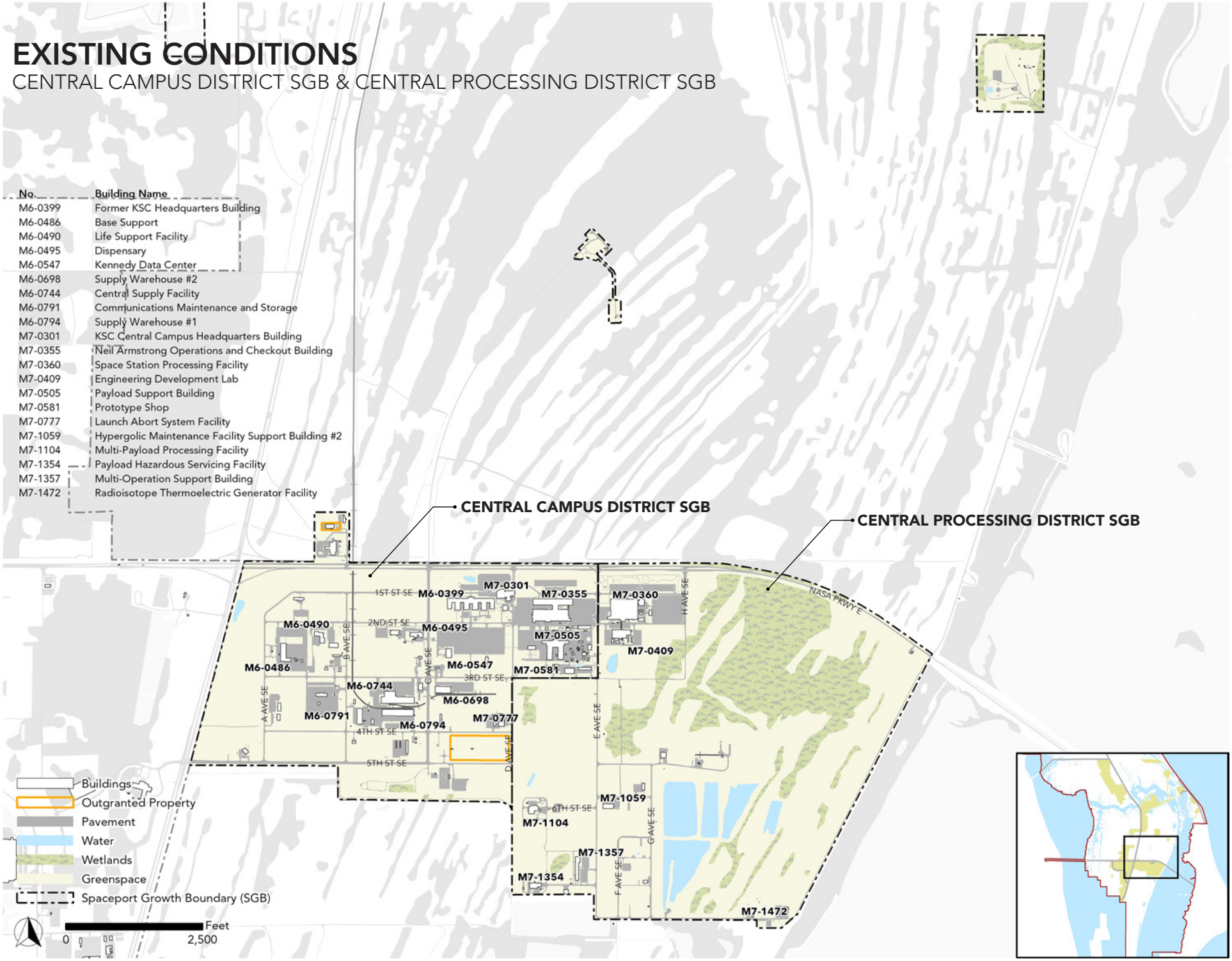
## KENNEDY SPACE CENTER WITH SPACEPORT GROWTH BOUNDARIES



# EXISTING CONDITIONS

## CENTRAL CAMPUS DISTRICT SGB & CENTRAL PROCESSING DISTRICT SGB

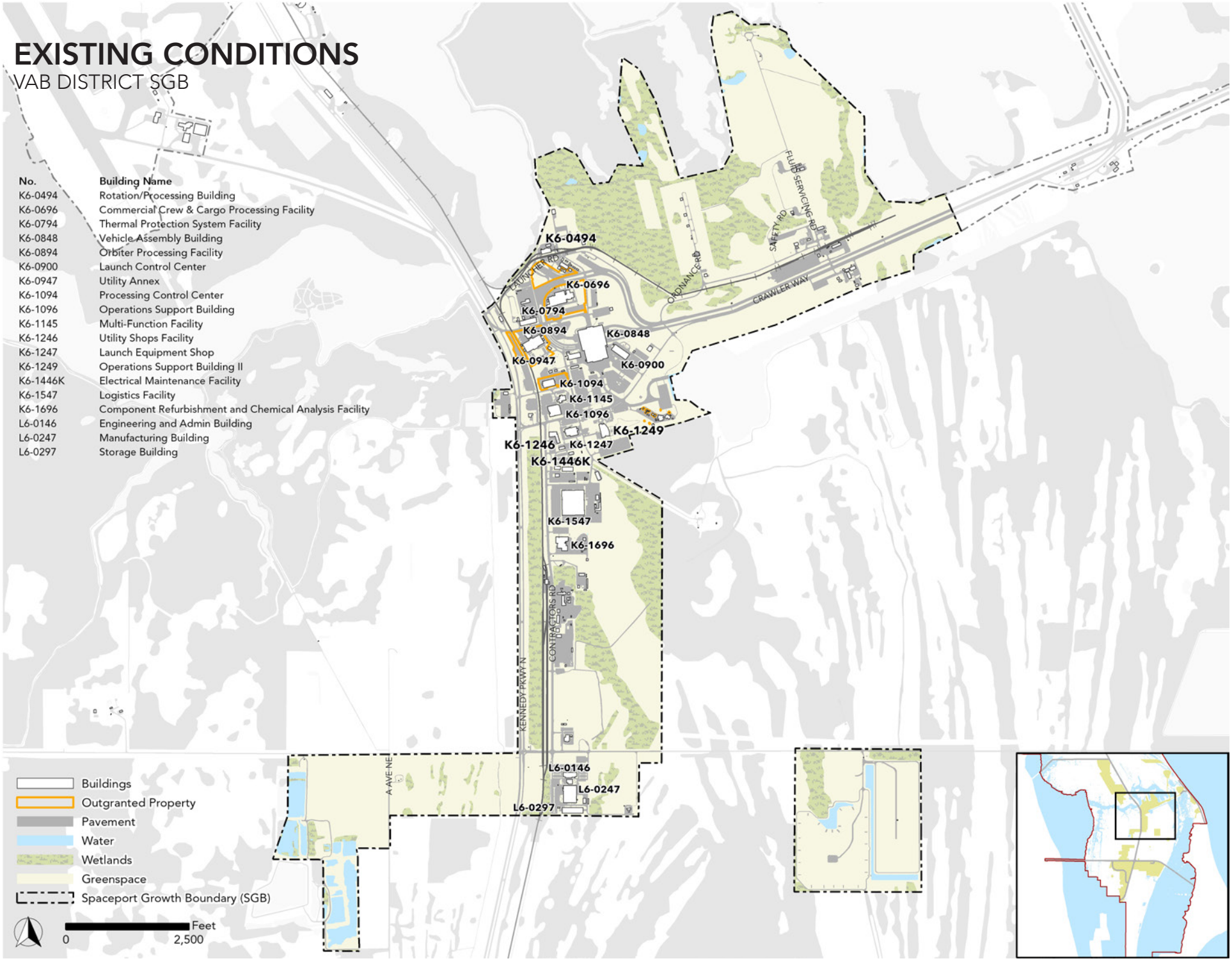
| No. | Building Name |
|---|---|
| M6-0399 | Former KSC Headquarters Building |
| M6-0486 | Base Support |
| M6-0490 | Life Support Facility |
| M6-0495 | Dispensary |
| M6-0547 | Kennedy Data Center |
| M6-0698 | Supply Warehouse #2 |
| M6-0744 | Central Supply Facility |
| M6-0791 | Communications Maintenance and Storage |
| M6-0794 | Supply Warehouse #1 |
| M7-0301 | KSC Central Campus Headquarters Building |
| M7-0355 | Neil Armstrong Operations and Checkout Building |
| M7-0360 | Space Station Processing Facility |
| M7-0409 | Engineering Development Lab |
| M7-0505 | Payload Support Building |
| M7-0581 | Prototype Shop |
| M7-0777 | Launch Abort System Facility |
| M7-1059 | Hypergolic Maintenance Facility Support Building #2 |
| M7-1104 | Multi-Payload Processing Facility |
| M7-1354 | Payload Hazardous Servicing Facility |
| M7-1357 | Multi-Operation Support Building |
| M7-1472 | Radioisotope Thermoelectric Generator Facility |



# EXISTING CONDITIONS

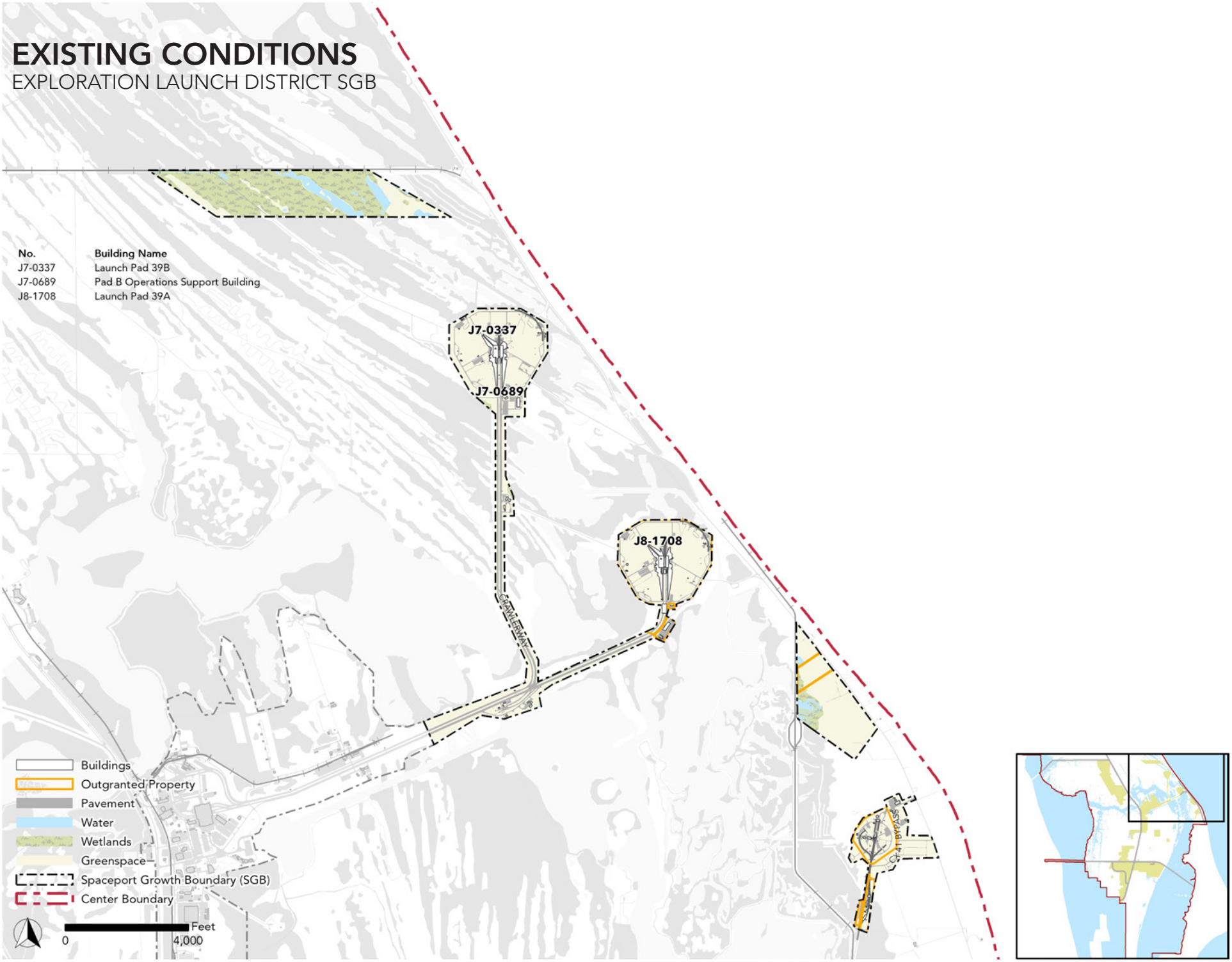
## VAB DISTRICT SGB

| No. | Building Name |
|---|---|
| K6-0494 | Rotation/Processing Building |
| K6-0696 | Commercial Crew & Cargo Processing Facility |
| K6-0794 | Thermal Protection System Facility |
| K6-0848 | Vehicle Assembly Building |
| K6-0894 | Orbiter Processing Facility |
| K6-0900 | Launch Control Center |
| K6-0947 | Utility Annex |
| K6-1094 | Processing Control Center |
| K6-1096 | Operations Support Building |
| K6-1145 | Multi-Function Facility |
| K6-1246 | Utility Shops Facility |
| K6-1247 | Launch Equipment Shop |
| K6-1249 | Operations Support Building II |
| K6-1446K | Electrical Maintenance Facility |
| K6-1547 | Logistics Facility |
| K6-1696 | Component Refurbishment and Chemical Analysis Facility |
| L6-0146 | Engineering and Admin Building |
| L6-0247 | Manufacturing Building |
| L6-0297 | Storage Building |



# EXISTING CONDITIONS

## EXPLORATION LAUNCH DISTRICT SGB

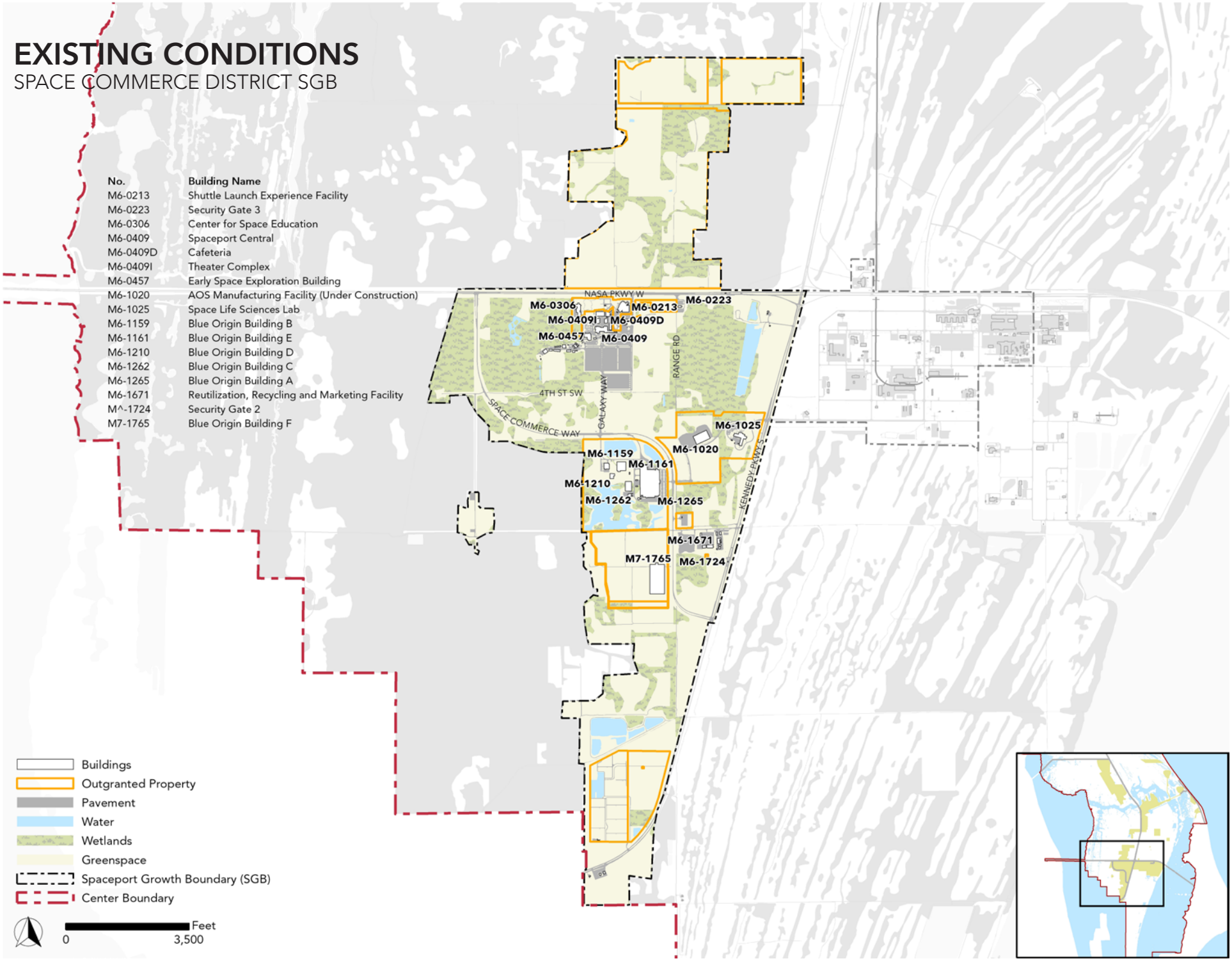



| No. | Building Name |
|---|---|
| J7-0337 | Launch Pad 39B |
| J7-0689 | Pad B Operations Support Building |
| J8-1708 | Launch Pad 39A |

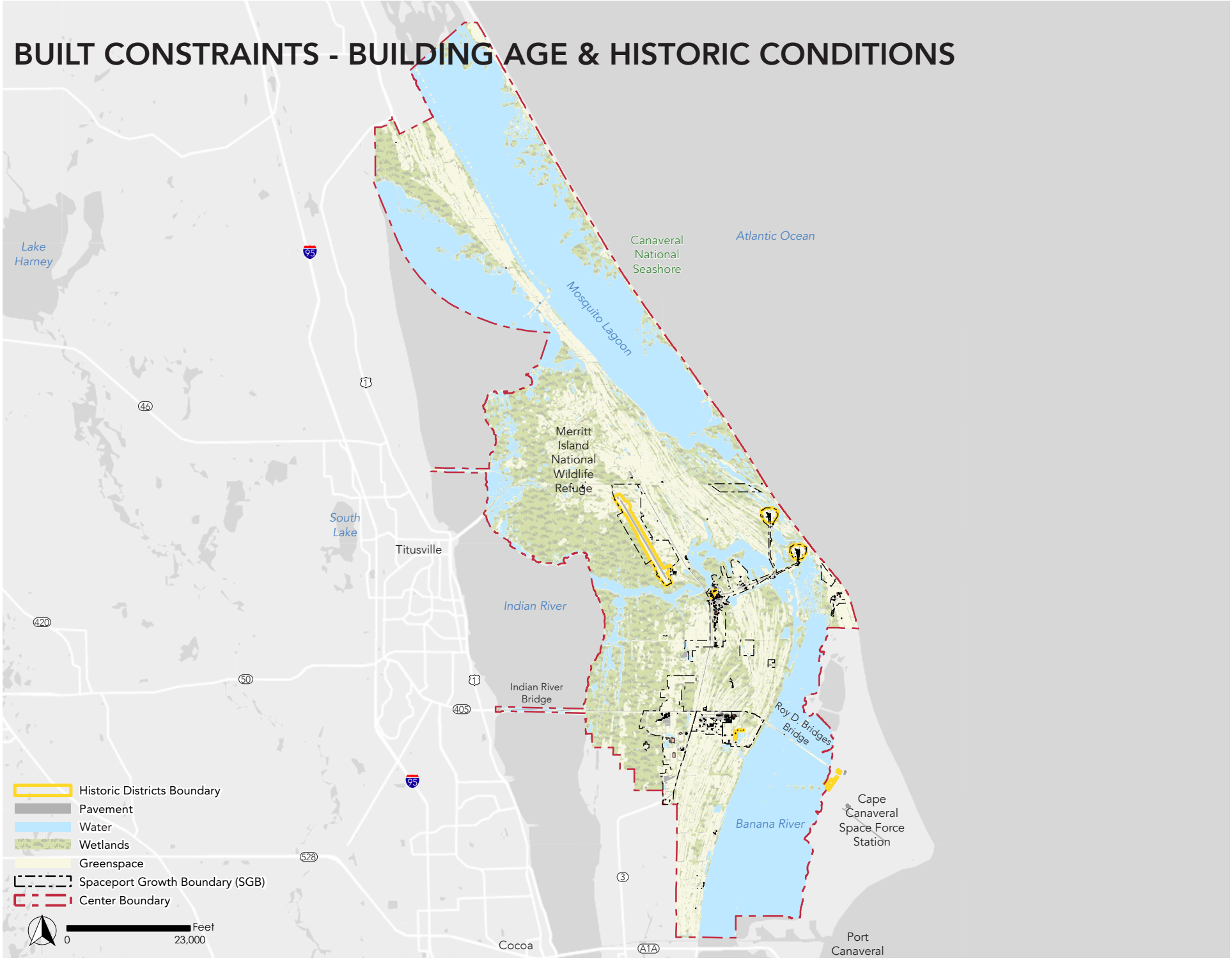
# EXISTING CONDITIONS

## SPACE COMMERCE DISTRICT SGB

| No. | Building Name |
|---|---|
| M6-0213 | Shuttle Launch Experience Facility |
| M6-0223 | Security Gate 3 |
| M6-0306 | Center for Space Education |
| M6-0409 | Spaceport Central |
| M6-0409D | Cafeteria |
| M6-0409I | Theater Complex |
| M6-0457 | Early Space Exploration Building |
| M6-1020 | AOS Manufacturing Facility (Under Construction) |
| M6-1025 | Space Life Sciences Lab |
| M6-1159 | Blue Origin Building B |
| M6-1161 | Blue Origin Building E |
| M6-1210 | Blue Origin Building D |
| M6-1262 | Blue Origin Building C |
| M6-1265 | Blue Origin Building A |
| M6-1671 | Reutilization, Recycling and Marketing Facility |
| M^-1724 | Security Gate 2 |
| M7-1765 | Blue Origin Building F |

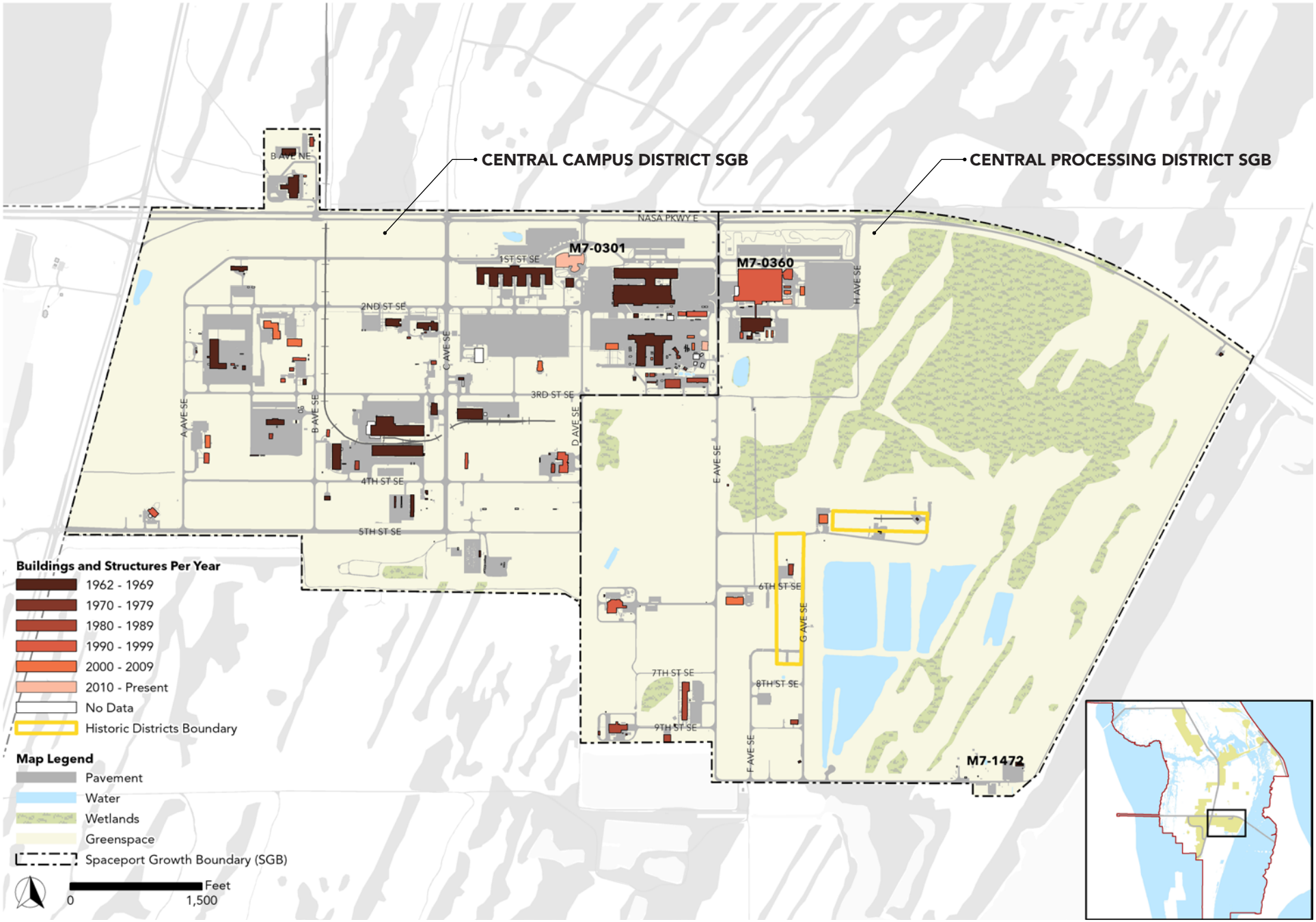


# BUILT CONSTRAINTS - BUILDING AGE & HISTORIC CONDITIONS



# BUILT CONSTRAINTS - BUILDING AGE & HISTORIC CONDITIONS

CENTRAL CAMPUS DISTRICT SGB & CENTRAL PROCESSING DISTRICT SGB



# BUILT CONSTRAINTS - BUILDING AGE & HISTORIC CONDITIONS

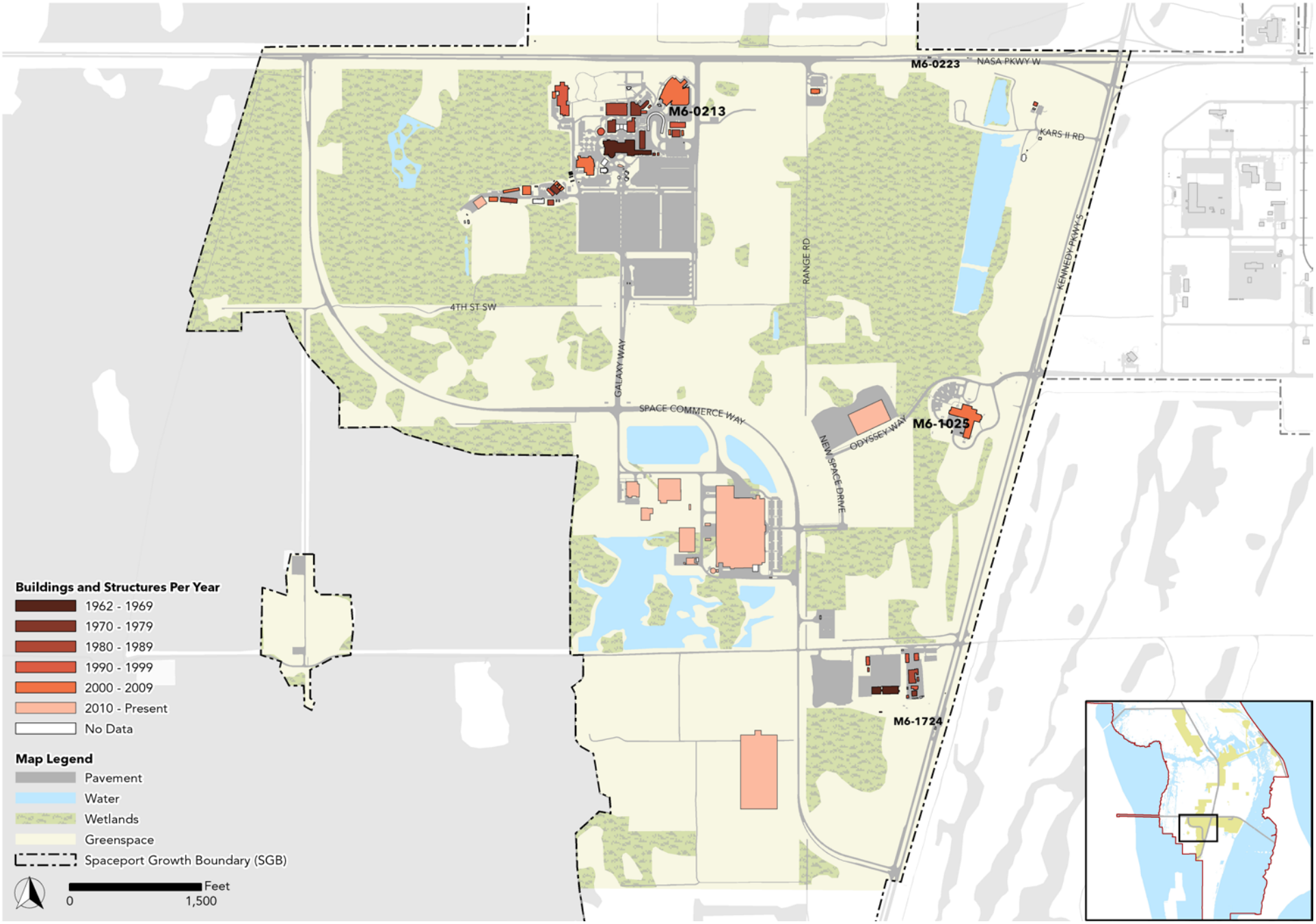
VAB DISTRICT SGB - NORTH

# BUILT CONSTRAINTS - BUILDING AGE & HISTORIC CONDITIONS

VAB DISTRICT SGB - SOUTH

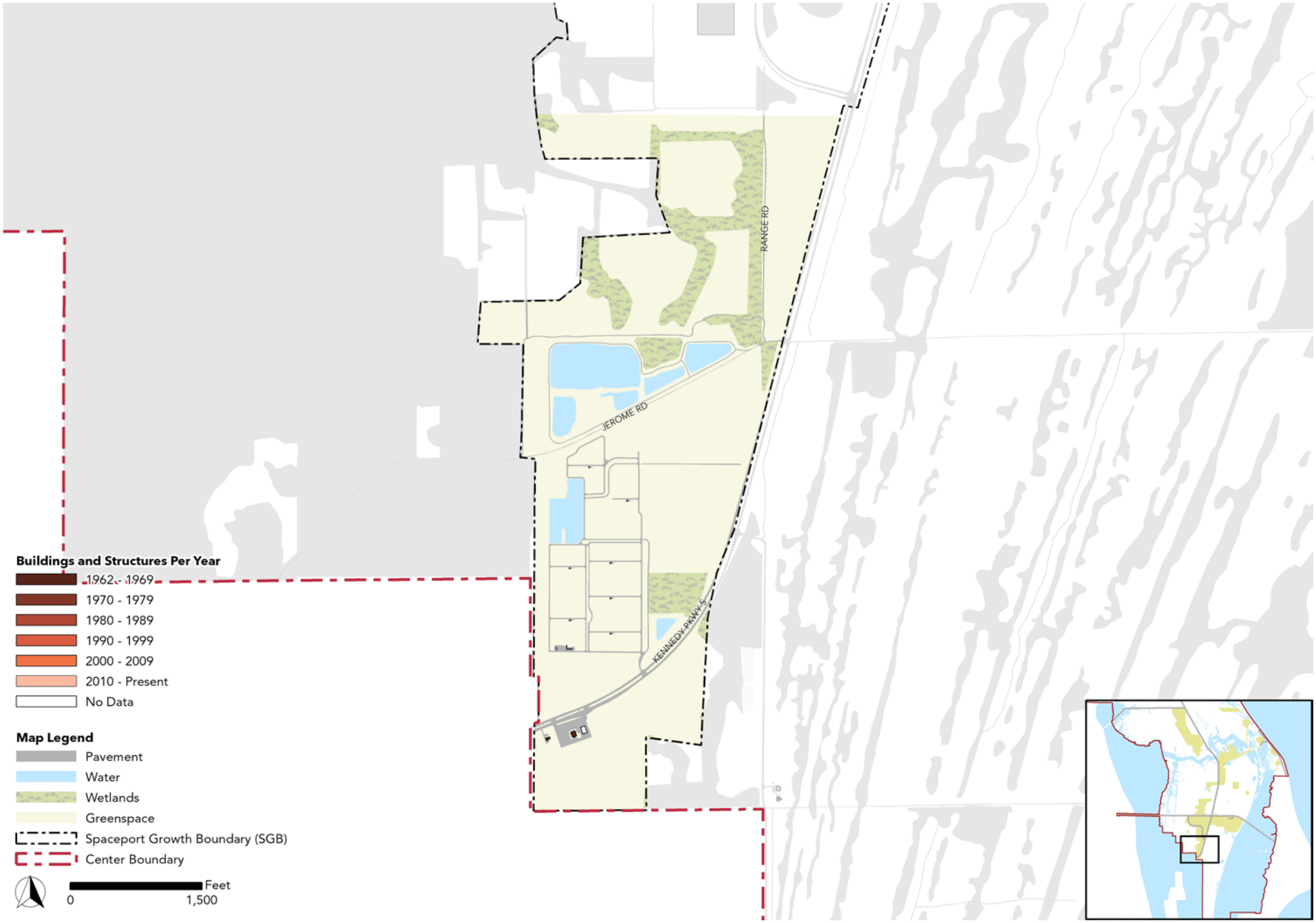
# BUILT CONSTRAINTS - BUILDING AGE & HISTORIC CONDITIONS

SPACE COMMERCE DISTRICT SGB - CENTRAL



# BUILT CONSTRAINTS - BUILDING AGE & HISTORIC CONDITIONS

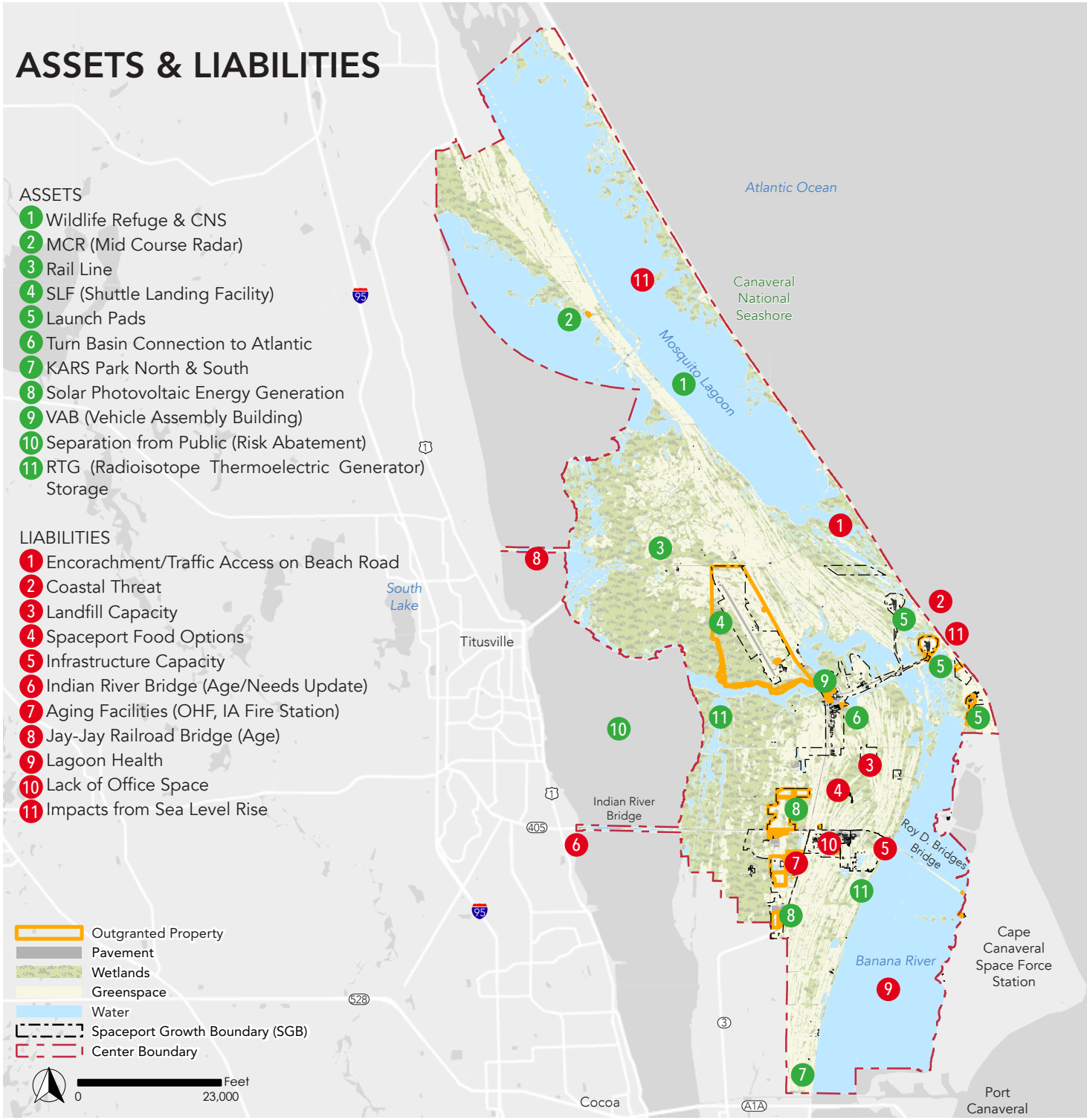
SPACE COMMERCE DISTRICT SGB - SOUTH



# ASSETS & LIABILITIES

ASSETS
1. Wildlife Refuge & CNS
2. MCR (Mid Course Radar)
3. Rail Line
4. SLF (Shuttle Landing Facility)
5. Launch Pads
6. Turn Basin Connection to Atlantic
7. KARS Park North & South
8. Solar Photovoltaic Energy Generation
9. VAB (Vehicle Assembly Building)
10. Separation from Public (Risk Abatement)
11. RTG (Radioisotope Thermoelectric Generator) Storage

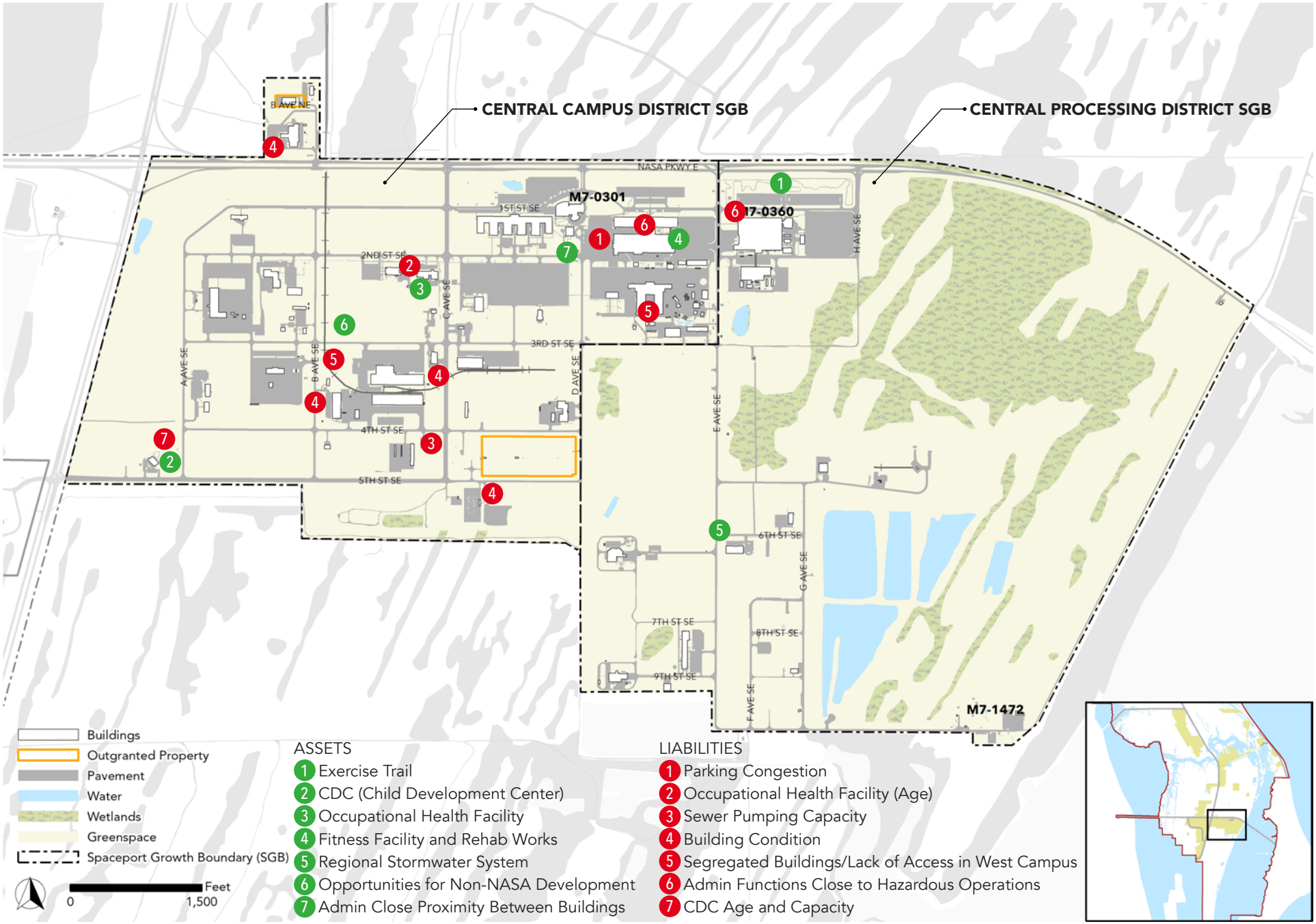
LIABILITIES
1. Encorachment/Traffic Access on Beach Road
2. Coastal Threat
3. Landfill Capacity
4. Spaceport Food Options
5. Infrastructure Capacity
6. Indian River Bridge (Age/Needs Update)
7. Aging Facilities (OHF, IA Fire Station)
8. Jay-Jay Railroad Bridge (Age)
9. Lagoon Health
10. Lack of Office Space
11. Impacts from Sea Level Rise




Stakeholders identified assets and liabilities during the Vision Plan workshop. Participants marked features of KSC they found beneficial or an asset to the Center. They also marked obstacles, liabilities, or features that could be improved. Future planning efforts will use the assets and liabilities analysis to ensure identified assets are kept or enhanced and future development mitigates the liabilities. For example, a surface hydrological model could be beneficial in addressing drainage issues.

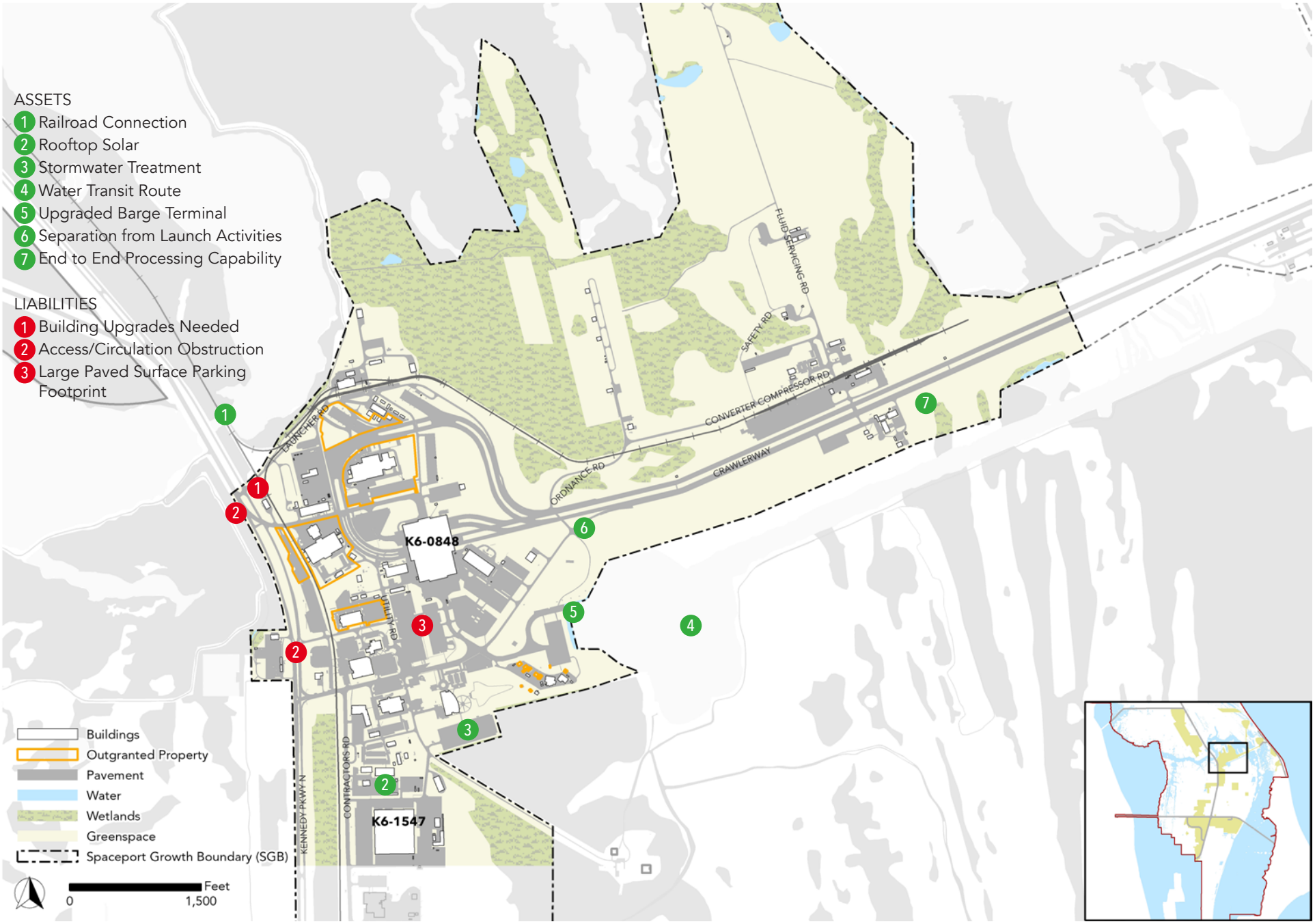
# ASSETS & LIABILITIES

## CENTRAL CAMPUS DISTRICT SGB & CENTRAL PROCESSING DISTRICT SGB



# ASSETS & LIABILITIES

## VAB DISTRICT SGB - NORTH

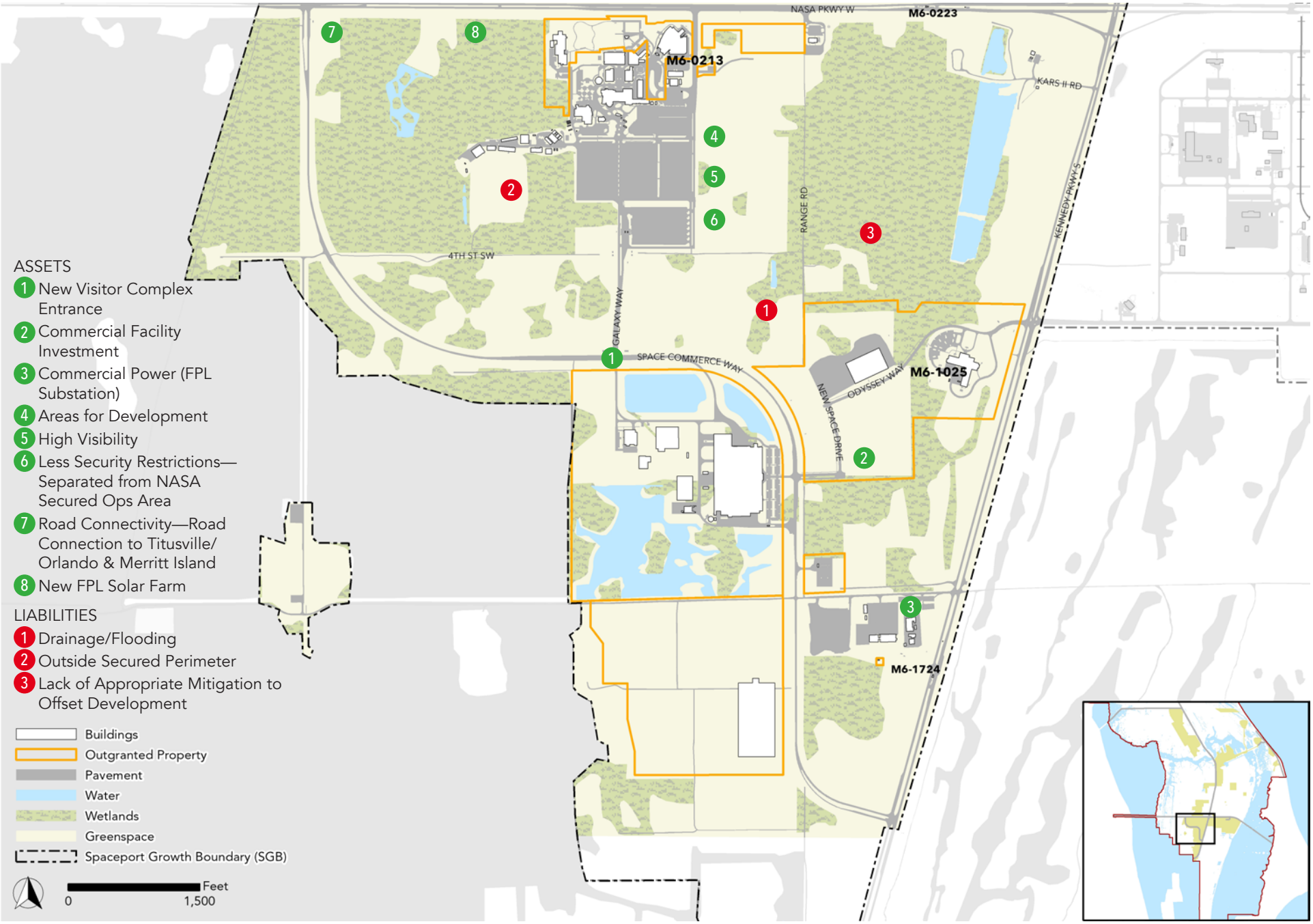


# ASSETS & LIABILITIES

## VAB DISTRICT SGB - SOUTH

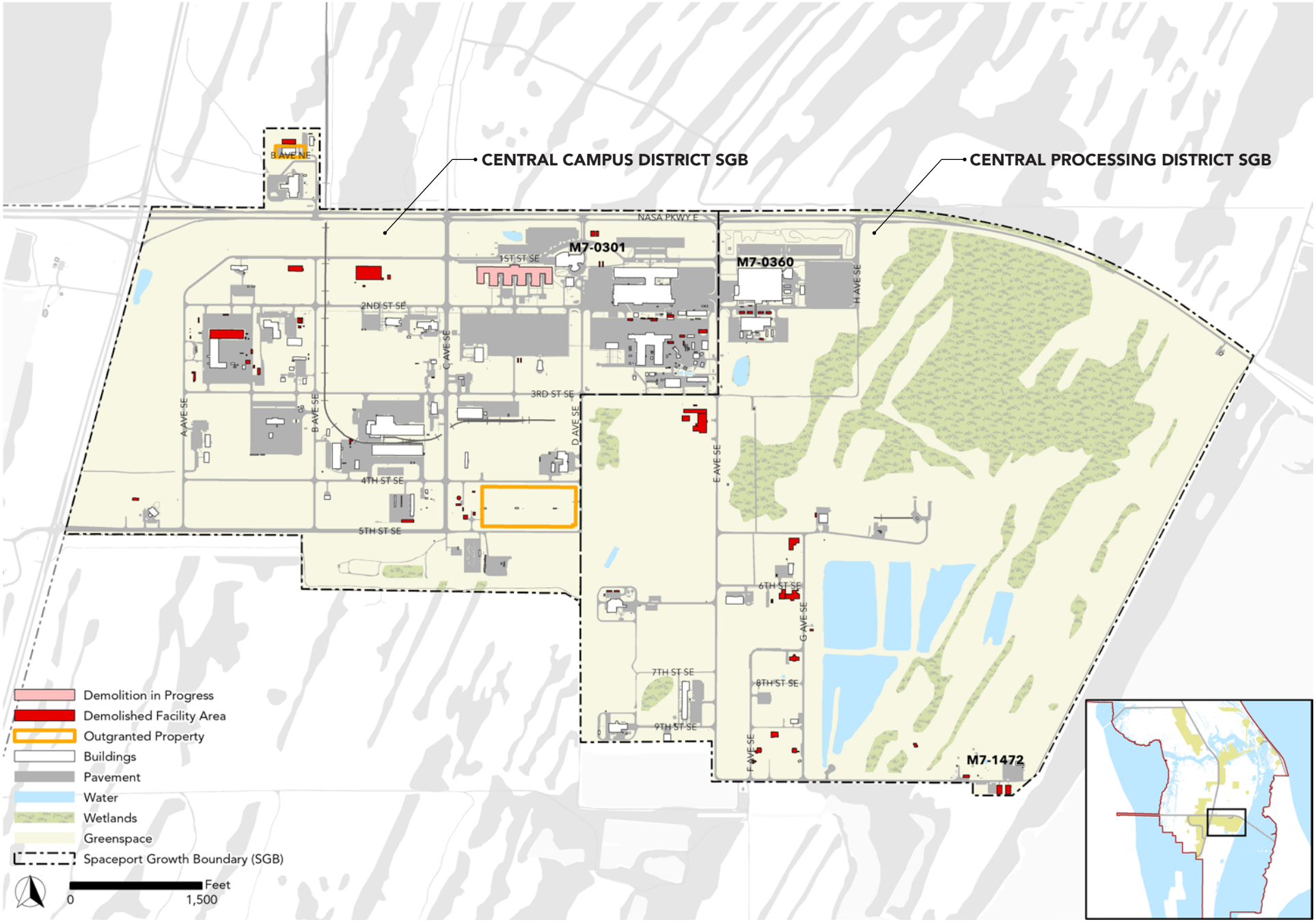
# ASSETS & LIABILITIES

## SPACE COMMERCE DISTRICT SGB - CENTRAL



# AFFORDABILITY ANALYSIS

DEMOLITION & OUTGRANTS CENTRAL CAMPUS DISTRICT SGB & CENTRAL PROCESSING DISTRICT SGB

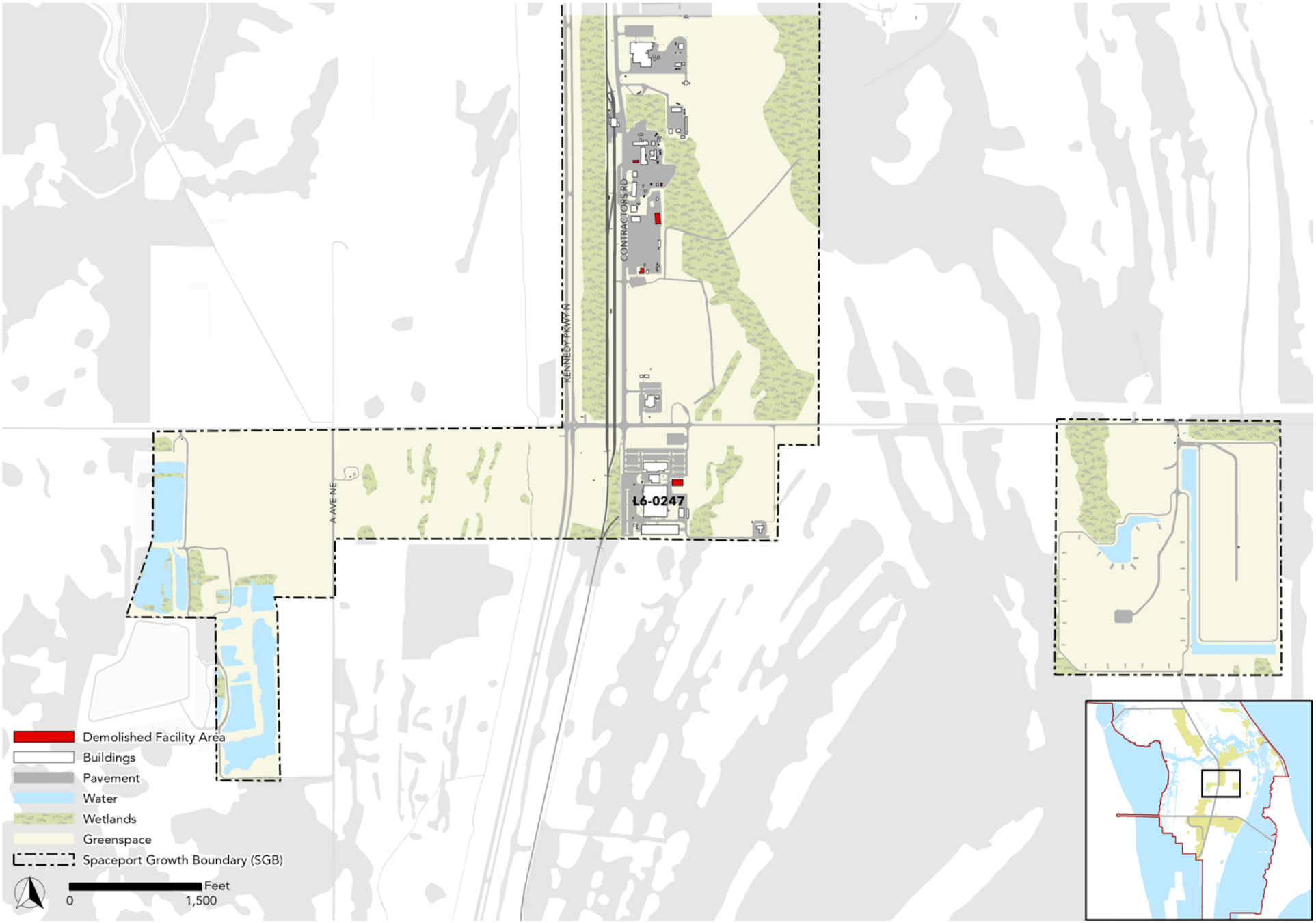


# AFFORDABILITY ANALYSIS

DEMOLITION & OUTGRANTS VAB DISTRICT SGB - NORTH

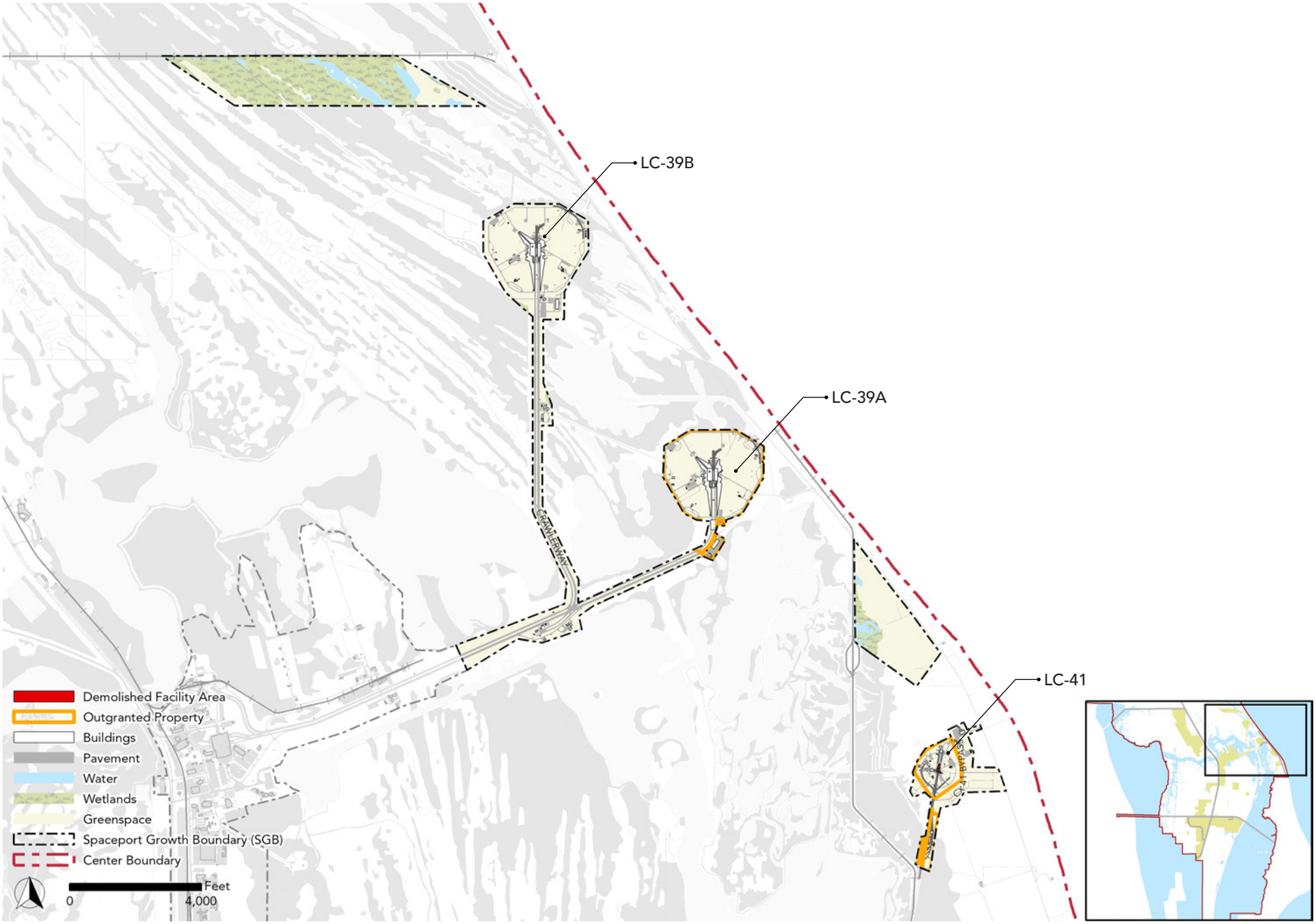
# AFFORDABILITY ANALYSIS

DEMOLITION & OUTGRANTS VAB DISTRICT SGB - SOUTH



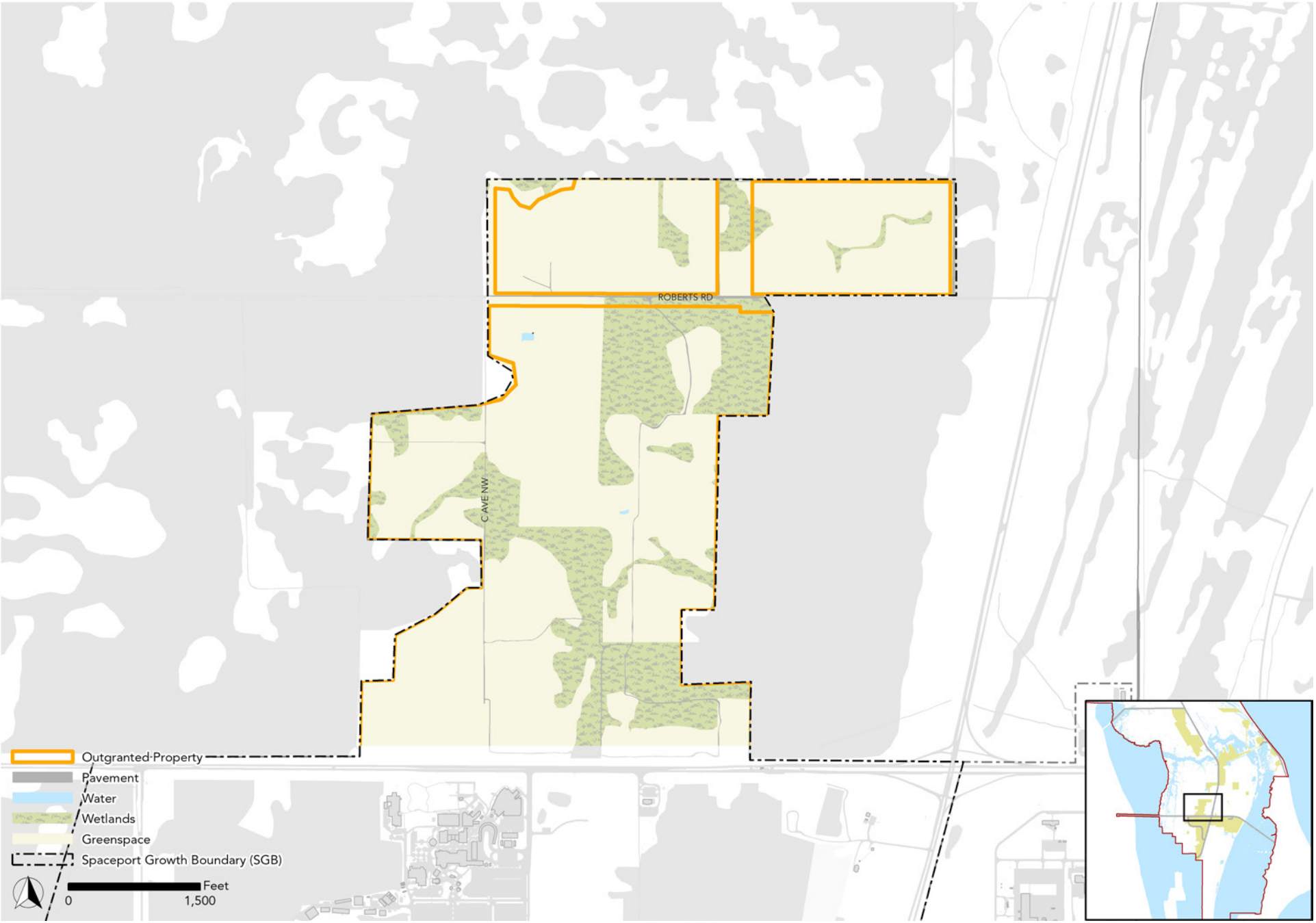
# AFFORDABILITY ANALYSIS

DEMOLITION & OUTGRANTS EXPLORATION LAUNCH DISTRICT SGB



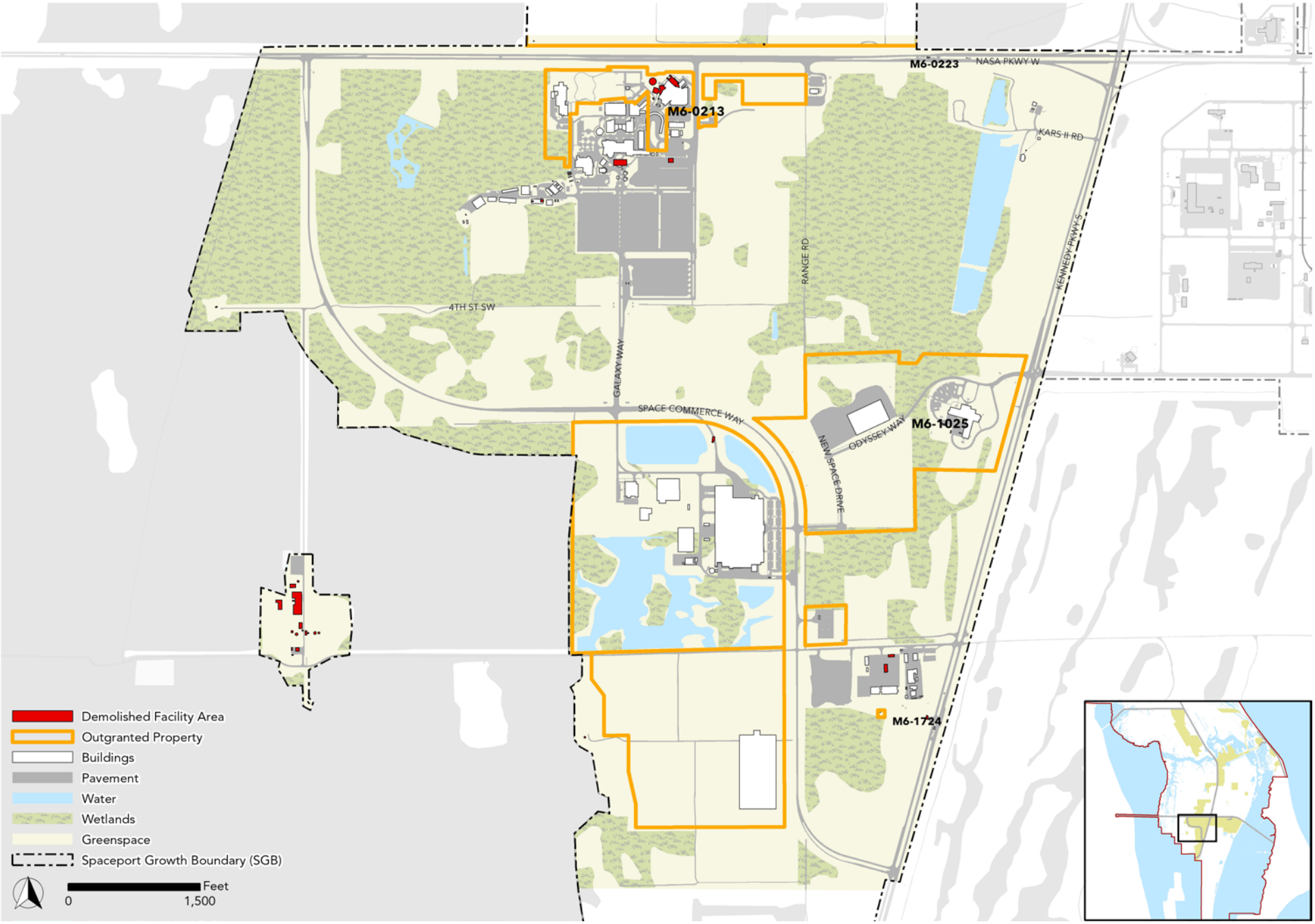
# AFFORDABILITY ANALYSIS

DEMOLITION & OUTGRANTS SPACE COMMERCE DISTRICT SGB - NORTH



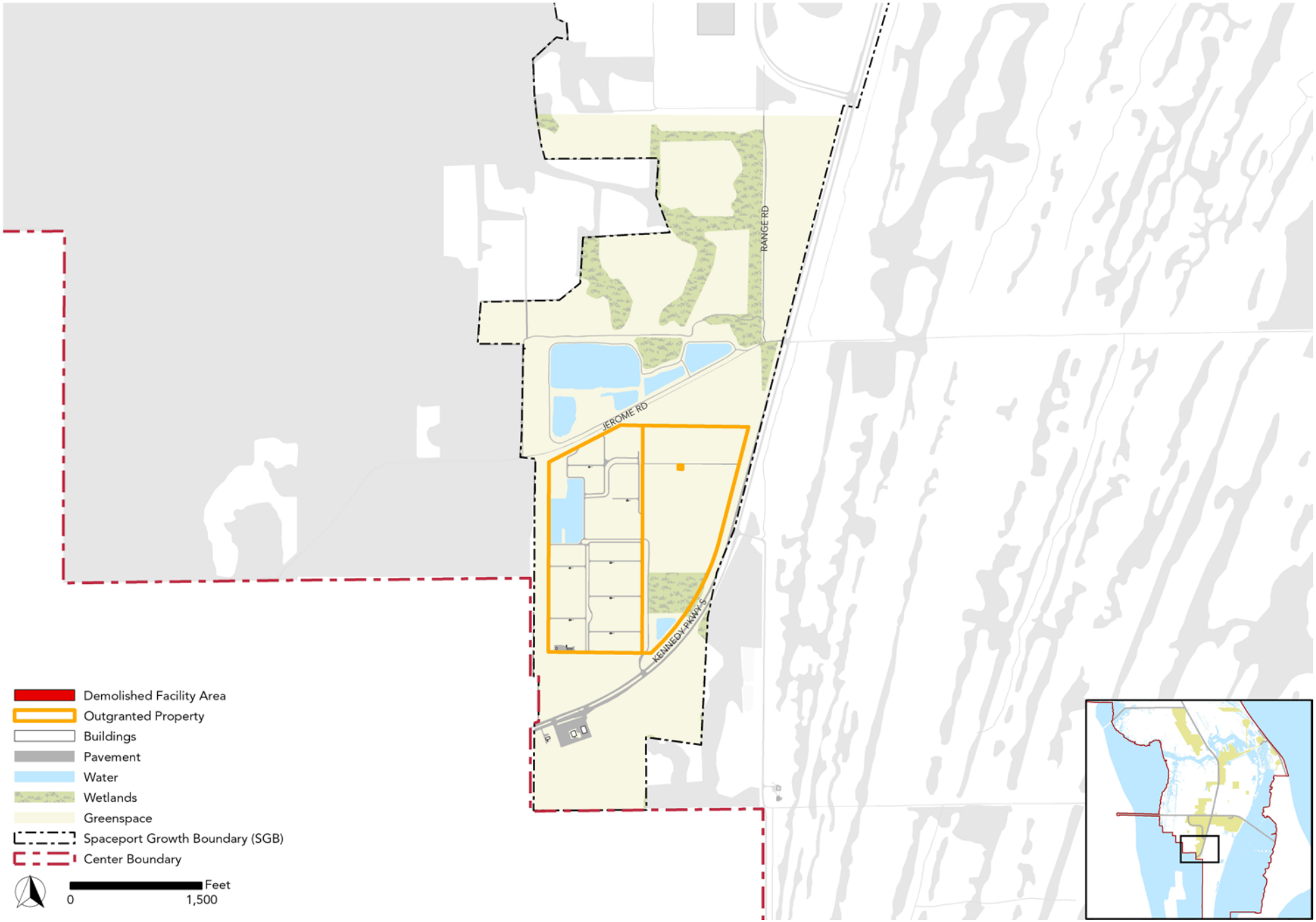
# AFFORDABILITY ANALYSIS

DEMOLITION & OUTGRANTS SPACE COMMERCE DISTRICT SGB - CENTRAL

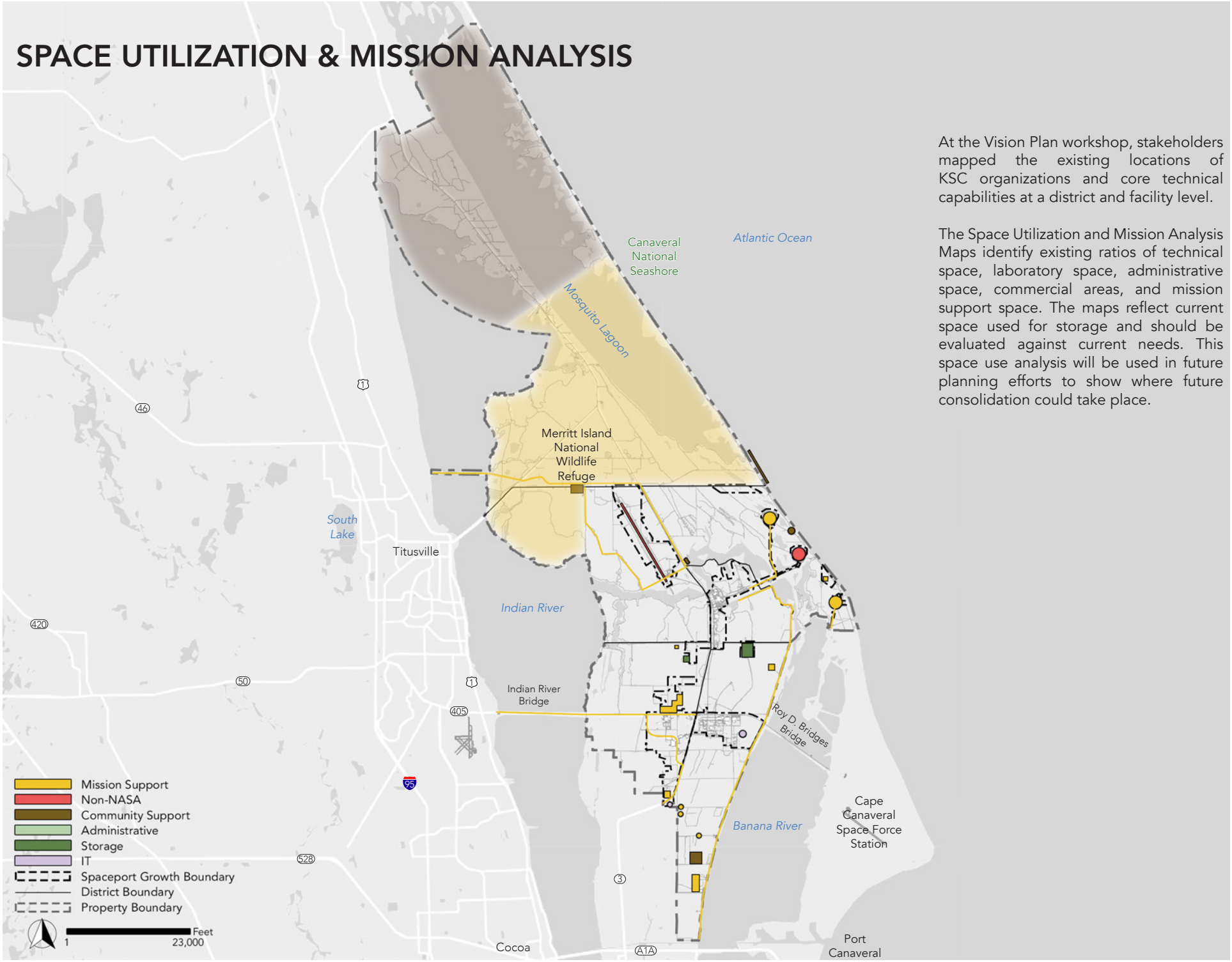


# AFFORDABILITY ANALYSIS

## DEMOLITION & OUTGRANTS SPACE COMMERCE DISTRICT SGB - SOUTH



# SPACE UTILIZATION & MISSION ANALYSIS

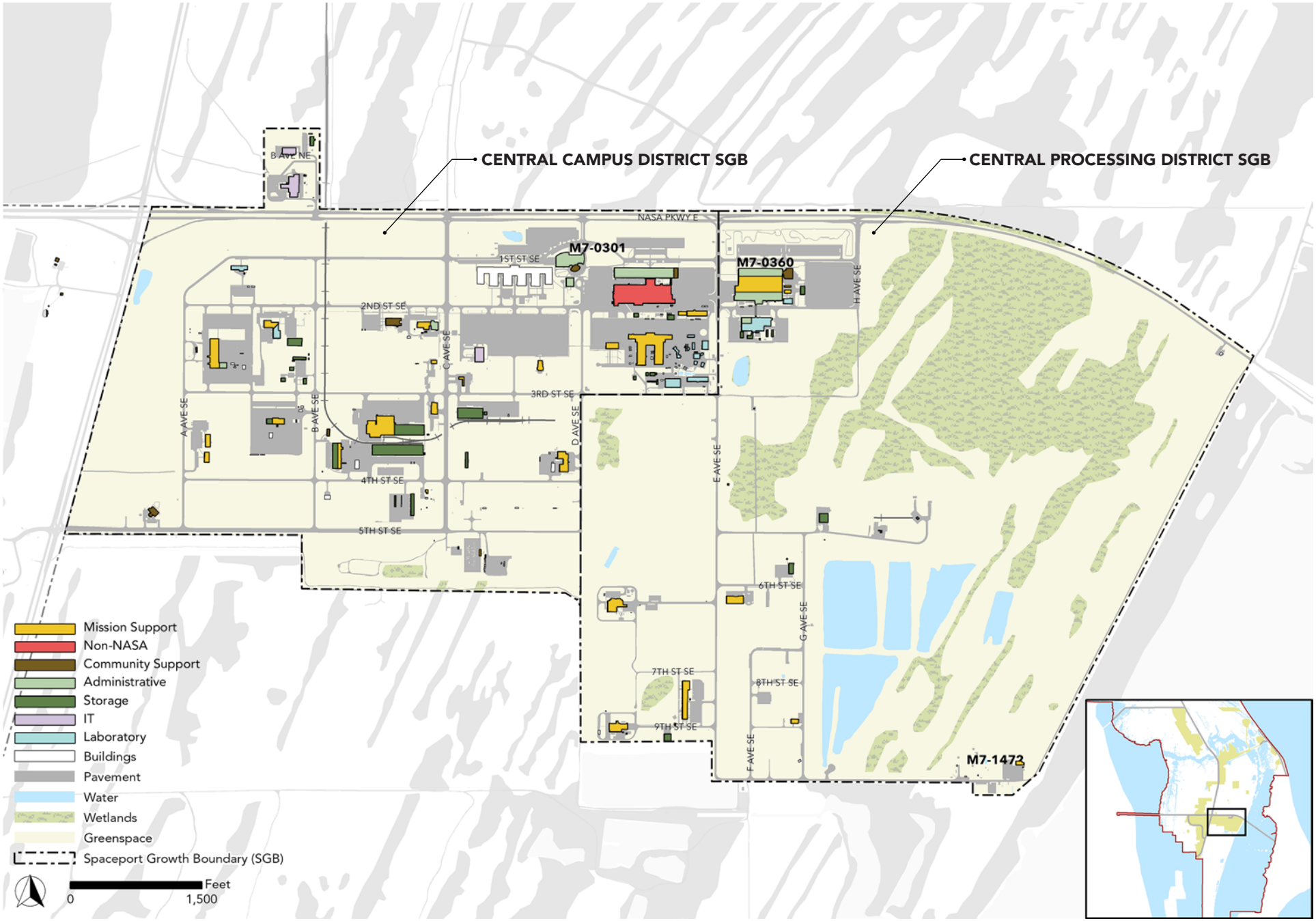



At the Vision Plan workshop, stakeholders mapped the existing locations of KSC organizations and core technical capabilities at a district and facility level.

The Space Utilization and Mission Analysis Maps identify existing ratios of technical space, laboratory space, administrative space, commercial areas, and mission support space. The maps reflect current space used for storage and should be evaluated against current needs. This space use analysis will be used in future planning efforts to show where future consolidation could take place.

# SPACE UTILIZATION & MISSION ANALYSIS

## CENTRAL CAMPUS DISTRICT SGB & CENTRAL PROCESSING DISTRICT SGB



# SPACE UTILIZATION & MISSION ANALYSIS

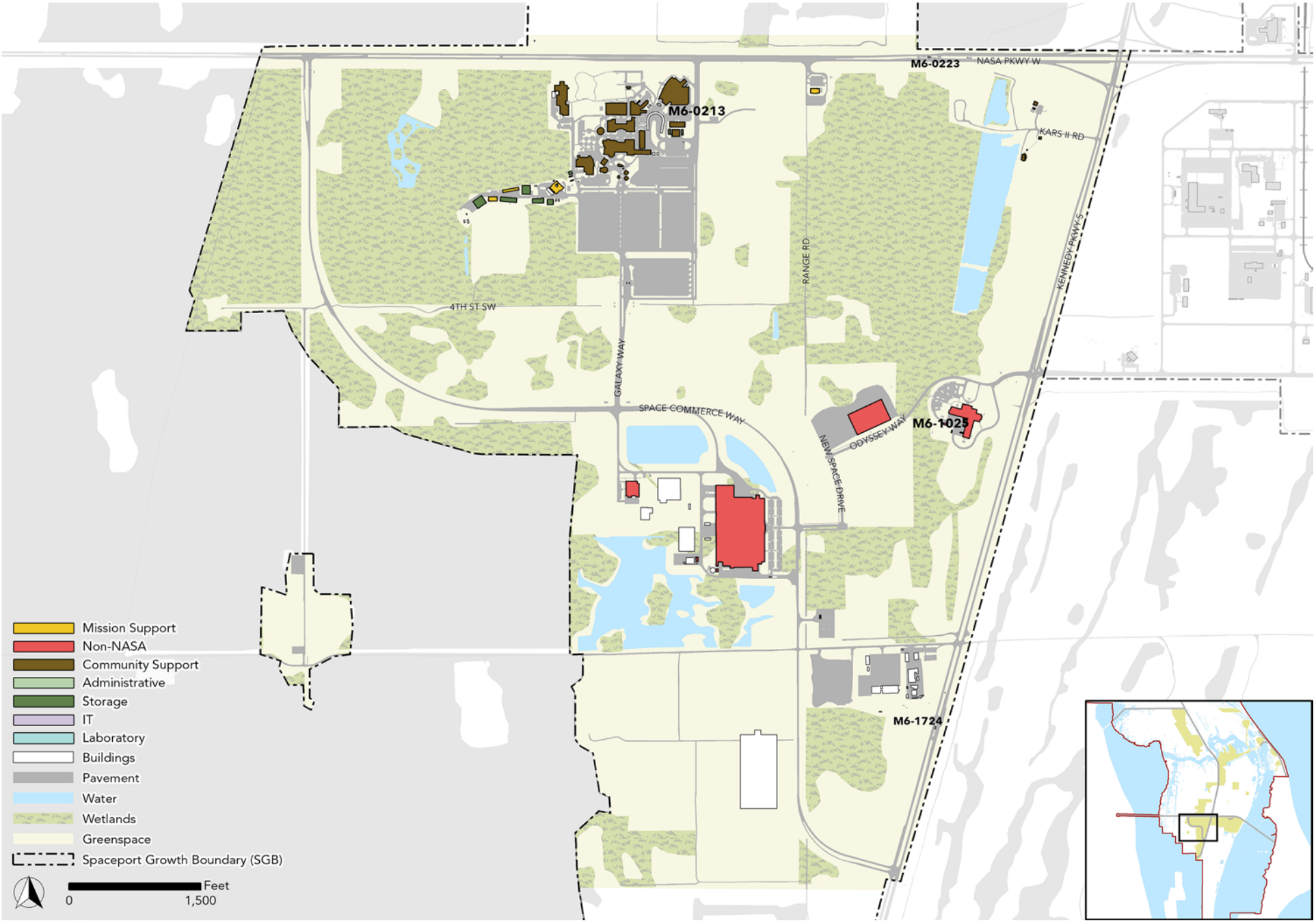
VAB DISTRICT SGB - NORTH

# SPACE UTILIZATION & MISSION ANALYSIS

VAB DISTRICT SGB - SOUTH

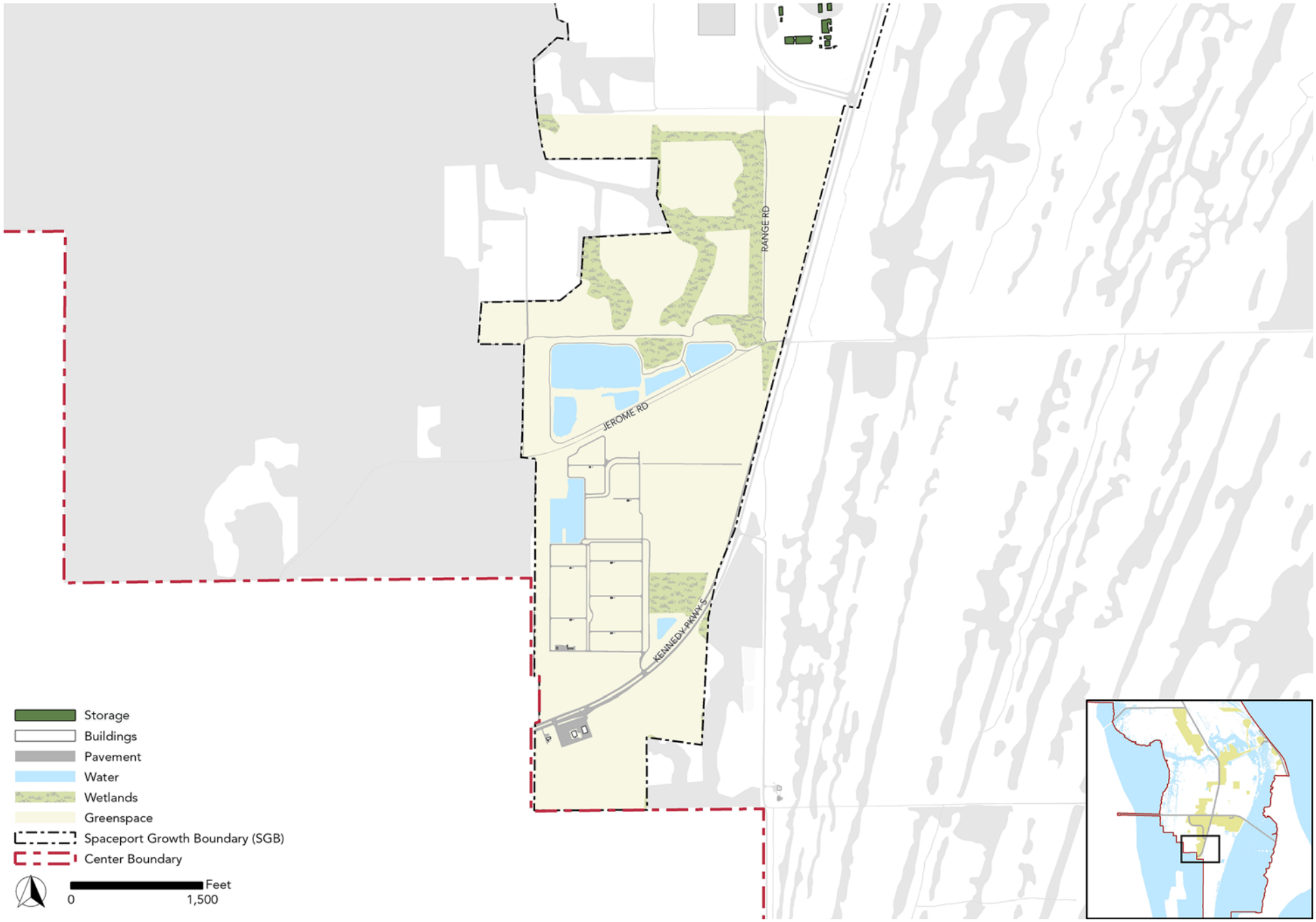
# SPACE UTILIZATION & MISSION ANALYSIS

SPACE COMMERCE DISTRICT SGB - CENTRAL



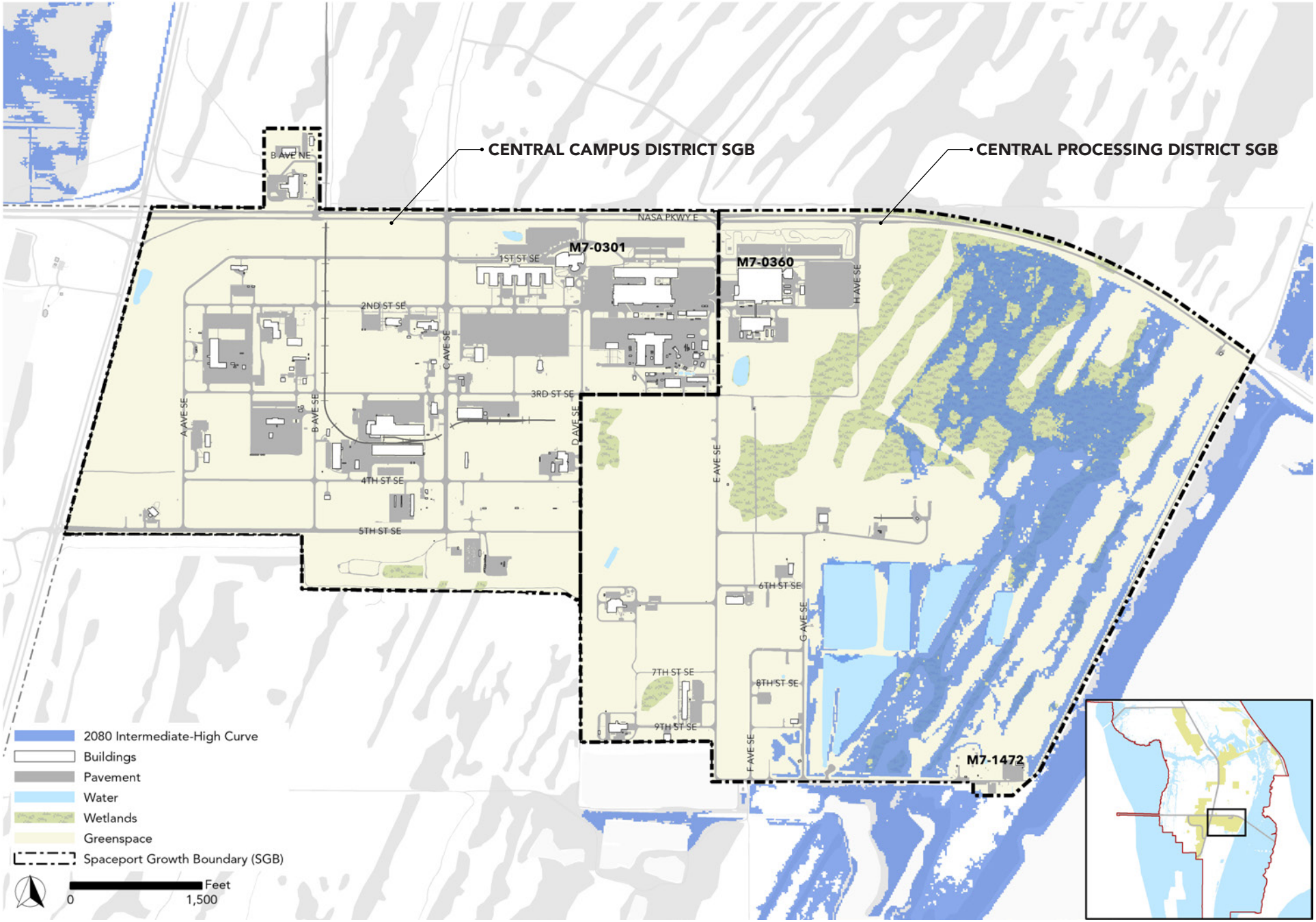
# SPACE UTILIZATION & MISSION ANALYSIS

SPACE COMMERCE DISTRICT SGB - SOUTH



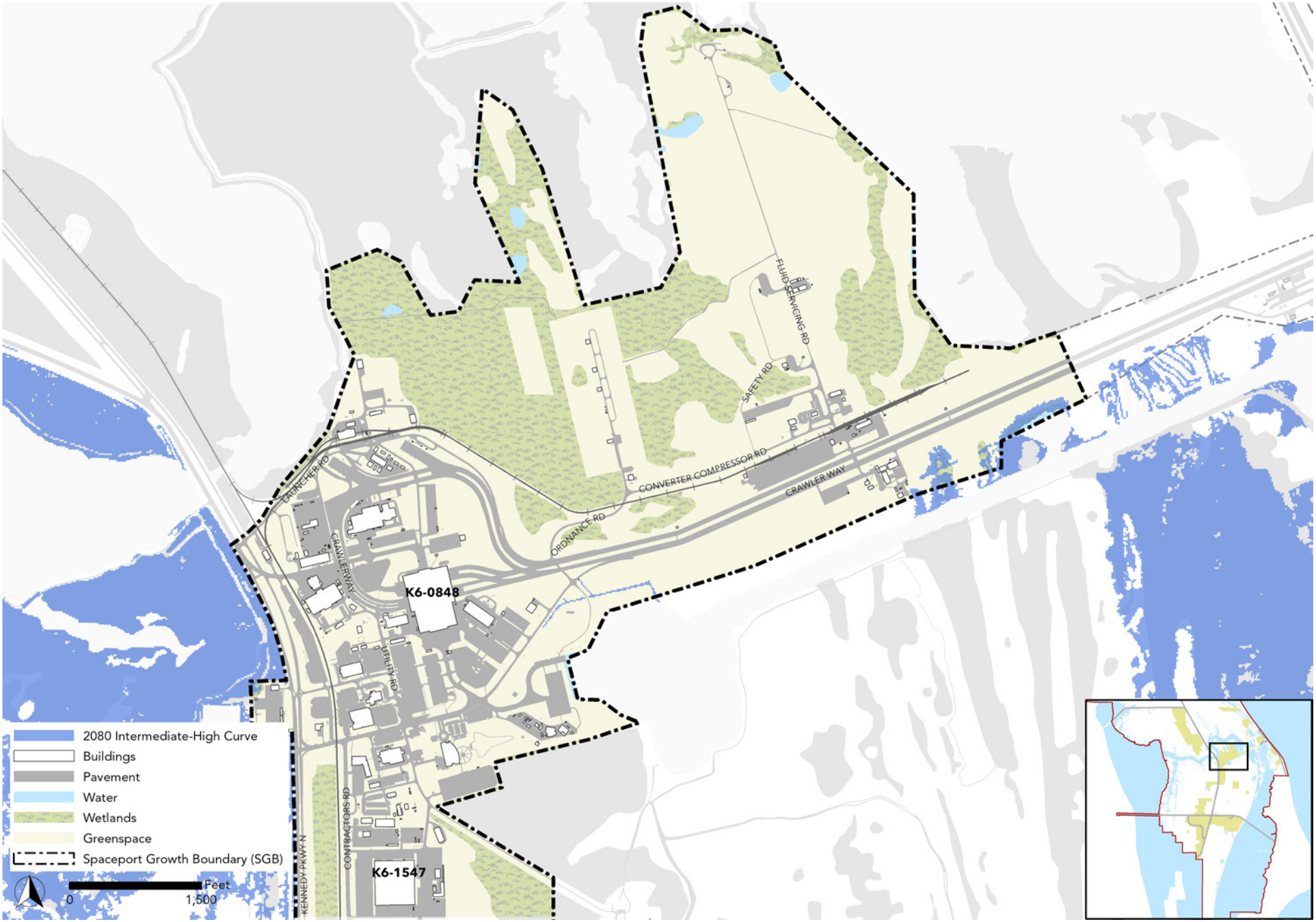
# SEA LEVEL RISE

CENTRAL CAMPUS DISTRICT SGB & CENTRAL PROCESSING DISTRICT SGB



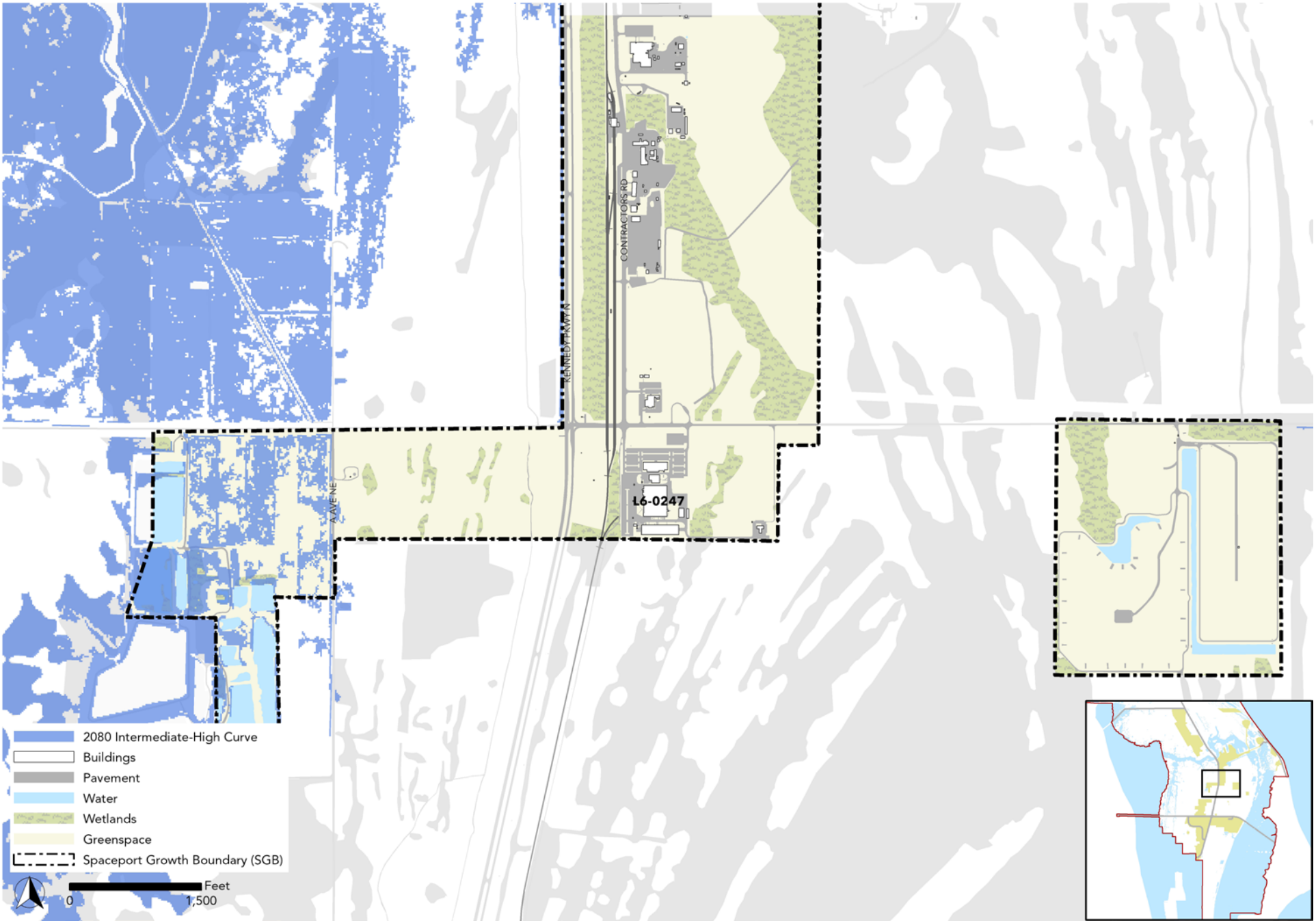
# SEA LEVEL RISE

VAB DISTRICT SGB - NORTH



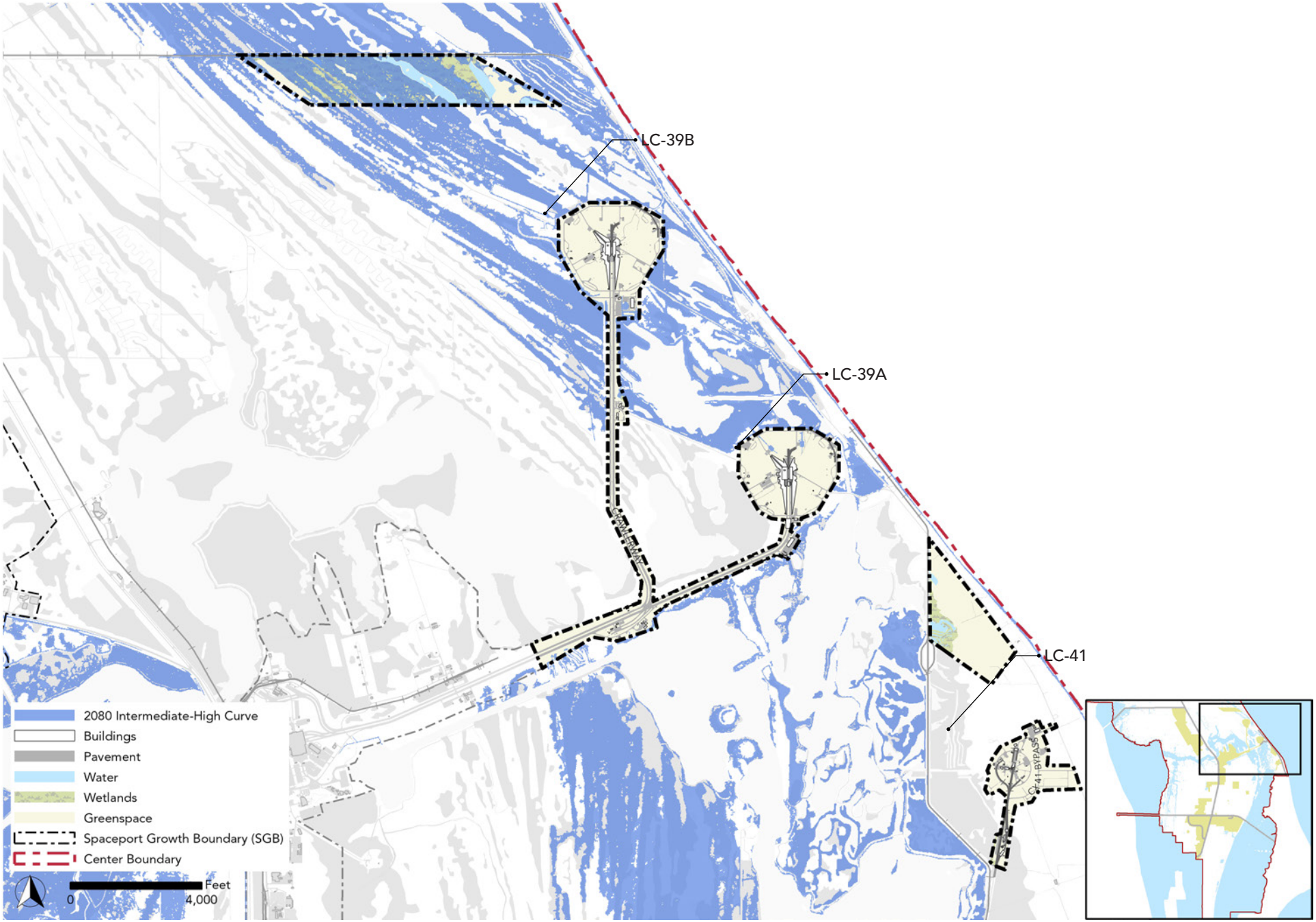
# SEA LEVEL RISE

## VAB DISTRICT SGB - SOUTH



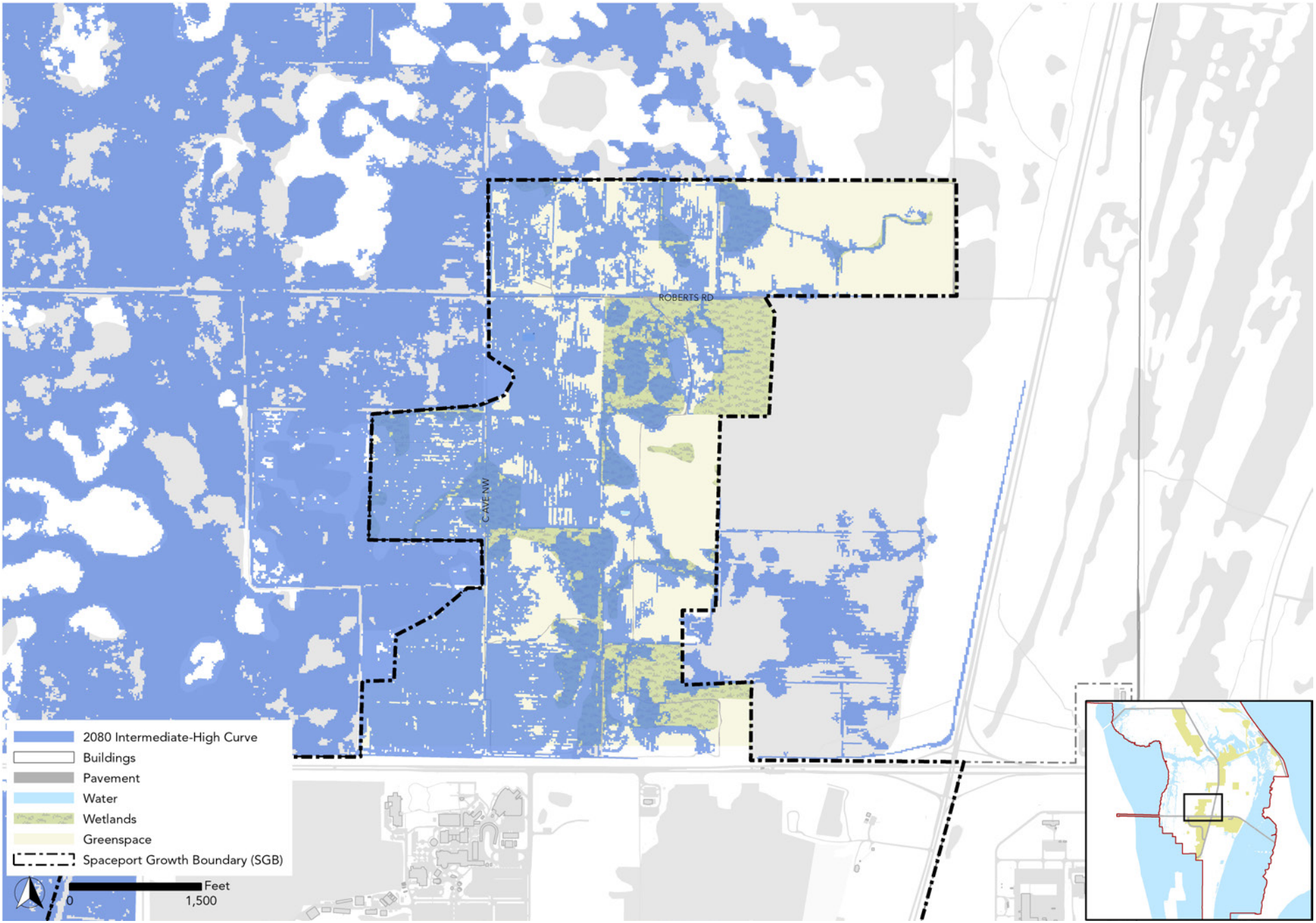
# SEA LEVEL RISE

EXPLORATION LAUNCH DISTRICT SGB



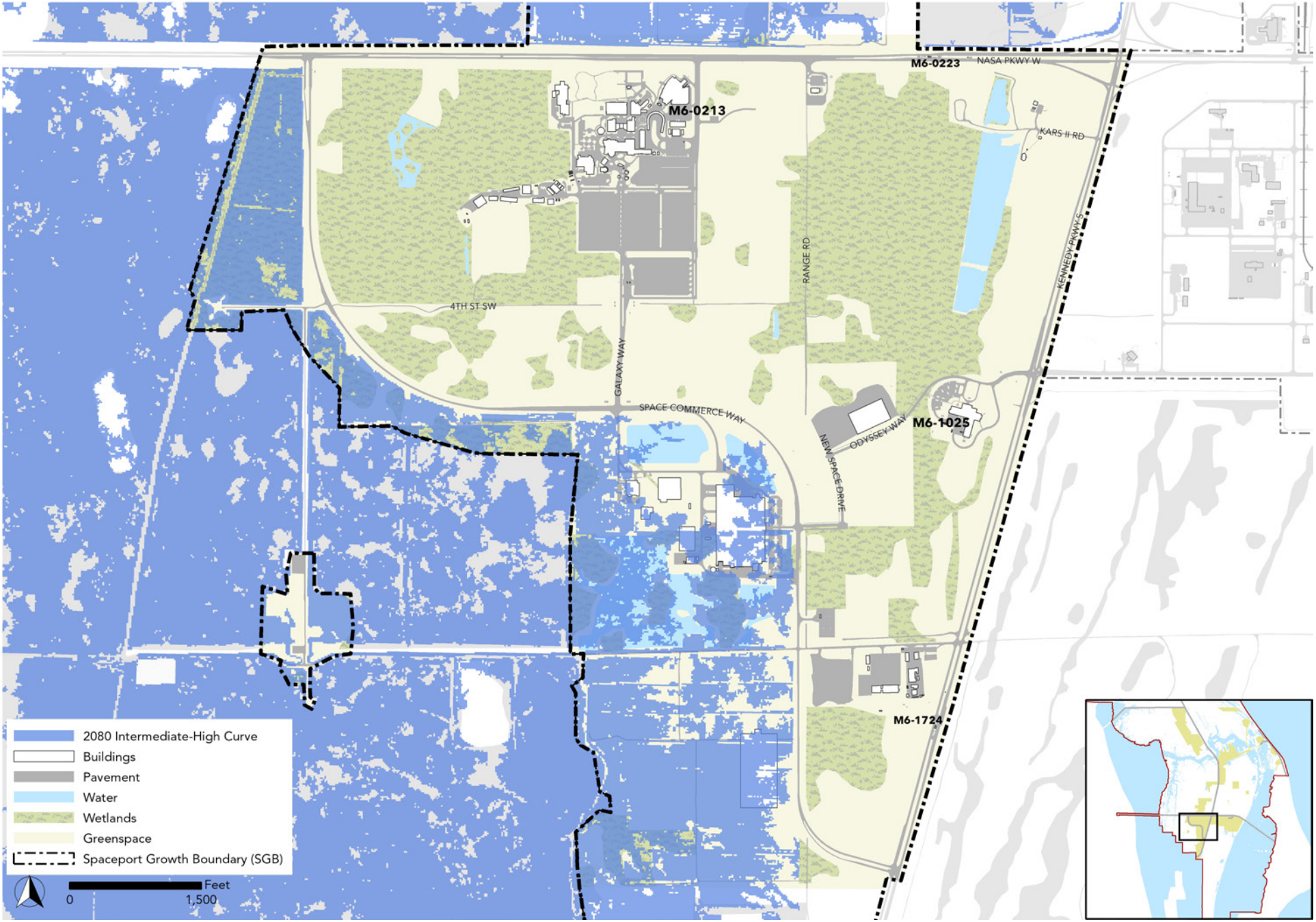
# SEA LEVEL RISE

SPACE COMMERCE DISTRICT SGB - NORTH



# SEA LEVEL RISE

SPACE COMMERCE DISTRICT SGB - CENTRAL



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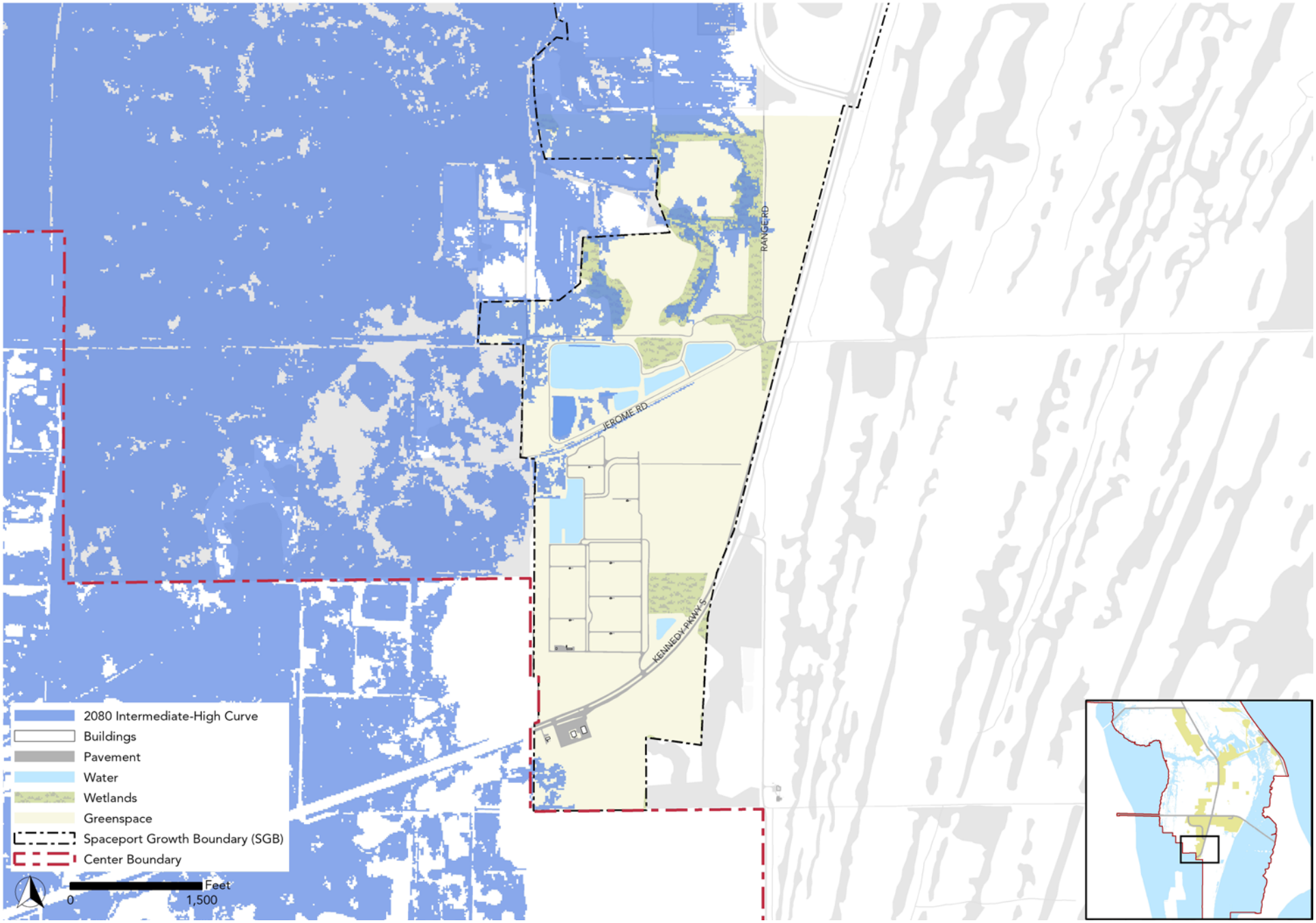
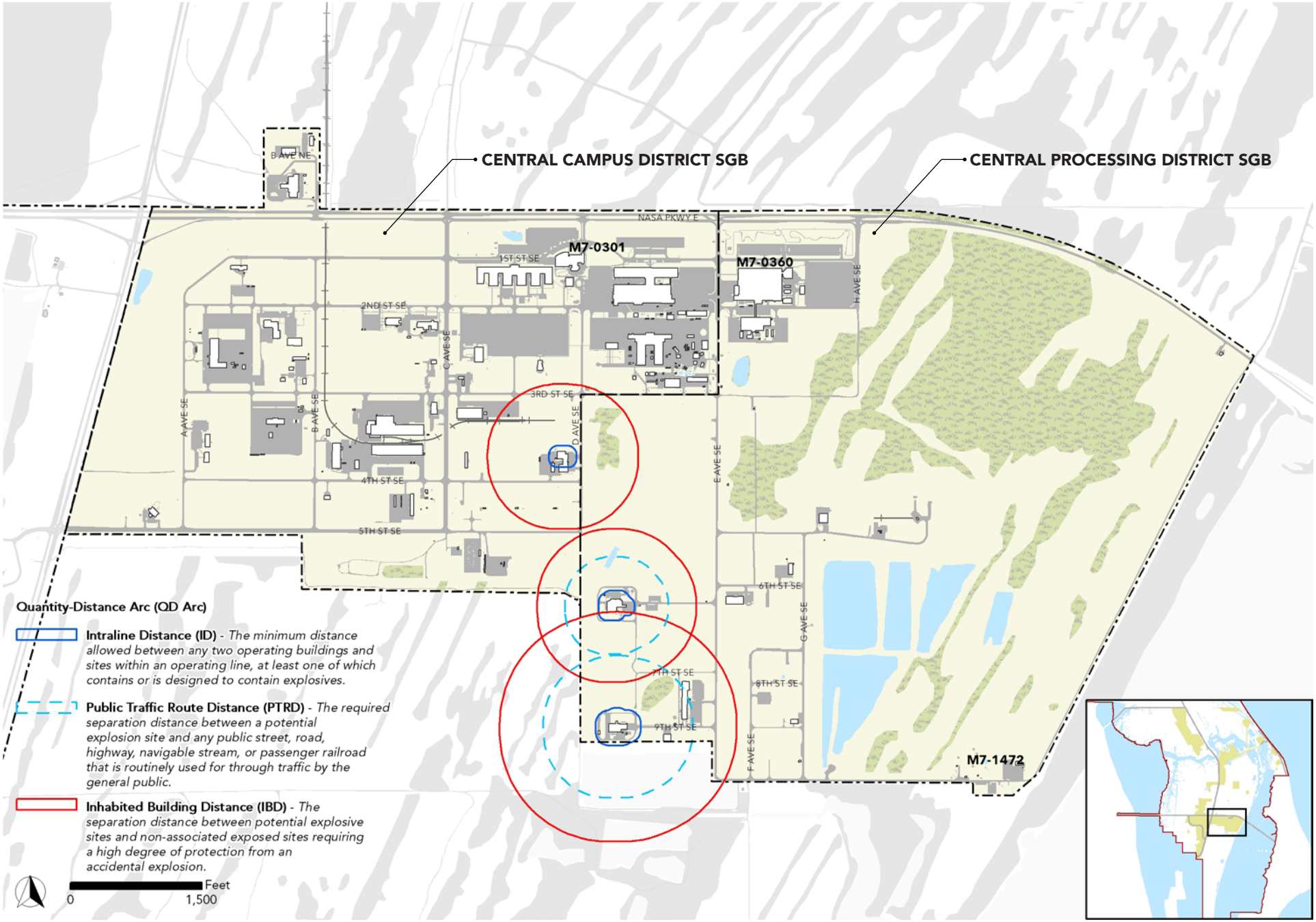
SPACE COMMERCE DISTRICT SGB - SOUTH



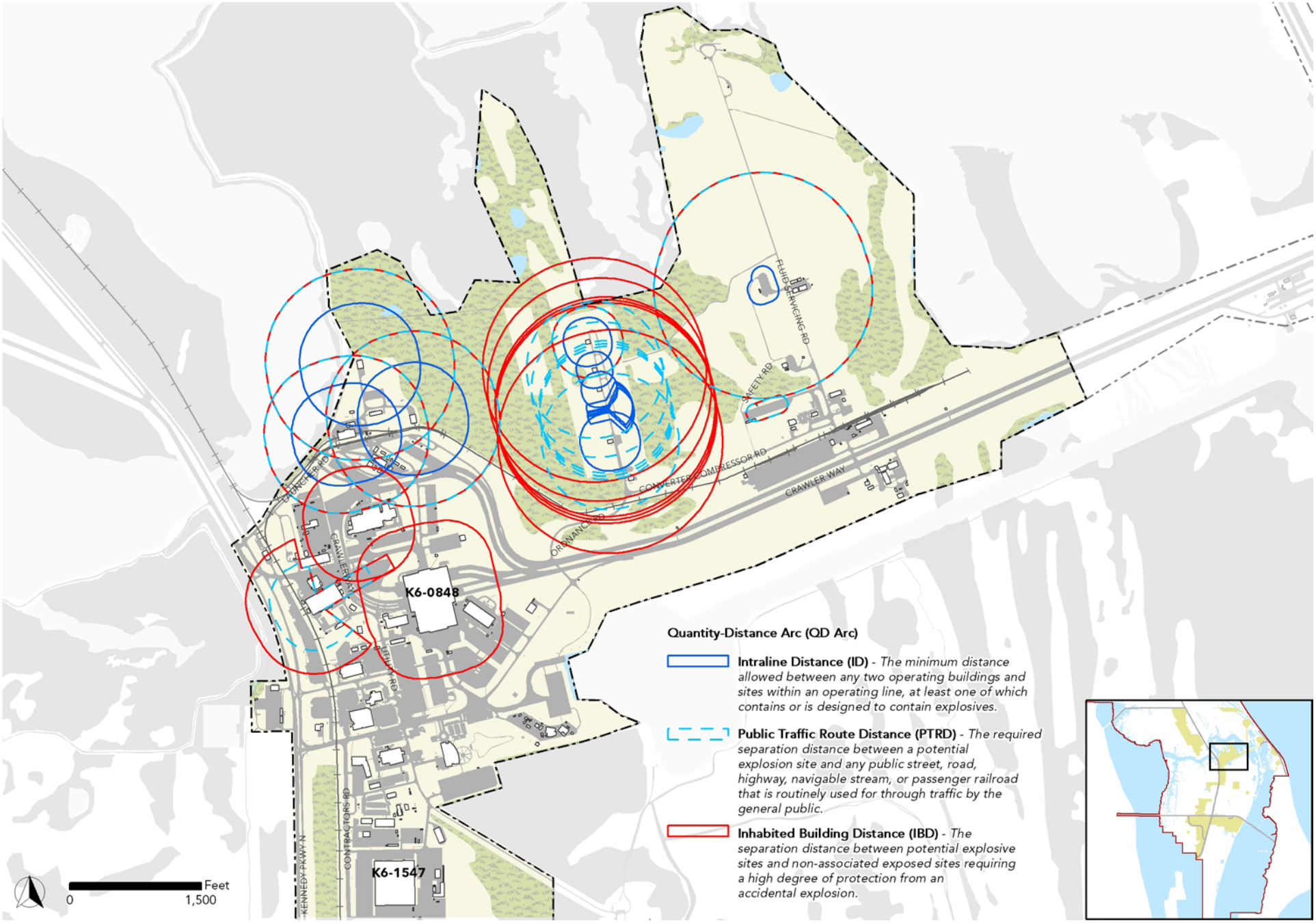
# SAFETY CONSTRAINTS

## CENTRAL CAMPUS DISTRICT SGB & CENTRAL PROCESSING DISTRICT SGB



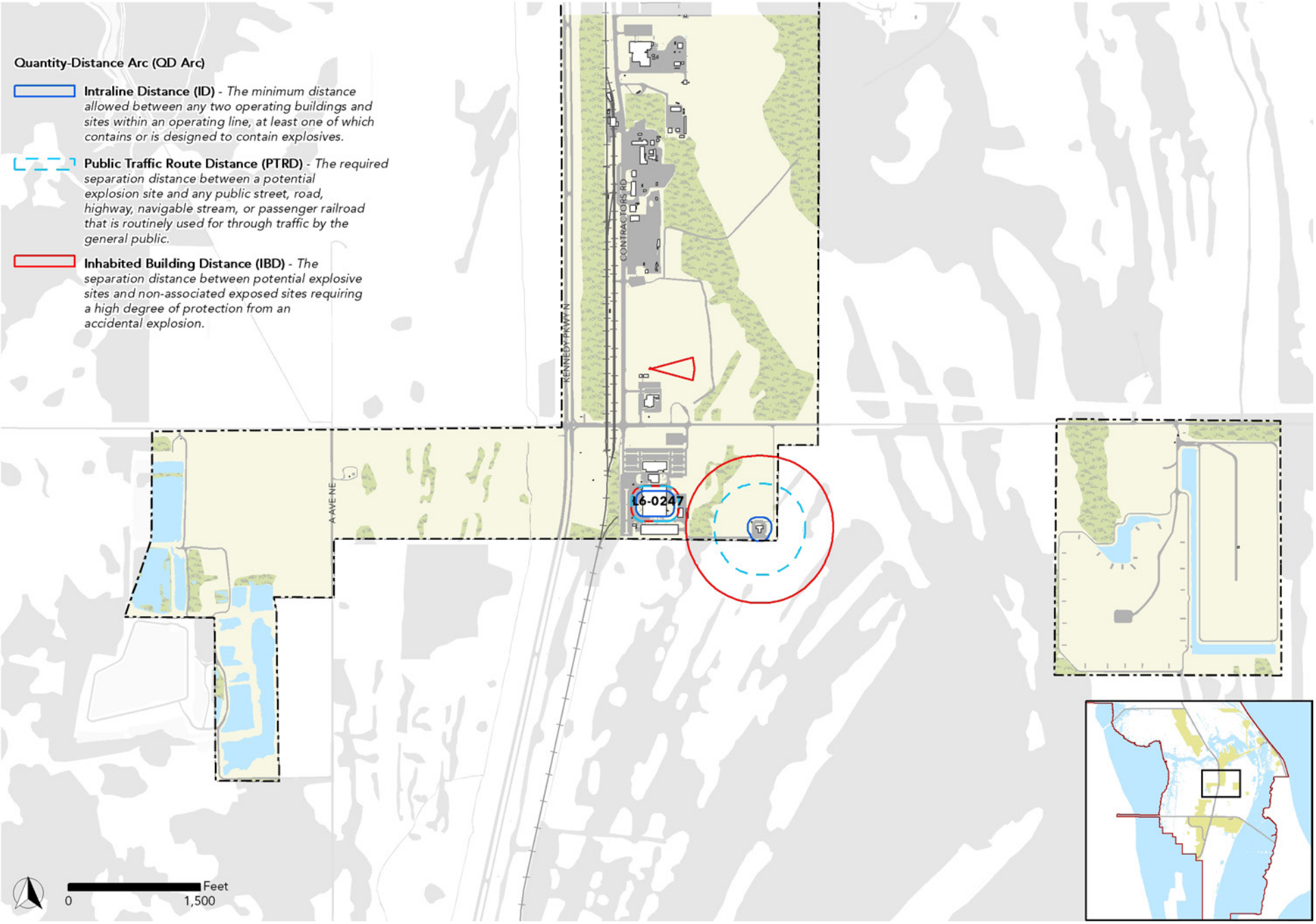
# SAFETY CONSTRAINTS

VAB DISTRICT SGB - NORTH



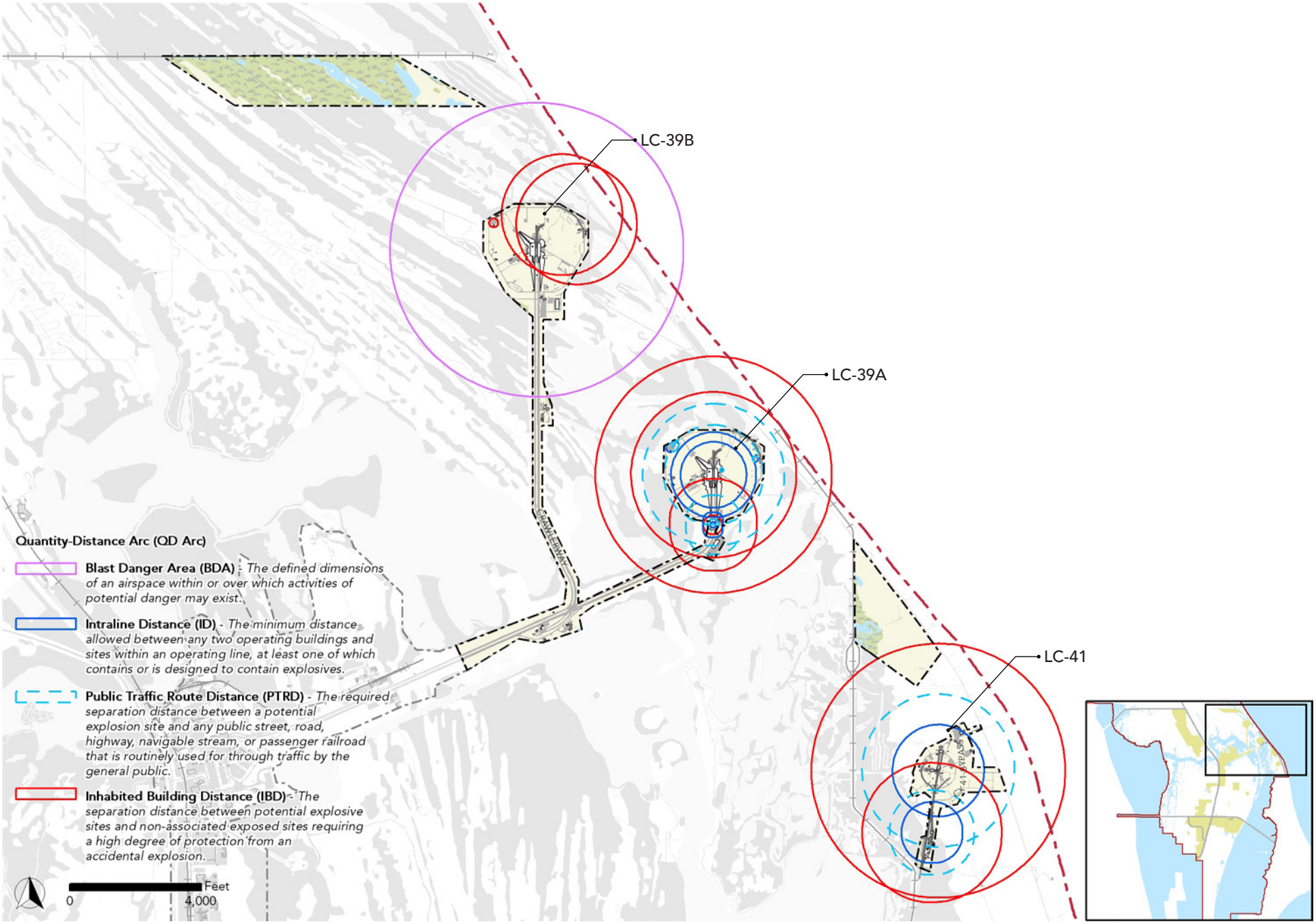
# SAFETY CONSTRAINTS

## VAB DISTRICT SGB - SOUTH



# SAFETY CONSTRAINTS

## EXPLORATION LAUNCH DISTRICT SGB



# F EA PUBLIC NOTICE & FONSI

# EA PUBLIC NOTICE

According the NEPA process, the KSC Vision Plan programmatic Environmental Assessment was posted in *Florida Today* on July 3, 2020. The comment period was 30 days, ending on August 3, 2020.



# Classifieds

To advertise, visit:
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- Classifieds Phone: **800.856.4237**
- Classifieds Email: **breclass@gannett.com**
- Public Notices/Legals Email: **brelegals@gannett.com**

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Are subject to approval before publication. FLORIDA TODAY reserves the right to edit, refuse, reject, classify or cancel any ad at any time. Errors must be reported in the first day of publication. FLORIDA TODAY shall not be liable for any loss or expense that results from an error in or omission of an advertisement. No refunds for early cancellation of order.

**Assorted Stuff** at kinds of things...

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**MELBOURNE AUDITORIUM**
**625 E. Hibiscus Blvd.**
**(2 blocks W. of US #1)**
**July 4th and July 5th**
SAT. 9-5; Sun 9-4.
Concealed Course at Show!
**Call (321) 777-7455**

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HIGHWAYMEN ART OR FLORIDA ART WANTED!!! Jones, A. Hair, R.A. McLendon, Enoch and others. 772-473-2567

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Equal Housing Opportunity. All real estate advertised in this newspaper is subject to the Federal Fair Housing Act of 1968 which makes it illegal to advertise any preference, limitation or discrimination because of race, color, religion, sex, national origin, handicap or familial status or an intention to make any such preference, limitation or discrimination.

This newspaper will not knowingly accept any advertising for real estate which is in violation of the law. Our readers are hereby informed that all dwellings advertised in this newspaper are available on an equal opportunity basis.

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Malabar, 4.3 acres, 10 mill basis, 4 bdrm, 4 ba, 2678 sq. ft., built in 1999, Appr. Appraised $850,000, (321)806-2014

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Chevy 2003 Cavalier, 2 dr, auto, many new parts, ALL maintenance records, $1500, Please call 321-383-4682

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**Dodge Wheelchair Van 2017 10 in lowered floor, ramp & tie downs. Low miles. Call 239-694-8267**

**Your Source Legals** for the latest...

### Fictitious Business

AD#4263168, 7/3/2020
Notice is hereby given that the undersigned intend to register the fictitious name of Handyman Pete Home Services. Business name as provided by Section 865.09 Florida Statutes is: Pete Services LLC, Names of Owners or Directors Pete R. Rouse, III and Anhi L. Rouse, Physical address 822 Cochran Road St. Palm Bay, FL 32909.

### Legal Notices

AD#4261891 03 7/5/2020
**NOTICE OF AVAILABILITY**
ENVIRONMENTAL ASSESSMENT
U.S. DEPARTMENT OF VETERANS AFFAIRS
NRHP/SHPO

The Department of Veterans Affairs (VA) announces the availability of the Final Environmental Assessment (FEA) and Finding of No Significant Impact (FONSI) for the proposed construction and operation of Phase 2 of the Cape Canaveral National Cemetery located at 6502 Phillips Parkway, Mims 32754. Phase 2 development of the Cape Canaveral National Cemetery will expand the existing cemetery facility by approximately 37 acres and represents the environmentally preferred alternative. Even phase cemetery buildout, in total, the Phase 2 area would include 20,074 burial plots, 9,000 niches, columbaria, crypts and urn copings in 20 sections. Other improvements include stormwater retention areas, interior roads, utilities and infrastructure, and signage. The Phase 2 expansion area is currently owned by the VA and is currently a mix of improved and unimproved cleared lands, stormwater ponds, and interior roadways.

The Draft and Final SEA were prepared in accordance with the National Environmental Policy Act (NEPA) to identify the potential environmental impacts associated with the construction of Phase 2 of the Cape Canaveral National Cemetery.

Upon review of the Final SEA, VA concludes that the project will have no significant impact on the human environment. Accordingly, VA has finalized a FONSI pursuant to NEPA and other laws which incorporate the Final SEA and concludes that the preparation of an Environmental Impact Statement is not required. The FONSI completes the NEPA process for this proposed action. The Final SEA and FONSI are available for review electronically at http://www.cem.va.gov/cem/NEPA/, and in hard copy at the Cape Canaveral National Cemetery in Mims, Florida. Due to the various current closures and shelter in place orders associated with the Coronavirus Disease 2019, the VA encourages the review of the electronic copy of the SEA located on the VA website.

For additional information, contact: Fernando Fernandez at Fernando.Fernandez@va.gov (preferred) or at (202) 632-5526, or mail comments to: Department of Veterans Affairs, 425 I Street Northwest, Suite 6W21T0, Washington D.C., 20426.

Sincerely,
/s/ FERNANDO L. FERNANDEZ
5362.37

Fernando L. Fernandez
Program Manager
U.S. Department of Veterans Affairs
Construction and Facilities Management Office

### Notice of Action

AD #4252826, 6/26, 7/3, 7/10, 7/17/2020
IN THE CIRCUIT COURT OF THE 18TH JUDICIAL CIRCUIT, IN AND FOR BREVARD COUNTY, FLORIDA

Case No.: 05-2020-DR-032092-XXXXX-XX

NANCY ELIZABETH NELIS
Petitioner

and

HENRY ANTHONY NELIS
Respondent

NOTICE OF ACTION FOR
DISSOLUTION OF MARRIAGE
(NO CHILD OR FINANCIAL SUPPORT)

TO: HENRY ANTHONY NELIS
(Respondent's last known address) 1706 UNIVERSITY LANE #603, Cocoa FL, 32922

YOU ARE NOTIFIED that an action for dissolution of marriage has been filed against you and that you are required to serve a copy of your written defenses, if any, to it on petitioner's attorney, whose address is 1706 UNIVERSITY LANE, #603, COCOA, FL, 32922 on or before 08/10/2020, and file the original with the clerk of this Court at P.O. BOX 219, Titusville, FL 32781-0219 before service on Petitioner or immediately thereafter. If you fail to do so, a default may be entered against you for the relief demanded in the petition.

### Notice of Action

Copies of all court documents in this case, including orders, are available at the Clerk's office. You may review these documents upon request.

You must keep the Clerk of the Circuit Court's office notified of your current address. (You may file Designation of Current Mailing and E-Mail Address, Florida Supreme Court Approved Family Law Form 12.915.) Future papers in this lawsuit will be mailed or e-mailed to the addresses on record at the clerk's office.

WARNING: Rule 12.285, Florida Family Law Rules of Procedure, requires certain automatic disclosure of documents and information. Failure to comply can result in sanctions, including dismissal or striking of pleadings.

Florida Supreme Court Approved Family Law Form 12.915(b/1). Notice of Action for Dissolution of Marriage (No Child or Financial Support)01/15

Dated 06/22/2020
CLERK OF THE CIRCUIT COURT
By:
Deputy Clerk

### Notice of Meetings

AD#4262422 07/03/2020
NOTICE OF MEETING
VERA EAST
COMMUNITY DEVELOPMENT DISTRICT

A meeting of the Board of Supervisors of the Vera East Community Development District will be held on Tuesday, July 14, 2020 at 2:00 PM at the Faith Lutheran Church, Multi-Purpose Room, 5550 Faith Drive, Vera, FL, Florida 32955. The meeting is being noticed and held in accordance with the provisions of Florida Law for Community Development Districts. A copy of the agenda for the meeting may be obtained from the District Manager, at 219 East Livingston Street, Orlando, FL 32801. The meeting may be continued to a date, time, and place to be specified on the record at the meeting.
There may be occasions when one or more Supervisors, Staff or other individuals will participate by speaker telephone.
Pursuant to the provisions of the Americans with Disabilities Act, any person requiring special accommodation to participate in this meeting is asked to advise the District Office at least forty-seven (48) hours prior to the meeting by contacting the District Manager at (407) 841-5524. If you are hearing or speech impaired, call the Florida Relay Service 1-800-955-8771, TDD or Voice, and ask to be connected to the District Office.
Each person who decides to appeal any decision made at this meeting is advised that that person will need a record of the proceedings and that accordingly, the person may need to ensure that a verbatim record of the proceedings is made, including testimony and evidence upon which such appeal is to be based.

Jason M. Showe
Governmental Management Services - Central Florida, LLC
District Manager

**Want to browse classifieds online? www.floridatoday.com/Classifieds**

### Notice of Meetings

AD#4265011 07/03/2020
Tuesday, July 7, 2020
2:00 P.M. Board of County Commissioners, Governing Board of the Brevard Mosquito Control District; Governing Board of the Brevard County Fire Rescue Sewer District; Zoning, 2725 Judge Fran Jamieson Way, Viera, FL, 1st Floor, Bldg. C, Commission Chamber. Contact 633-2067.

If a person desires to appeal any decision made by this commission with respect to any matter considered at such meeting or hearing, such a person will need a record of this proceeding and that, for such purposes, such person may need to ensure that a verbatim record of this proceeding is made, which record includes testimony and evidence upon which any appeal is to be based. The needs of the hearing and/or visually impaired persons who wish to be present at the proceeding the meeting/hearing is presented with such a request no later than 48 hours prior to the meeting.

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**Homes** FLORIDATODAY.COM/HOMES

AD#4250348 06/26, 07/02/2020
NOTICE OF SALE
NOTICE IS HEREBY GIVEN that the undersigned intends to sell the personal property described below to satisfy a lien pursuant to Florida Statutes Section 83.801-83.809, the Self Storage Facility Act Statutes (Section 83.801-83.809). The undersigned will sell at public sale by competitive bidding on Friday, July 10th, 2020 at 10:00 A.M., on Lockerbox.com. Said property has been stored and which are located at: Storage Titusville/South, 4345 South Street Titusville, Florida 32780
The following:

| Name | Unit# | Contents |
|---|---|---|
| Terry Quigley | 3317 | Boxes |
| Kristian Bishop | 2086 | Totes, Boxes, Book Case, Cooler |
| Kristian Bishop | 2088 | Totes, Flat Screen Tv, Boxes, Suitcase |
| David Lewis | 4333 | Dressers, Radio, Sofa Couch, Glass Cabinet |
| Robert Myers | 2116 | Computer, Totes, Books, Clothes |
| Monique Johnson | 3194 | Car Mats, Black Mercedes CLK |
| by Gibbon | 5471 | Boxes, Mattress, Dressers, Boxes, Furniture, Dressers, Kids Bed |

Purchases must be paid for at the time of purchase by cash only. All purchased items are sold as is, where is, and must be removed at the time of the sale. Sale is subject to cancellation in the event of settlement between owner and obligated party.
Dated this 26th day of June, 2020 and 3rd day of July, 2020

# Pets

to advertise, visit: **classifieds.floridatoday.com**
or call: **800.856.4237**

FLORIDA STATUTE 828.29 STATES THAT ANY DOG OR CAT SOLD IN THE STATE OF FLORIDA MUST BE ACCOMPANIED BY AN OFFICIAL CERTIFICATE OF VETERINARY INSPECTION AT ALL TIMES WHILE BEING OFFERED FOR SALE.
IN ADDITION, ANY DOG OR CAT THAT IS LESS THAN 8 WEEKS OLD MAY NOT BE OFFERED FOR SALE WITHIN THE STATE.

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German Shepherd Puppies - All import bloodline. Ready Now! Also available retired DCI 1 trained 7 yr old male. $700 Great companion GSD 334-234-5384

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### Garage & Moving Sales

**ESTATE SALE**
To Visit | Visited

**MELBOURNE, Fl 32901**
**1024 S. Harbor City Blvd**
**July 2nd-4th, 10am-4pm**
Amazing Estate Sale! Lots of great items at not crazy prices! Highwayman painting!•Massive collection of WWII BAW photos•Tin signs•Old post cards•Albums from 1800's•Hardly glass•Tons of Vintage Christmas•Much more! Large Out trailer will be out front full of treasure•Come check it out.
View pics on estatesale.net
Melbourne FL southern trading co. llc.

### Garage & Moving Sales

*Estate Sale*
Cocoa Beach, Estate Sale, 4160 Hickory Hill Blvd., Fri: 8-2, Sat: 8-2, Designer home!

**Garage Sales work! Make some money for your honey.**

# Business & Service Directory

to advertise, email: **ServiceDirectory@floridatoday.com** or call: **800.856.4237**

### Computers & IT Service

**BRIAN CONSULTING** Computer Repair, Upgrades, Wireless Installs, Services & Vids are appreciated! 321-298-1740

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**RAS Construction** New Homes remodel garage, additions, commercial buildings LIC. CBC058906, Call 321-537-3497

### Fences

**LEANING FENCE? BROKEN POST? Gates Sagging? We Repair or Replace. We Also Install New Wood or Chain Link Fence. LIC. Fence Cont. #FF2 Free Estimates 321-213-5489**

### Handyman Services

Grab Bars & Handicap Ramps, Power Washing, Screens/Gate Repairs, much more! Mike Kawon 321-288-4681

**SAME DAY GRAB BARS!!!**
Safe, Fast, Affordable.
Call (321) 390-3069
SameDayGrabBars.com

### Hauling

JDog Junk Removal and Hauling Residential Junk Removal/Home Declutter/Yard and Hoarding Services. We Serve the Entire Space Coast Area Including all of Brevard County. Free Estimates Call 321-431-2853 or Email us at jdogjunk@jdog.com WestPalmJdog.com

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Mom.comfortcare@gmail.com

### Personal Services

NOTICE OF OFFICE CLOSURE
CENTRAL FLORIDA HOMES CENTER
The Central Florida Homes Center will be retiring as of July 27, 2020. If you need any of your records you can contact us at the office before July 27, 2020 or contact us with your request after that. 407-915-1114 centralflorida@adventist.org

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Expert Installation of Vinyl, Aluminum, Hardi/Plank Material. Free Estimates. Lic./Ins.
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SOFFIT, FACSIA & SIDING. All Types Seamless Gutters
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# NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

**NOTICE:** KSC-02-20

National Environmental Policy Act: John F. Kennedy Space Center, Kennedy Space Center (KSC), Florida

**AGENCY:** National Aeronautics and Space Administration (NASA)

**ACTION:** Availability of the Kennedy Space Center 2020 Vision Plan Environmental Assessment (EA), KSC, Florida

**SUMMARY:** Pursuant to the National Environmental Policy Act (NEPA) of 1969, as amended (42 United States Code 4321 et seq.), the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA; 40 Code of Federal Regulations (CFR) §1500–1508; and NASA policy and procedures, (14 CFR §1216.3), NASA has prepared and issued a Draft EA for the Kennedy Space Center 2020 Vision Plan, KSC, Florida. The purpose of the proposed action is the adoption and implementation of the KSC Vision Plan. The Proposed Action reflects future and preliminary concept development projects within identified developable areas on KSC.

**DATES:** Interested parties are invited to submit written comments on environmental concerns on or before August 3, 2020 or 30 days from the date of this notice publication, whichever is later.

**ADDRESSES:** Address written comments or questions to:

Mr. Donald Dankert
KSC Environmental Management Branch
Mail Code: SI-E3
Kennedy Space Center, FL 32899
E-mail: donald.j.dankert@nasa.gov

The Draft EA is available in Acrobat® format at:

https://environmental.ksc.nasa.gov/EnvironmentalPlanning/NEPA/nepa-comments

Due to an abundance of precaution during the on-going pandemic response and recovery and reduced on-site staffing at KSC, NASA will not be making hard copies of the report available at local public libraries or for distribution by mail.

**FOR FURTHER INFORMATION CONTACT:**

Mr. Donald Dankert
KSC Environmental Management Branch
Mail Code: SI-E3
Kennedy Space Center, FL 32899
E-mail: donald.j.dankert@nasa.gov
Telephone: 321.861.1196

**SUPPLEMENTAL INFORMATION:**

The KSC 2020 Vision Plan will serve as a framework for stewarding KSC's physical assets over the next 20 years and guide the development of the 2020 Master Plan update. NASA last updated the KSC Master Plan in 2012, and an update is needed to meet changing NASA and partner needs and address several newly proposed developments within KSC's property boundaries. The Vision Plan is needed to establish the guiding framework for this update and to ensure future development that minimizes adverse mission impacts and maximizes concurrent operations while preserving KSC's most environmentally sensitive areas and planning for resiliency.

This EA addresses potential impacts associated with the Proposed Action and No Action Alternative. The Proposed Action is to adopt and implement the KSC Vision Plan. The Vision Plan describe the process through which the Proposed Action (i.e., Vision Plan) was developed and details the future development vision for KSC. Under the No Action Alternative, the proposed Vision Plan would not be adopted, and NASA would continue to manage KSC under the existing Master Plan. NASA would continue to maintain and upgrade existing facilities according to the existing Master Plan but would not implement some of the management and development actions specified in the Vision Plan.

FT-0GC0AB1F-01

# FONSI

Public engagement took place over a period of one year, including a formal 30-day public review period. No negative or opposing comments were received.

The Finding of No Significant Impact (FONSI) for the KSC VIsion Plan Programmatic Environmental Assessment was signed on September 2, 2020.

**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION**

**NOTICE: KSC-04-20**

**National Environmental Policy Act:** Finding of No Significant Impact (FONSI) for the Programmatic Environmental Assessment (PEA) for the Kennedy Space Center (KSC) Vision Plan

**AGENCY:** National Aeronautics and Space Administration (NASA)

**ACTION:** Finding of No Significant Impact (FONSI)

**SUMMARY**: Pursuant to the National Environmental Policy Act (NEPA) of 1969, as amended (42 United States Code 4321, et. seq.); the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA (40 Code of Federal Regulations (CFR) Parts 1500-1508); and NASA policies and procedures (14 CFR Part 1216, Subpart 1216.3), NASA has made a FONSI with respect to the proposed KSC Vision Plan at the Kennedy Space Center, Florida. The Proposed Action is the implementation of the KSC Vision Plan which reflects future and preliminary concept development projects within identified developable areas on KSC.

**DATE:** This Proposed Action may proceed as of the date of the signature of this FONSI.

**ADDRESSES:** Written comments or questions should be addressed to:

Mr. Donald Dankert
Environmental Management Branch
NASA Kennedy Space Center
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Kennedy Space Center, FL 32899
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E-mail: donald.j.dankert@nasa.gov

The final PEA and Vision Plan are available online at
https://environmental.ksc.nasa.gov/EnvironmentalPlanning/NEPA
A limited number of hard copies of the final PEA and Vision Plan are available by contacting Don Dankert at the address above, electronic mail address, or telephone indicated herein.

**DESCRIPTION OF THE PROPOSED ACTION:** The Proposed Action is to accept and implement the KSC Vision Plan. The Vision Plan will serve as a framework for stewarding KSC's physical assets over the next 20 years and guide the development of the 2020 Master Plan update in support of these objectives. NASA last updated the KSC Master Plan in 2014, for a planning horizon of 2012 to 2032. An update is needed to meet changing NASA and partner needs and address several newly proposed developments within KSC's property boundaries.

Environmental Assessment for NASA KSC Vision Plan
August 2020

# FONSI

The Vision Plan establishes the guiding framework for this update and ensures future development that minimizes adverse mission impacts and maximizes concurrent operations while preserving KSC's most environmentally sensitive areas and planning for resiliency.

The PEA evaluated potential impacts of implementing the Proposed Action. The two alternatives considered are: 1) the Preferred Alternative, which is the implementation of the Vision Plan; and 2) the No Action Alternative where the Vision Plan would not be adopted, and NASA would continue to manage KSC under the existing Master Plan.

**ALTERNATIVE TO BE IMPLEMENTED:** The Preferred Alternative is to adopt and implement the KSC Vision Plan as described in Chapter 5 of the document.

**ENVIRONMENTAL CONSEQUENCES:** The PEA contains the results of an impact analysis of the proposed action and alternative on the affected environment, including the following:

1. land use
2. physical resources (climate, topography, geology, soils, air quality, and water resources);
3. aesthetics and visual resources
4. biological resources (flora, fauna, and threatened and endangered species)
5. cultural resources
6. noise and vibration
7. socioeconomic resources
8. utilities and infrastructure
9. hazardous and solid waste
10. human health and safety

No significant impacts on the environment have been identified for the implementation of the KSC Vision Plan and no significant cumulative impacts are expected.

**CONCLUSION:** Based on the analysis in this PEA, NASA has concluded that the implementation of the KSC Vision Plan will not result in a significant effect on the human or natural environment. Applicable Federal, state, and local laws and regulations will be followed. NASA has determined that an Environmental Impact Statement pursuant to the NEPA is not required, and this FONSI is hereby submitted.

On the basis of the final PEA, I have determined that the environmental impacts associated with the Proposed Action would not individually or cumulatively have a significant impact on the quality of the biological or physical environment.

**RESPONSIBLE OFFICIAL:**

ROBERT CABANA

Digitally signed by ROBERT CABANA
Date: 2020.09.02 10:42:45 -04'00'

Robert D. Cabana
Director

Environmental Assessment for NASA KSC Vision Plan
August 2020

# G APPENDIX

## ACKNOWLEDGMENTS

# ACKNOWLEDGMENTS

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These stakeholders supported and participated in the development of this Vision Plan.

# ACKNOWLEDGMENTS

Participants at the Center Vision Plan Workshop

Thank you to over 200 KSC staff, partners, and stakeholders that participated in the Kennedy Space Center Vision Plan process during interviews and the planning workshop!

National Aeronautics and Space Administration

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www.nasa.gov/centers/kennedy

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