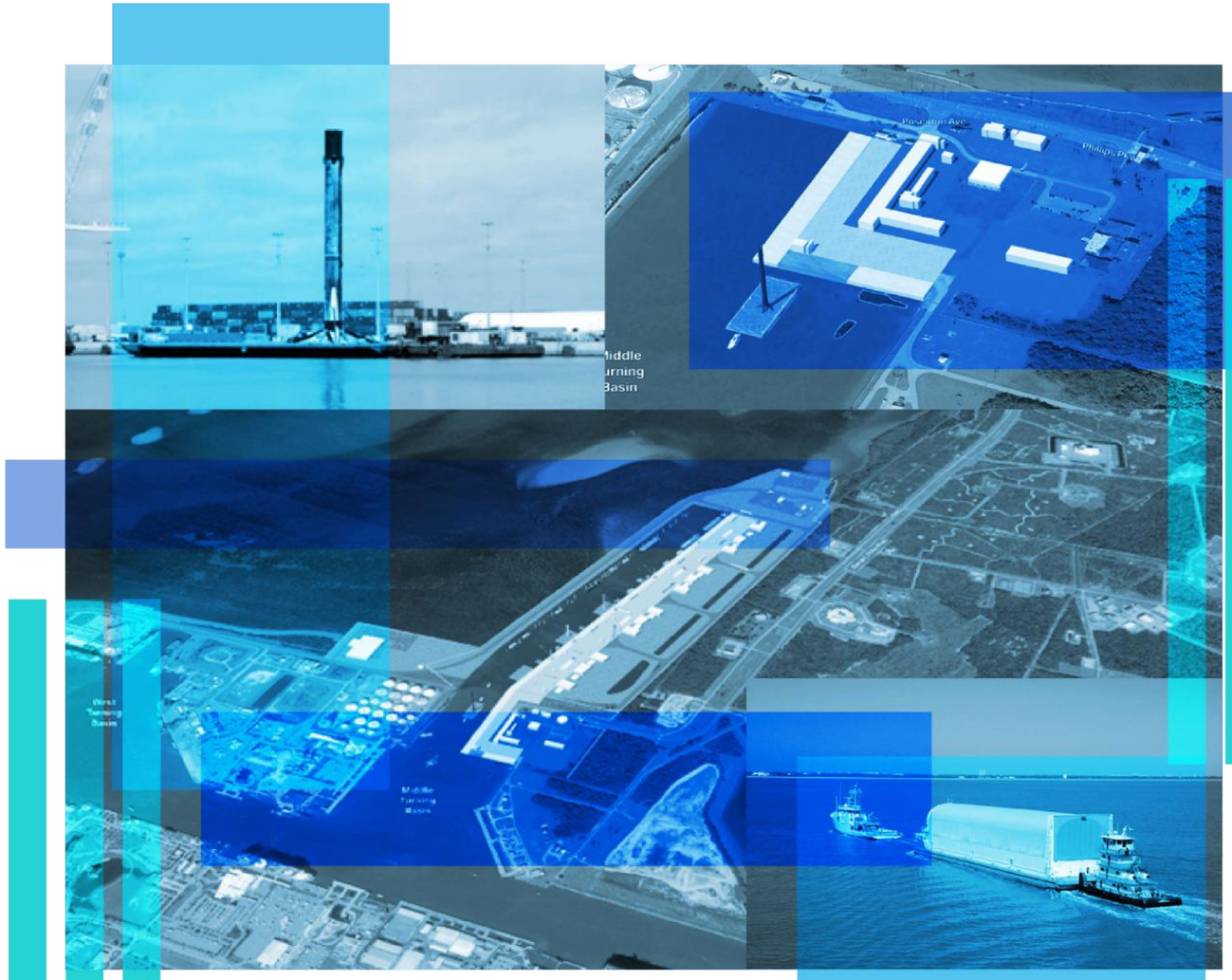


APRIL 2024

The Florida Spaceport System Maritime Intermodal Transportation Study

FEASIBILITY PHASE

SPACE FLORIDA

TABLE OF CONTENTS

ABBREVIATIONS

The following table of abbreviations applies to the entire Wharf Study Report. Some abbreviations may not apply to certain facilities within the CCS.

Abbreviation	Description
AC	Acres
AF	Air Force
AIWA	Atlantic Intracoastal Waterway Administration
ARP	Archaeology Research Permit
ARPA	Archaeological Resources Protection Act
AFSS	Automated Flight Safety Systems
AUTEC	Atlantic Undersea Test and Evaluation Center
BIPP	Beaches, Inlets, and Ports Program
CAGR	Compound Annual Growth Rate
CCS	Cape Canaveral Spaceport
CCSFS	Cape Canaveral Space Force Station
CPA	Canaveral Port Authority
CSA	Commercial Space Activities
DoD	Department of Defense
EDA	Economic Development Administration
ERP	Environmental Resource Permit
ESA	Endangered Species Act
ESQD	Explosive Site Quantity Distance
FAA	Federal Aviation Administration
FDEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
FIND	Florida Inland Navigation District
FPL	Florida Power and Light
GT	Gulftainer USA
IBD	Inhabited Building Distance
INFRA	Infrastructure for Rebuilding America
ITL	Integrate Transfer and Launch
JCP	Joint Coastal Permit
KSC	Kennedy Space Center
LC	Launch Complex
LF	Linear Feet
LSP	Launch Service Provider
MARAD	Maritime Administration
MHW	Mean High Water
MEGA	National Infrastructure Project Assistance
MILCON	Military Construction
MPA	Marine Protected Area
MPDG	Multimodal Projects Discretionary Grants
MSSSS or MS4	Municipal Separate Storm Sewer System
NASA	National Aeronautics and Space Administration
NCB	North Cargo Berth
NE	National Estuary
NEPA	National Environmental Policy Act
NGO	Non-Governmental Organization
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOTU	Naval Ordnance Test Unit
NPDES	National Pollutant Discharge Elimination System
NWR	National Wildlife Refuge
O&M	Operations & Maintenance
PRD	Protected Resource Division
PIDP	Port Infrastructure Development Program
PTR	Public Transportation Route
PWEAA	Public Works and Economic Adjustment Assistance Programs
QD	Quantity-Distance
RAISE	Rebuilding American Infrastructure with Sustainability and Equity
RoRo	Roll On & Roll Off
SF	Space Florida
SJRWMD	St. Johns River Water Management District
SLC	Space Launch Complex
SLD 45	Space Launch Delta 45
SR	State Route
TIFIA	Transportation Infrastructure Finance and Innovation Act
TOR	Task Order Request
TPO	Transportation Planning Organization
UAO	Utility Agency/Owners
UBC	Unit Berth Capacity
ULA	United Launch Alliance
US	United States
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
USDOT	United States Department of Transportation
USFWS	United States Fish and Wildlife Service
USSF	United States Space Force
VAB	Vehicle Assembly Building

EXECUTIVE SUMMARY

The Florida Spaceport System Maritime Intermodal Transportation Study feasibility phase represents a critical first step in addressing the burgeoning maritime needs of Florida's commercial space transportation sector.

As the commercial space transportation industry's vertical launch cadence continues to evolve – 300 to 500 percent increase, the demand for specialized maritime support, including transportation vessels and seaport access has emerged as a pivotal growth constraint.

While Port Canaveral supports the commercial space industry, existing infrastructure does not have capacity to meet the demands of the expected exponential growth in the space transportation industry necessitating a comprehensive study to identify near-term (5 to 10 years) and long-term solutions (10 to 50 years). This planning aligns with the standard practice in maritime and port infrastructure planning industry to develop a 50-year vision given the extensive capital outlay and extended permitting timeline required to build such a large infrastructure project.

The space transportation market is in its early stage but expanding rapidly, and the industry is projected to grow as the safety, reliability, and cost efficiency increases with potential to transition from mostly cargo to a broad mix with passenger transportation. Any near-term solution, therefore, must account for this growth and can expand the capacity in a phased manner.

All major ports in Florida typically only service cruise passengers and cargo operations. Within the vicinity of Cape Canaveral Spaceport (CCS), Port Canaveral currently is not a sustainable long-term solution to support space transportation operations capacity needs.

The objective of this Florida Spaceport System Maritime Intermodal Transportation Study feasibility phase is to identify near- and long-term requirements of an aerospace industry dedicated wharf and support facilities by performing:

- Asset Inventory
- Concept Design
- Stakeholder Engagement with landowners, leaseholders, launch service providers (LSPs) and regulatory agencies via interviews and design review meetings.
- Demand Forecast
- Business Case
- Alternatives Analysis

Past iterations of this report were submitted as follows:

- 30% Report: June 16, 2023
- 60% Report: August 18, 2023
- 90% Report: October 20, 2023
- Pre-Final Report: February 13, 2024

OBJECTIVES

The objective of this Florida Spaceport System Maritime Intermodal Transportation Study feasibility phase (Wharf Study or Study) is to objectively assess available opportunities in and around Cape Canaveral and Port Canaveral that can be used to build required capacity to support the near-term and long-term needs of the commercial space transportation industry and provide a recommended location to build dedicated wharf and support facilities. The near-term solution is projected to capture the commercial space industry's requirements for the next 5 to 10 years and is based upon interviews with the LSPs and their launch cadence projections. The long-term solution is developed based on the forecasts developed from those launch cadence projections and represents a possible vision of the port infrastructure that will be required by the commercial space flight industry. The illustrations provided in this study are conceptual only and do not represent preliminary or final design efforts.

KEY FINDINGS

Asset Inventory and Demand Forecast: Current facilities at Port Canaveral and surrounding areas are insufficient to meet the projected demand for maritime operations related to space launches, necessitating over 9,000 linear feet of dedicated wharf space.

Asset Inventory

The asset inventory identified existing water and landside port/wharf facilities, marine and riverine channels, and area access constraints associated with barge or retrieval vessel sizes (width, length, height, and draft). Other operations restrictions include Explosive Site Quantity Distance (ESQD) arcs, power lines, and surface transportation infrastructure.

Demand Forecast

The demands below gathered from LSPs include transloading operations for maritime launches and retrieval/recovery of boosters, capsules, and/or fairings, and potential mooring of support vessels between launches.

Table ES.1 – LSP Demand Forecast

Description/Year	2028	2033	2043	2053	2063	2073
Projected Recovery/Launch Operations	197	282	386	571	846	1,252
Vessel Traffic (4 Vessels/Operation)	788	1,128	1,544	2,285	3,383	5,007
Shared Berth Length Required to Meet Demand (LF)	1,245	1,782	2,439	3,610	5,344	7,911
Dedicated Berth Length Required to Meet Demand (LF)	2,610	2,610	3,915	4,785	6,960	9,135

The possibility of capturing these demands is dependent upon adequate available wharf space, the capabilities of Cape Canaveral Space Force Station (CCSFS) and Kennedy Space Center's (KSC) launch facilities, and the US Coast Guard's (USCG) ability to provide timely inspections of returning retrieval vessels.

Existing wharf facilities in Port Canaveral under jurisdiction of Canaveral Port Authority (CPA), KSC, and CCSFS cannot meet this need, which may in the long-term require over 9,000 linear feet of LSP-dedicated wharf space and additional mooring areas.

Alternatives Analysis: A thorough examination of six potential zones for new facilities led to the prioritization of expansions in the West and Middle Turning Basins, with a long-term vision for northward expansion to accommodate future needs.

- Middle Turning Basin (CCSFS/USSF)
- North Turning Basin (Proposed) (Port Canaveral/CPA; KSC/NASA; CCSFS/USSF)
- West Turning Basin (Port Canaveral/CPA)
- Atlantic Ocean (CCSFS/USSF)
- Banana River/West of SR 401 (KSC/NASA; CCSFS/USSF)
- East Turning Basin (CCSFS/USSF)

Alternatives Analysis

Six (6) zones analyzed to accommodate the new wharf and port infrastructure are listed below (area/landowners are noted in parentheses):

- Middle Turning Basin (CCSFS/USSF)
- North Turning Basin (Proposed) (Port Canaveral/CPA; KSC/NASA; CCSFS/USSF)
- West Turning Basin (Port Canaveral/CPA)
- Atlantic Ocean (CCSFS/USSF)
- Banana River/West of SR 401 (KSC/NASA; CCSFS/USSF)
- East Turning Basin (CCSFS/USSF)

FIGURE ES.1 – ALTERNATIVES ANALYSIS ZONES

Based on schedule, environmental/permitting and military operational constraints, the Atlantic Ocean, Banana River/West of SR 401, and East Turning Basin Zones were eliminated from further consideration. Based on additional input received from stakeholders such as the U.S. Coast Guard and CPA, the northern expansion of the Middle Turning Basin is the preferred option as expansion and growth of the cruise industry at Port Canaveral can cause additional operational and security risks associated with increased space related maritime activities in the West Turning Basin.

Concept Design

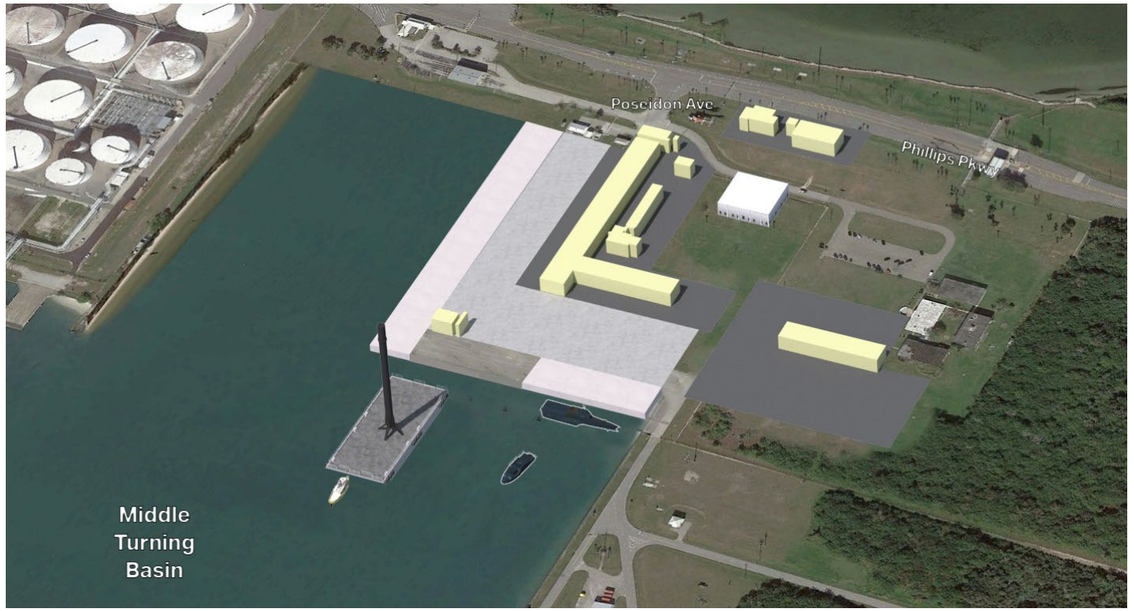
Near-Term Recommended Concept – Within Middle Turning Basin

Recommendations include utilizing existing infrastructure in the short term and significant expansions of the Middle Turning Basin for long-term capacity enhancement.

The near-term option would continue the use of Port Canaveral's north cargo berths in the West Turning Basin for transloading retrieved rocket components and docking as directed by the CPA Harbormaster. Additional capacity could be obtained by dredging the northern portion of the Middle Turning Basin and building a new wharf facility east of the existing Army Wharf and Rocketship Wharf (Delta Mariner Wharf) as a first phase and adding a cut to the north at the existing U.S. Army Wharf as a second phase, which could be shared between the U.S. Army, ULA, and other LSPs as needed. The second phase would involve replacement of the existing US Army infrastructure at the Middle Basin.

FIGURE ES.2 – NEAR-TERM RECOMMENDED CONCEPT

FIGURE ES.3 – NEAR-TERM RECOMMENDED CONCEPT RENDERING



Mooring options include all existing wharves within Port Canaveral at the discretion of the CPA Harbormaster. A potential near-term mooring option is the construction of additional concrete piles north of the Barge Canal, west of the Banana River Channel, and just northwest of the Canaveral Locks. Dredging in this area is maintained by NASA/USAEE and can be maintained for use by any vessel that can safely navigate the Canaveral Lock.

LONG-TERM RECOMMENDED CONCEPT – EXPANSION OF MIDDLE TURNING BASIN TO THE NORTH

The long-term option would involve a longer cut north through the Middle Turning Basin, ultimately expanding the basin to the north. This new basin would run parallel to the existing Banana River north-south shoreline along CCSFS property. Existing buildings and infrastructure used by the U.S. Army and USSF would be rebuilt and relocated. A realigned SR 401 would act as the perimeter of the expanded basin and dredge material may be used as fill for landside operations. No new connections between the Port and the Banana River are proposed.

FIGURE ES.4 – LONG-TERM RECOMMENDED CONCEPT

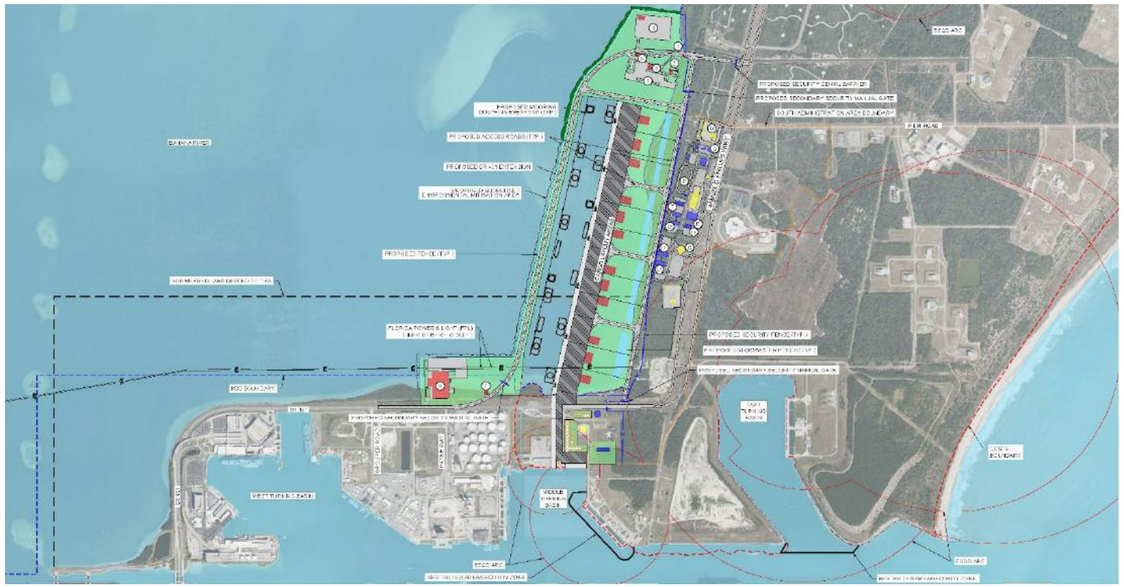


FIGURE ES.5 – LONG-TERM RECOMMENDED CONCEPT RENDERING

Business Case

The financial analysis underscores the need for a sustainable funding model, combining federal grants and potentially higher usage fees, to realize the construction of recommended facilities without overburdening launch service providers (LSPs). This aligns with cargo and cruise industry contracts which can be negotiated for prolonged periods, including 30 to 50-year agreements with multiple concessions or potential cost savings agreed upon by both parties. All estimated costs are reported in 2023 dollars.

The total estimated cost to build the near- and long-term infrastructure recommendation is:

- Approximately $2.1 billion, constructed in seven (7) construction phases.
- Each berth is approximately 430 linear feet.
- The cost to relocate USSF/U.S. Army facilities is approximately $220 million.

Table ES.2 – Summary of Total Estimated Costs

Cost Item	Total
Raw Cost Subtotal	**$1,390,114,693**
Design, Permitting, and CM (10%)	$139,011,469
Contingency (40%)	$556,045,877
Total Cost	**$2,085,172,039**
Annualized Cost	$151,485,479
Number of Berths	15
Average Annualized Cost Per Berth	**$10,099,032**

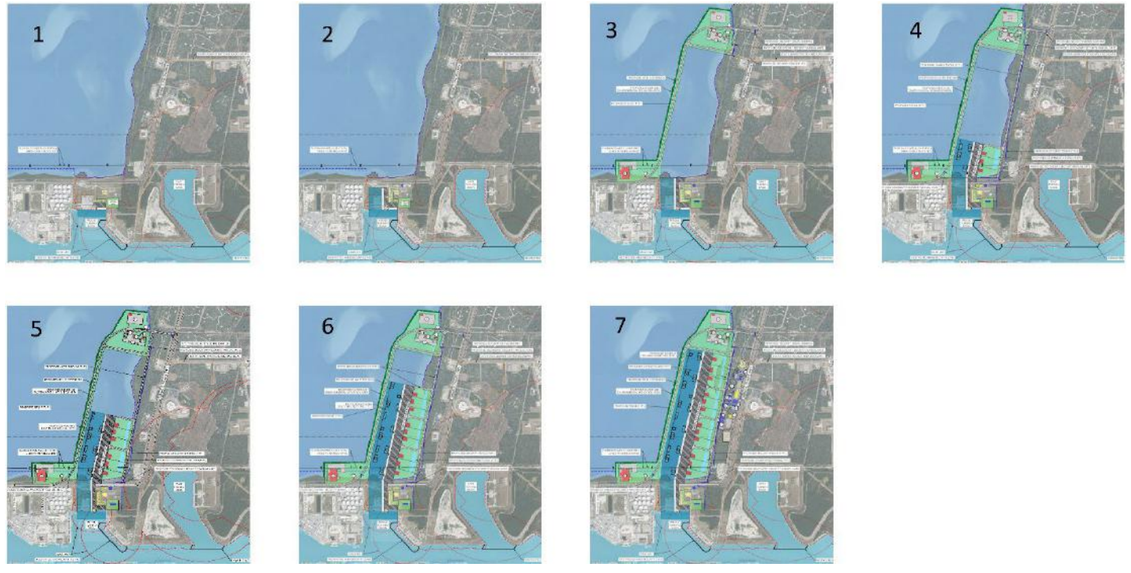
If this cost is amortized over 30 years with an interest rate of 6%, the annual development cost for the entire project is approximately $150 million.

The two primary options to develop a viable business case for this long-term development are:

- To secure development grants from the Federal government and other funding sources so that the developer, and eventually the LSPs, are not burdened with the full cost of development and pass on the savings to the LSPs.
- To increase higher lease costs or rent for use of existing shared facilities within the port.

Each barge call is projected to cost over $100,000 to be charged to cover future development of capacity for this type and extent of activity at Port Canaveral. Future development will depend on a combination of grants or other external sources of funding combined with potentially higher rents and/or use fees from private operators.

FIGURE ES.6 – CONSTRUCTION PHASES 1-7 FOR NEAR- AND LONG-TERM OPTIONS



APPENDIX A – SCOPE OF WORK

The scope of the initial feasibility phase of the Florida Spaceport System Maritime Intermodal Transportation Study was centered on assessing the feasibility of various options for maritime support of the space industry. The study's intention is to serve as a guide for expansion options, based on comprehensive stakeholder feedback and a thorough engineering analysis taking place over nearly one year.

The Study is a comprehensive effort to forecast both near-term (5-year) and long-term (20-year) demand and requirements for maritime-related infrastructure improvements needed to support Florida's Spaceport System. The near-term (5-year) analysis will be focused on wharf infrastructure improvements at or near Cape Canaveral Space Force Station (CCSFS) and/or the Kennedy Space Center (KSC), collectively defined in Florida Statute 331 as the Cape Canaveral Spaceport (CCS).

The primary goals and objectives of this study are:

- Near-term: Determine requirements, infrastructure improvements, alternatives, estimated present-day costs, and implementation schedules to support near-term growth over the next five (5) years. Based on stakeholder and landowner input, identify and evaluate alternatives to support space transportation maritime operations including the berthing of seafaring vessels, transloading of flight hardware to/from land-based transporters, and enable limited hazardous operations.

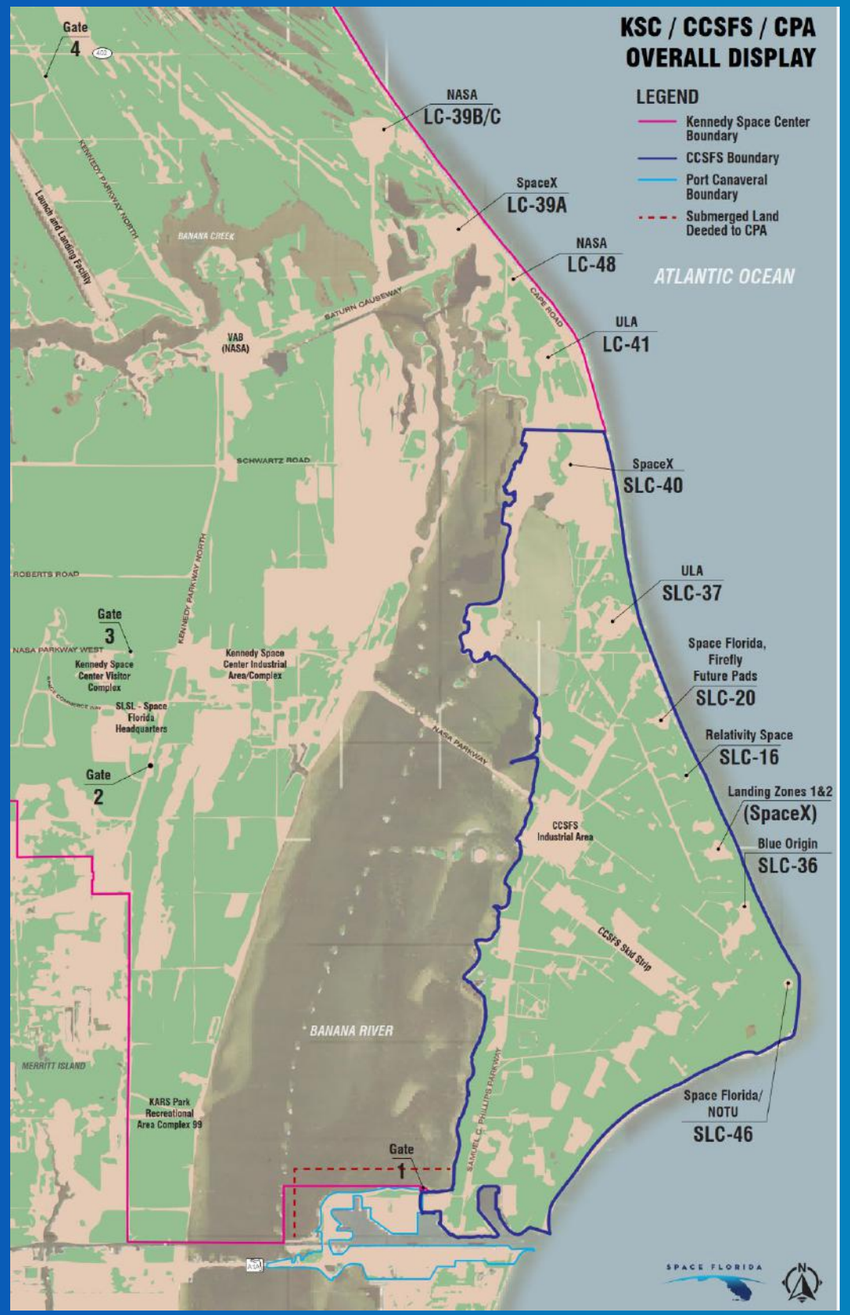
- Long-Term: Determine longer-term opportunities at CCS and Statewide to strengthen the State's and Nation's capabilities as the space transportation industry continues to invest and innovate with sea launch, landing, and maritime logistics. Identify how other Florida seaports can support off-shore launch, landing, and recovery and land-based logistics, processing, and integration.

Project Area

The Study's project area encompasses land or channels under the jurisdiction of NASA at Kennedy Space Center (KSC), USSF at Cape Canaveral Space Force Station (CCSFS), Canaveral Port Authority (Port Canaveral), and US Army Corps of Engineers (USACE). Figure 1 illustrates the overall project area that is analyzed as part of the Study.

SpaceX Booster Recovery at Port Canaveral

FIGURE 1 – WHARF STUDY PROJECT AREAS NEAR KSC, CCSFS, AND PORT CANAVERAL



APPENDIX B – ASSET INVENTORY

EXISTING ASSETS

Through stakeholder engagement and site visits, information was compiled on all existing marine and landside assets at KSC, CCSFS, and Port Canaveral, including potential constraints to transportation (both marine and landside). The existing assets are shown in Tables 1 through 3 and Figures 2 through 5; they identify key parameters associated with each asset. The three (3) asset type categories are:

- **Marine/Channel** – provides access to deep draft ships between coastal channels and shallow draft tows in inland waterway channels.
- **Land/Wharf** – a structure built along the port or the shore of navigable waters where ships may lie alongside to receive and discharge passengers, cargo, and infrastructure associated with rockets. Some wharves are undeveloped, meaning they only have bulkheads but lack land on the backside to support cargo or cruise terminal operations.
- **Transportation Constraints (Marine and Land)** – any channel that cannot accommodate desired boat vessel length/draft/width; overhead obstructions (bridges or powerlines) that restrict air draft; and insufficient roadway geometry to accommodate wide transporters that carry rocket flight ware from a wharf to launch/processing facilities.

Figure 2 is an overall summary of all assets and parameters (*Note: this Figure is formatted to be printed as an oversize plot/exhibit).* Figures 3 through 5 show landowner-specific assets in more detail.

Table 1 – CCSFS/Port Canaveral Asset Parameters for Figure 3

Asset No.	Asset Name	Width (ft.)	Channel Depth (ft.)	Maximum Draft (ft.)	Location	Overhead Clearance (ft.)
1	Canaveral Locks (600’ long)	90	-12	-12	USACE	N/A
2	West Turning Basin	500	-44	-40	CPA	N/A
3	Middle Turning Basin (Poseidon Basin)	500	-44	-40	CCSFS/CPA	N/A
4	East Turning Basin (Trident Basin – Military Only)	500	-44	-41	CCSFS	N/A
5	Main Channel/Canaveral Harbor Channel (500’ Clearance)	500	-44	-40	CPA	N/A
6	Entrance Channel	500	-44	-40	CPA	N/A
10	Port Canaveral Anchorage (N 28°21.5’; W -80°33.2’)	N/A	N/A	N/A	USACE	N/A
13	North Cargo Berth (NCB) 8	1,020	-43	-35	CPA	N/A
14	North Cargo Berth (NCB) 6	1,872	-43	-40	CPA	N/A
15	Trident Wharf (Military Only)	1,200	-44	-41	CCSFS	N/A
16	Poseidon Wharf (Military Only)	1,200	-44	-40	CCSFS	N/A
17	Air Force/Army Wharf (Military Only)	500	-15 to -30	-15	CCSFS	N/A
18	Rocketship Wharf (Delta Mariner Wharf)	100	-16	-16	CCSFS	N/A
22	SR 401 Existing Bascule Bridges *(Proposed Replacement in Design Phase)*	90 *(Future TBD)*	-12	Bridge	CPA	N/A (existing) *65 (future)*
23	Charles Rowland Drive/SR 401 Overpass Bridge	70	N/A	Bridge	CPA	22
26	FPL Secondary Distribution Lines SR 401 Northern/Southern Right of Way	N/A	N/A	Powerline	CPA	85

Table 2 – NASA KSC Asset Parameters for Figure 4

Asset No.	Asset Name	Width (ft.)	Channel Depth (ft.)	Maximum Draft (ft.)	Location	Overhead Clearance (ft.)
8	Saturn Channel (Banana River Channel)	125	-12	-12	KSC	65
9	VAB/LC 39A Turn Basin	125	-12	-12	KSC	65
20	VAB Barge Dock/VAB Wharf (Undeveloped)	75 (Dock) 1,250 (Undeveloped)	-12	-12	KSC	N/A

Table 3 – Cape Canaveral Spaceport (KSC and CCSFS) and Immediate Vicinity Asset Parameters for Figure 5

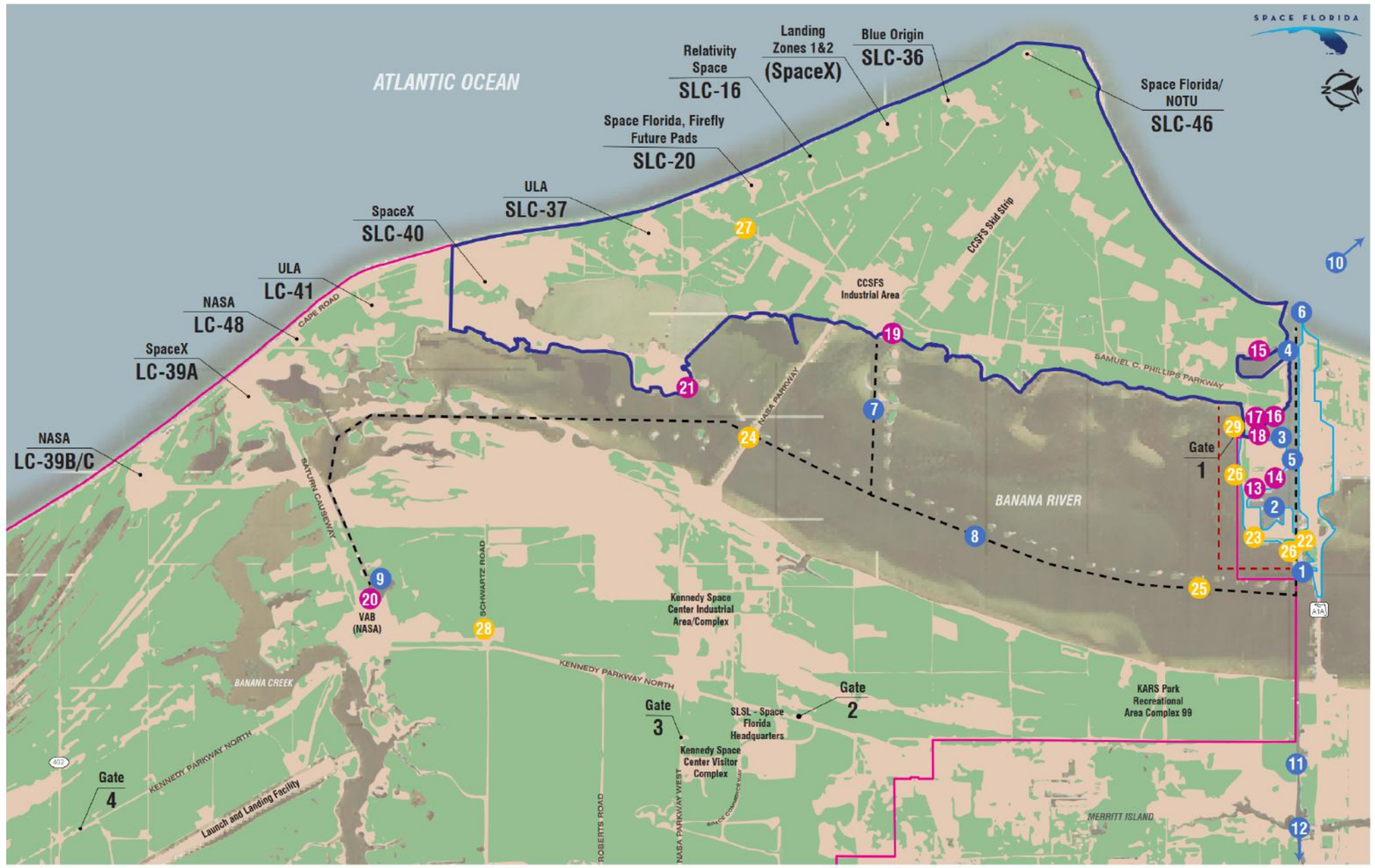
Asset No.	Asset Name	Width (ft.)	Channel Depth (ft.)	Maximum Draft (ft.)	Location	Overhead Clearance (ft.)
7	AF Channel	125	-12	-12	CCSFS	65
8	Saturn Channel (Banana River Channel)	125	-12	-12	KSC	65
11	Canaveral Barge Channel	90	-12	-12	USACE	N/A
12	Intracoastal Waterway (ICW)	150	-12	-12	KSC	65
19	Hangar AF Wharf	75	-12	-12	CCSFS	N/A
21	ITL Area South	0	-12	-12	CCSFS	N/A
24	Roy D. Bridge Existing Bascule Bridges	90	-12	Bridge	NASA	N/A
25	FPL Primary Distribution Lines	125	-12	Powerline	NASA	65
26	FPL Secondary Distribution Lines	N/A	N/A	Powerline	CPA	35
27	FPL Distribution Lines – Phillips Parkway/ICBM Road	Roadway Width	100	Powerline	CCSFS	100
28	FPL Distribution Lines – Kennedy Parkway/Schwartz Road	Roadway Width	100	Powerline	CPA	100
29	CCSFS Gate 1 (Outbound Side Entry)	35 (Roadway Width)	100	Gate	CCSFS	N/A

FIGURE 2 – OVERVIEW OF EXISTING ASSETS BY ASSET TYPES

KSC / CCSFS / CPA OVERALL DISPLAY

LEGEND

- Kennedy Space Center Boundary
- CCSFS Boundary
- Port Canaveral Boundary
- Channel
- Submerged Land Deeded to CPA
- Marine/Channel Assets
- Land/Wharf Assets
- Transportation Constraints



MARINE/CHANNEL ASSETS

Asset No.	Asset Name	Width (ft)	Channel Depth (ft)	Max. Draft (ft)	Location
1	Canaveral Locks (600' long)	90	-12	-12	USACE
2	West Turning Basin	500	-44	-40	CPA
3	Middle Turning Basin (Poseidon Basin)	500	-44	-40	CCSFS/CPA
4	East Turning Basin (Trident Basin- Military Only)	500	-44	-41	CCSFS
5	Main Channel/Canaveral Harbor Channel	500	-44	-40	CPA
6	Entrance Channel	500	-44	-40	CPA
7	AF Channel	125	-12	-12	CCSFS
8	Saturn Channel (Banana River Channel)	125	-12	-12	KSC
9	VAB/LC39 Turn Basin	125	-12	-12	KSC
10	Port Canaveral Anchorage (N 28°21.5'; W -80°33.2')	N/A	N/A	N/A	USACE
11	Canaveral Barge Channel	90	-12	-12	USACE
12	Intracoastal Waterway (ICW)	150	-12	-12	CPA

LAND/WHARF ASSETS

Asset No.	Asset Name	Dock Length (ft)	Channel Depth (ft)	Max. Draft (ft)	Location
13	North Cargo Berth (NCB) 8	1,020	-43	-35	CPA
14	North Cargo Berth (NCB) 6	1,872	-43	-40	CPA
15	Trident Wharf (Military Only)	1,200	-44	-41	CCSFS
16	Poseidon Wharf (Military Only)	1200	-44	-40	CCSFS
17	Air Force/Army Wharf (Military Only)	500	(-15 to -30)	(-15 to -30)	CCSFS
18	Rocketship Wharf (Delta Mariner Wharf)	100	-16	-16	CCSFS
19	Hangar AF Wharf	75	-12	-12	CCSFS
20	VAB Barge Dock/VAB Wharf (undeveloped)	75' Dock 1250' Undeveloped	-12	-12	NASA
21	ITL Area South	0	-12	-12	CCSFS

TRANSPORTATION CONSTRAINTS

Asset No.	Asset Name	Horizontal Clearance (ft)	Vertical Clearance (ft)	Feature	Location
22	SR 401 Existing Bascule Bridges (Proposed Replacement in Design Phase)	90 (Future TBD)	N/A (exist.) 65 (future)	Bridge	CPA
23	Charles Rowland Dr/SR 401 Overpass Bridge	70	22	Bridge	CPA
24	Roy D Bridges Existing Bascule Bridges	90	N/A	Bridge	NASA
25	FPL Primary Distribution Lines 85' height (in Saturn Channel/ Banana River north of SR 401)	125	65	Powerline	NASA
26	FPL Secondary Distribution Lines SR 401 Northern/Southern Right of Way	N/A	65	Powerline	CPA
27	FPL Distribution Lines Phillips Parkway/ICBM Road	Roadway Width	100	Powerline	CCSFS
28	FPL Distribution Lines Kennedy Parkway/Schwartz Road	Roadway Width	100	Powerline	CPA
29	CCSFS Gate 1 (Outbound side entry)	35' Roadway width	100	Gate	CCSFS

FIGURE 3 – CCSFS/PORT CANAVERAL ASSETS

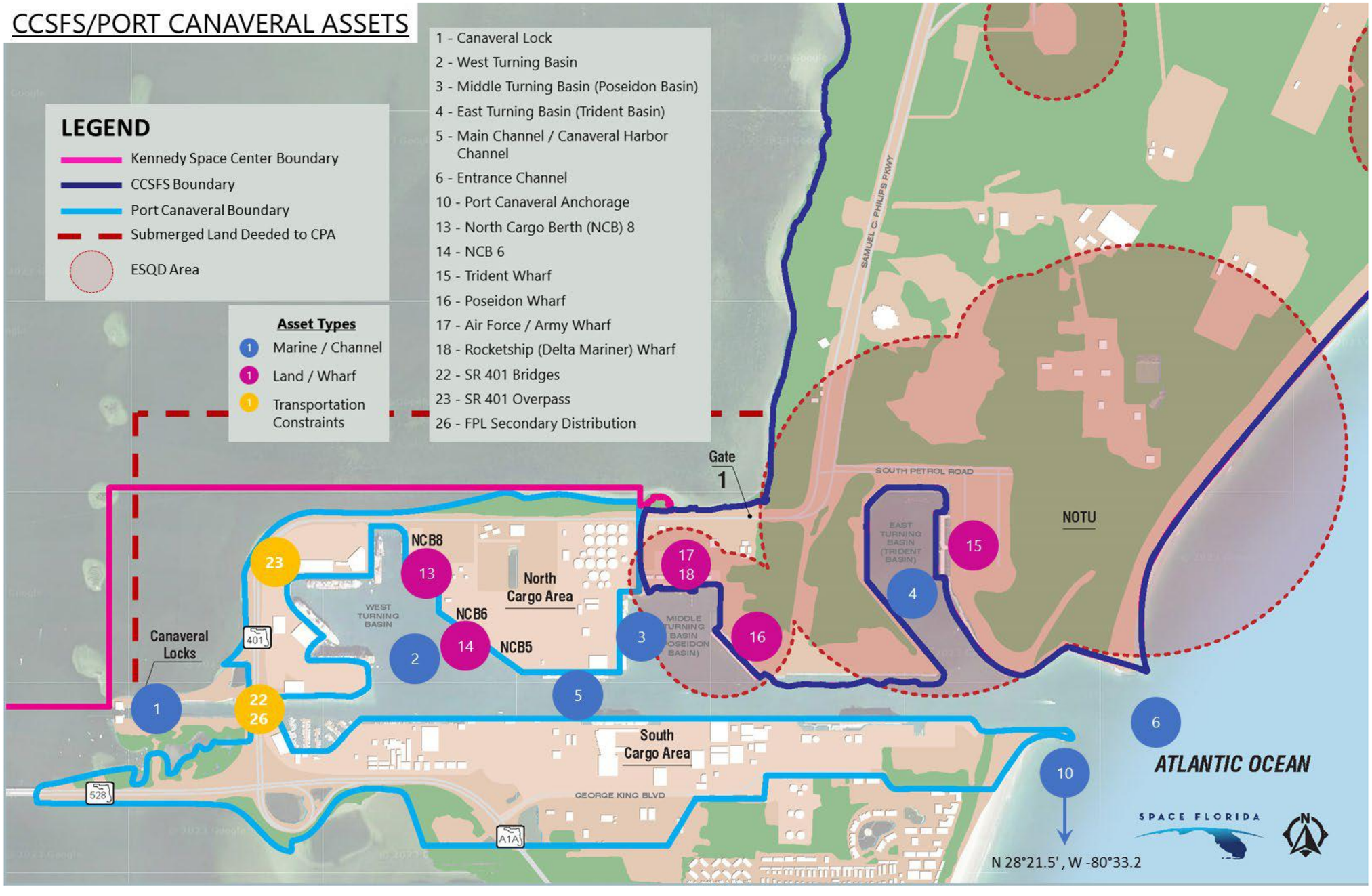


FIGURE 4 – NASA KSC ASSETS

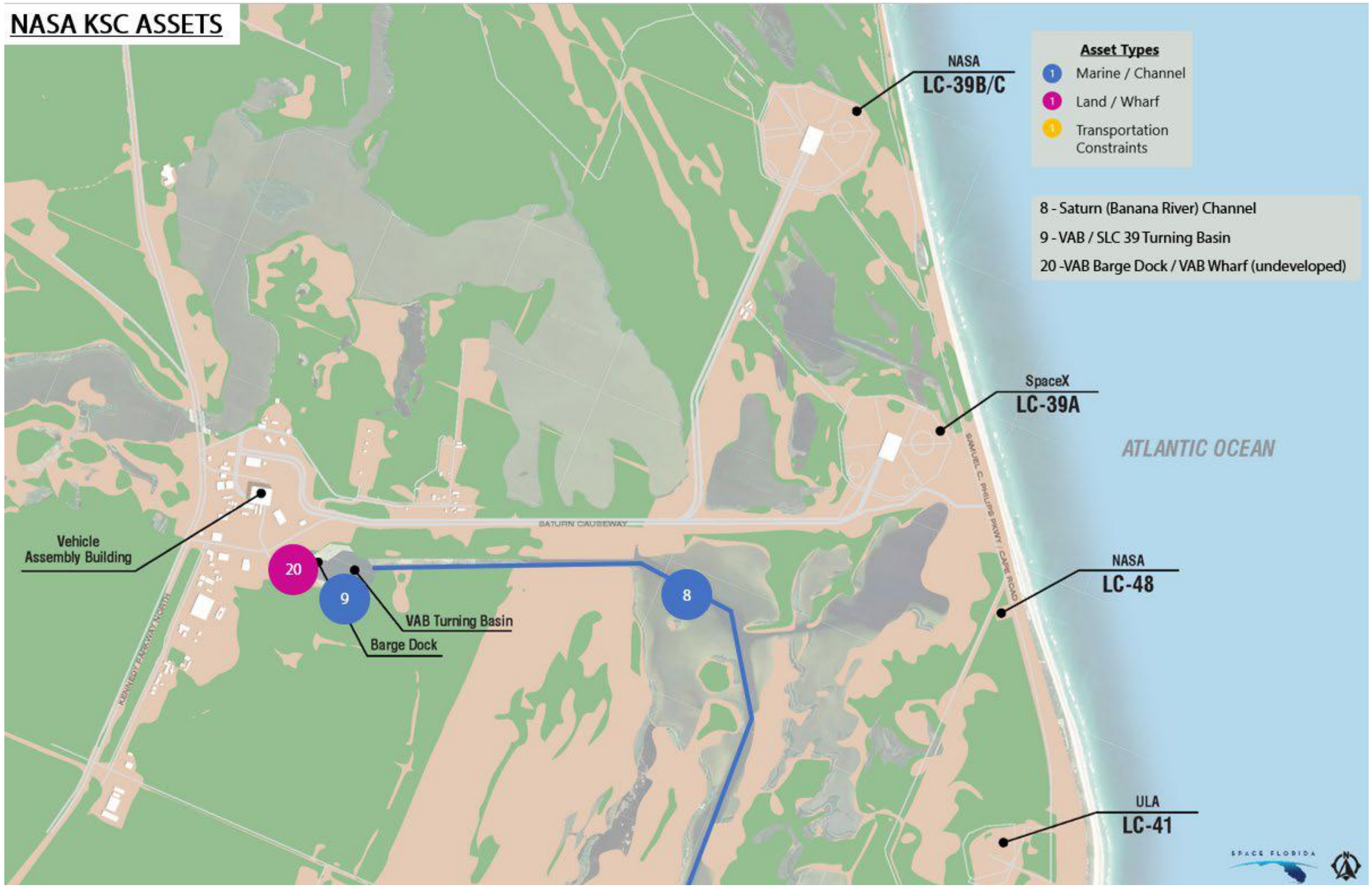
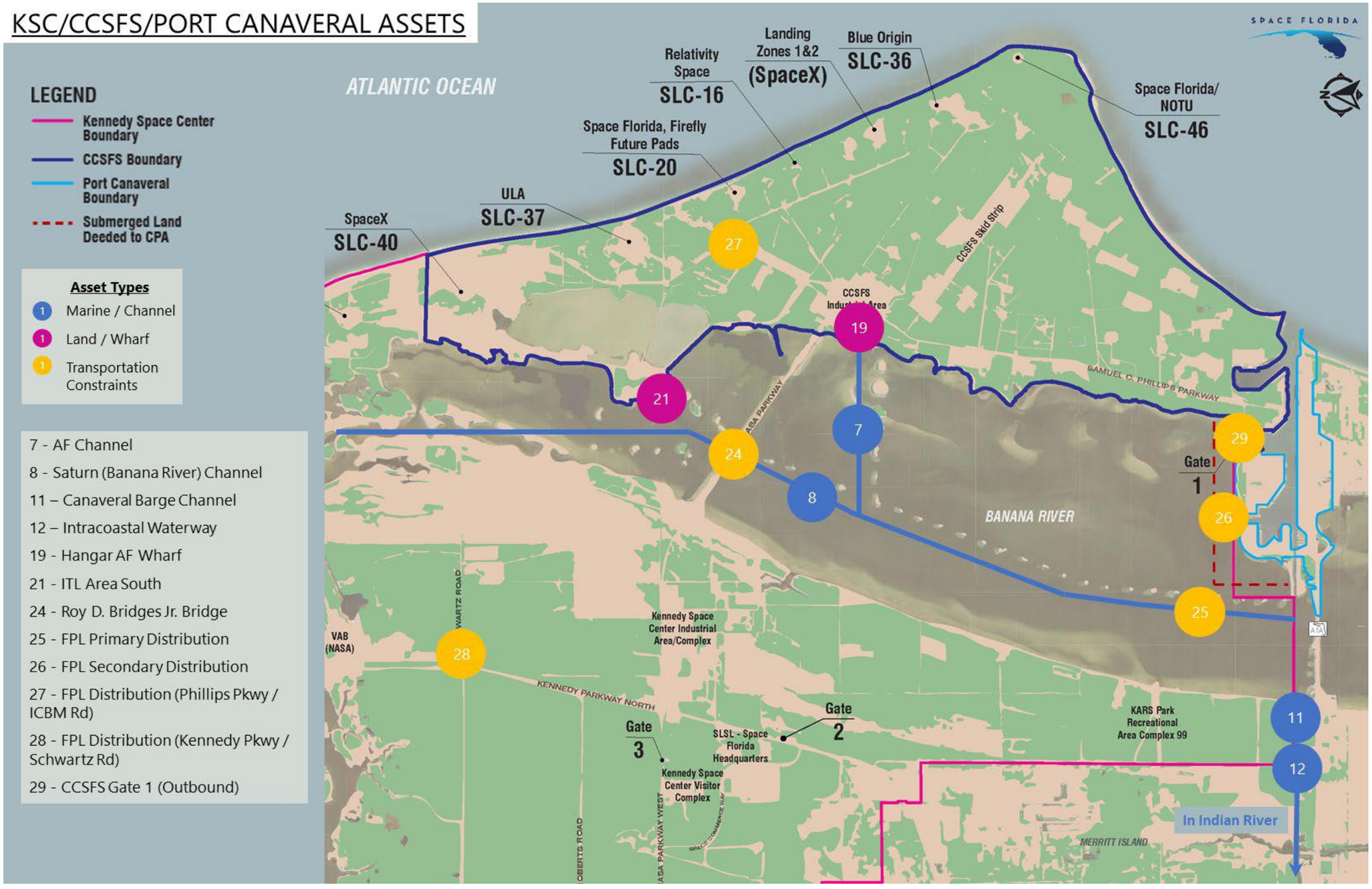


FIGURE 5 – CAPE CANAVERAL SPACEPORT (KSC AND CCSFS) AND IMMEDIATE VICINITY ASSETS



TRANSPORTATION CONSTRAINTS

Navigational Channels

The Marine/Channel (Assets 2 through 6) within and between the West, Middle and East Turning Basins and the Atlantic Ocean can accommodate the length, width, and depth/draft of all existing LSP vessels. Within the Middle Turning Basin, the Air Force/Army Wharf (Military Only) and Rocketship Wharf (Delta Mariner Wharf) can only accommodate vessels with drafts of less than 16 feet.

The Canaveral Barge Channel (Asset 11) between the West Turning Basin and Banana River, including the portion under the SR 401 Bascule Bridges and through the Canaveral Locks, cannot accommodate marine vessels larger than 600 feet long, 90 feet wide, and with a 12-foot draft.

The Saturn Channel/Banana River Channel, AF Channel, and VAB/LC 39A Turn Basin (Assets 7 through 9) cannot accommodate marine vessels larger than 600 feet long, 90 feet wide, and with a 12-foot draft.

Canaveral Locks

The Canaveral Locks (Asset 1) are owned, operated, and maintained by USACE. The Canaveral Locks restrict access for all marine vessels larger than 600 feet long, 90 feet wide, and with a 12-foot draft. When the locks are closed, access to the Banana River or Atlantic Ocean is either though Sebastian Inlet to the south or Ponce Inlet to the north. They are the largest navigation locks in Florida and were constructed in 1965. The lock reduces tidal-current velocities in Canaveral Harbor, prevents entry of hurricane tides into the Banana River, and prevents saltwater intrusion.

SR 401 Bridges

There are three (3) sets of SR 401 Bascule Bridges (Asset 22) with a horizontal clearance of 90 feet that allow marine vessels into the Banana River. An ongoing FDOT Project Development and Environment (PD&E) Study recommends a fixed span concrete bridge with a 90-foot horizontal clearance and a 65-foot vertical clearance to replace the existing SR 401 bascule bridges.

Overhead Powerlines

There are four (4) runs of Florida Power and Light (FPL) overhead powerlines (Transportation Constraint Assets 25 through 28) within the project area which all provide a minimum of 65 feet of clearance. There are two (2) runs that cross the marine channels:

- FPL Primary Distribution Lines (85 feet of vertical clearance) within in Saturn Channel/Banana River north of SR 401
- FPL Secondary Distribution Lines west of SR 401 Bridges and Northern/Southern Right of Way
- There are two (2) runs that cross roadway which are inside KSC and CCSFS:
- FPL Distribution Lines at Phillips Parkway/ICBM Road
- FPL Distribution Lines at Kennedy Parkway/Schwartz Road

Roadway Restrictions

All LSPs indicated they plan to transport the flight ware once offloaded and processed at the wharf horizontally using a traditional transporter and a convoy of security/police personnel from the West or Middle Turning Basins back to their processing and launch facilities located within KSC or CCSFS. This is similar to how rocket infrastructure is transported within CCSFS and KSC properties. There are no current or planned future ground transports of recovered stages anticipated west of the Grouper Road and SR 401 intersection. There is an overpass bridge just north of the SR 401 Bascule Bridges (Transportation Constraint Asset 23).

All transporters carrying LSP flight ware that is offloaded within the three basins access SR 401 via either Grouper Road, Payne Way, or Poseidon Avenue to enter CCSFS via Gate 1. The preferred path for LSPs is SR 401 onto Phillips Parkway through the outbound side of CCSFS Gate 1 to Saturn Causeway to Kennedy Parkway. The roadway width and lateral clearances are adequate for LSP transporters and flight ware widths.

There are no overhead obstructions besides traffic signals over SR 401 or Phillips Parkway between Grouper Road back to the LSP processing/operations facilities within KSC and CCSFS. The traffic signals at the intersection of SR 401 and Grouper Road, and SR 401/Phillips Parkway and Poseidon Avenue have been reconfigured to allow large transporters to maneuver through them.

NASA KSC, and CCSFS require LSPs to procure an oversize transport permit. NASA Protective Services and CCSFS Security escort all transporters within their respective properties. Most transport operations occur outside rush hour traffic times or busy times which are typically 7 a.m. to 9 a.m. and 3 p.m. to 6 p.m.

EXPLOSIVE SITE QUANTITY DISTANCE (ESQD) RESTRICTIONS

All launch pads, ammunition storage facilities, and military vessels have Explosive Site Quantity Distance (ESQD or QD) arcs setbacks. ESQD arcs are established zones associated with operations and activities that guide siting and design of facilities to provide the maximum possible protection to people and property from the potential damaging effects of explosives. These required separation distances are determined by the types and quantities of explosive materials in facilities or marine vessels that store, process, utilize, or test materials. ESQD arcs are also present during the transport of vessels along marine channels and roads to their final destination facility.

No permanently occupied facilities are located within the Inhabited Building Distance (IBD) ESQD arc. Public roads should not be within the Public Transportation Route (PTR) ESQD arc. All non-associated facilities are designed to be located outside of the ESQD arcs. There are also significant restrictions regarding facilities that must be within each ESQD arc, and these restrictions are a significant constraint when planning new facilities. There are several ESQD arcs active concurrently within the Middle and East Turning Basins which cause significant disruption in operations, including disrupting access to specific facilities.

The explosives site plan for the AF/Army Wharf within the Middle Turning Basin was coordinated between Space Launch Delta 45 (SLD45) Range Safety and CPA. CPA signed a Risk Assumption Memorandum with the full understanding that the Compensatory Measures would be enforced during explosives operations. SLD45 oversees all explosives operations at the AF/Army Wharf/Pier and they enforce these measures, which are also included in an Explosives Operational Safety Plan (OSP).

APPENDIX C – STAKEHOLDER COORDINATION

With the wide array of interests and entities involved in the Wharf Study, achieving consensus is vital to determining a recommended concept for more detailed study. We have identified over 25 stakeholders for this Study. Stakeholder coordination commenced with the kickoff meeting held on February 16, 2023, and is continuing on an almost daily basis between the Space Florida Team and project stakeholders. Numerous meetings, field visits, and workshops were held to understand landowner concerns, current operations, future near- and long-term needs of the commercial space industry, and constraints within the project area.

In addition to meetings and workshops, two questionnaires were developed (an initial and a follow-up, see Appendix J) to send to each LSP to determine specific near- and long-term needs and operations. The individual LSP meeting notes and questionnaire responses contain proprietary information and are only for use by Space Florida.

The following lists individual meetings held as of December 27, 2023, with project stakeholders:

- Project Kickoff Workshop (all stakeholders) – 2/16/23
- Project 60% Workshop (all stakeholders) – 8/15/23
- Project Final Workshop (all stakeholders) – 1/10/24
- Florida Senator Debbie Mayfield (includes FDOT and CPA) – 7/11/23, 11/1/23 (Space Florida only)
- SpaceX – 3/30/23
- The Spaceport Company – 3/24/23, 4/6/23, 10/2/23
- Relativity Space – 3/31/23
- Blue Origin – 4/14/23, 9/27/23
- United Launch Alliance (ULA) – 4/20/23, 10/3/23
- USSF – 4/20/23, 5/4/23, 9/6/23, 11/8/23, 12/18/23
- CPA – 5/11/23, 8/11/23, 9/20/23, 10/2/23, 12/7/23
- NASA – 5/11/23, 8/29/23, 10/11/23
- US Army Corps of Engineers (USACE) – 5/30/23
- US Army – 6/22/23, 9/21/23
- US Navy/Naval Ordnance Test Unit (NOTU) – 6/26/23, 7/11/23, 9/12/23, 2/7/24
- Florida Department of Environmental Protection (FDEP) – 10/2/23
- US Coast Guard (USCG) – 10/11/23
- US Maritime Administration (MARAD) – 12/7/23
- Florida Department of Transportation (FDOT) – Ongoing coordination

Several other stakeholders to be interviewed as the project moves forward include the following:

- Space Coast Regional Air and Spaceport
- Atlantic Intracoastal Waterway Administration (AIWA)
- Florida Inland Navigation District (FIND)
- Space Coast Transportation Planning Organization (TPO)
- Brevard County
- Indian River Lagoon Council
- St. John's River Water Management District (SJRWMD)
- Utility Agency/Owners (UAOs)

LANDOWNERS/LEASEHOLDERS

The landowners within the existing turning basins and Banana River area include the following entities:

- USSF CCSFS
- Canaveral Port Authority (CPA)
- NASA KSC
- U.S. Army Corps of Engineers

The key government entity leaseholders within the existing turning basins include the following entities:

- U.S. Navy – NOTU
- U.S. Army – Military Surface Deployment and Distribution Command

Kickoff Meeting 2/16/23

LAUNCH SERVICE PROVIDERS

The target LSPs for this Study are limited to those who are commercially conducting or are planning on conducting operations for maritime retrievals or recovering the rocket stages at sea. The LSPs interviewed via questionnaires/ conference calls, and/or engaged through collaboration via workshops include:

- Space Exploration Technologies Corporation (SpaceX)
- Blue Origin
- United Launch Alliance (ULA)
- Relativity Space
- The Spaceport Company
- Space Perspective
- ABL Space Systems
- Vaya Space
- Phantom Space
- Stoke Space
- Astra

The bullet points below summarize general issues, perspectives, and concerns of the LSPs obtained via meetings and/or emailed questionnaires. All specific information related to each LSP's operations is considered proprietary and for use only by Space Florida.

- LSPs conducting marine vessel recovery operations to increase from one (1) LSP to six (6) in three (3) years. LSP launch operations are increasing; hence, recovery operations and vessel cadence will increase.
- Dock lengths requested by each LSP ranged between 650 and 1,400 linear feet.
- The current/anticipated recovery operations marine vessel lengths are 150-350 feet, widths are 100-150 feet, and drafts are 12-29 feet. The heights vary between 80-150 feet. These parameter marine vessels will not fit through the Canaveral Locks, Saturn Channel/Banana River Channel, or the channel west of the SR 401 Bascule Bridges.
- 12 hours to 96 hours – the turnaround time or "turn-time" from mooring to casting off, not accounting for inclement weather or unforeseen issues. Approximately 6 hours to 48 hours is the offload time to remove recovery rocket boosters from marine vessels onto dock.
- 48 hours to 72 hours – the booster service time on the dock after offloading, or the time before it can be put on a transporter to remove it from the Port.
- Offshore mooring may be a reasonable near-term solution.
- Need dedicated wharf space due to uncertainty of post-launch retrieval damage to marine vessels.
- Possibility of turning vertically recovered booster into horizontal position at sea has not been explored.
- No opportunity to share maintenance facility or office space due to proprietary equipment and information.
- Onsite maintenance and repair of marine vessels after retrieval could last from 2-15 days due to launch damage.
- Requested on-site storage, maintenance, and office space.
- Homeporting ability and safe harboring would be preferred.
- Cannot operate like an airport and use common use resources because launch vehicles/recovery operations are not standardized.
- No plans to move passengers from maritime vessels to shore facilities.

TECHNICAL WORKSHOP 7/11/23

APPENDIX D – DEMAND FORECAST

LANDOWNER PERSPECTIVE

The study will not account for U.S. Army, USSF, NOTU, military, and other DoD missions that occur at the Middle and East Turning Basins. The current commercial space transportation maritime operations include the berthing of seafaring vessels, RoRo or transloading of flight hardware to/from land-based transporters and limited hazardous operations.

CPA's primary mission is to service the cruise and cargo industry from the West Turning Basin, portions of the Middle Turning Basin, and the South Cargo Area. The CPA Harbormaster directs LSP vessels between North and South Cargo Berths and controls traffic within the main channel, very similar to air traffic controllers at an airport. The hazardous activities within CPA-managed areas are limited to removal of fuel/propellants remaining on recovered rocket boosters.

USSF/NOTU has supported RoRo operations within the Middle and East Turning Basins associated with rocket motors and rocket stage deliveries. They support LSP crewed capsule recovery operations within the Middle and East Turning Basins and at Hangar AF Wharf. NASA, DoD and USSF missions conducted by LSPs can be supported at Poseidon Wharf and Trident Wharf but are restricted to RoRo-type operations only.

NASA has limited operations within the West, Middle and East Turning Basins. NASA utilizes the Main Channel, Canaveral Locks and Saturn Channel (Banana River Channel) to traverse their mission-critical infrastructure via vessels to/from VAB Wharf.

During a hurricane or major storm, all marine vessels must evacuate the West and Middle Turning Basins. This is a USCG requirement. USCG and CPA require each maritime company operating within the Basins to have an approved Hurricane Plan submitted by June 1 of each year. Vessels may not evacuate to the East Turning Basin during a hurricane or major storm.

LSP MARITIME OPERATIONS

There are four (4) commercial LSPs that conduct maritime operations within the West and Middle Turning Basins, and Hangar AF Wharf. LSP maritime operations consist of recovery, RoRo, and launch-at-sea operations. Recovery operations consist of retrieving launched components at sea which can consist of capsules for manned space flight, booster stages, and fairings. RoRo operations are similar to cargo deliveries and consist of delivery of new rocket stages and other rocket flight ware. One (1) LSP has recently conducted a vertical launch at sea from the Atlantic Ocean using marine vessels.

As of August 2023, there is only one (1) LSP that is conducting active launch capsule and booster recovery operations. All booster recovery operations currently occur at CPA's NCB 6 where there are support infrastructure pedestals installed for the offload operations. All booster recovery operations land on drone ships vertically and are 50-150 feet high and which must be transported vertically. The LSP cannot retrieve boosters horizontally or turn them to lay horizontally at sea. Refer to the YouTube links below for additional information, which were created by NASA Spaceflight (NSF, no affiliation with NASA):

- NSF Booster Recovery 1/1/2021
- NSF Booster Recovery 11/24/2022

All RoRo operations occur at Rocketship Wharf (Delta Mariner Wharf), Hangar AF Wharf, and VAB Wharf. The capsule recovery operations can occur within the Middle and East Turning Basins and Hangar AF Wharf depending on the nature/sponsorship of the mission (i.e., NASA, commercial, or military).

VESSEL PARAMETERS

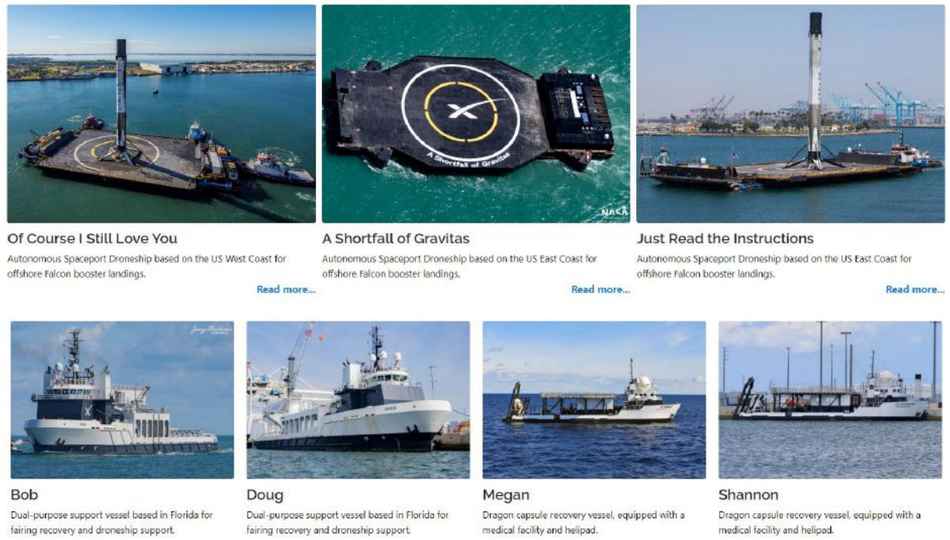
All LSPs plan to utilize offshore supply vessels and support vessels consisting of autonomous drone ships, marine vessels, and smaller boats for recovery or retrieval operations of fairings, capsules, and boosters. The summary from LSPs' questionnaire responses of existing or proposed marine vessel lengths, widths, drafts, and dock/wharf lengths needed is provided in Table 4.

TABLE 4 – OFFSHORE SUPPLY VESSEL AND SUPPORT VESSEL PARAMETERS

LSP	Length Min. (ft.)	Length Max. (ft.)	Width Min. (ft.)	Width Max. (ft.)	Draft Min. (ft.)	Draft Max. (ft.)	Dock Space Min. (LF)	Dock Space Max. (LF)
A	300	300	170	170	25	25	700	1,400
B	350	350	100	150	26	29	650	650
C	280	300	80	100	12	16	900	900
D	340	340	73	73	11	24.5	340	340
E	150	150	75	150	12	20	150	200
Total Min./Max.	**150**	**350**	**73**	**170**	**11**	**29**	**2,740**	**3,490**

There are several marine vessels listed above that currently conduct RoRo operations within the Middle and West Turning Basins. Most of the marine vessels associated with fairings and booster recovery will not be able to navigate between the West Turning Basin and the Banana River due to the restrictions of the Channel depths, Canaveral Locks, and SR 401 Bascule Bridges. There is one LSP conducting capsule recovery operations and their support marine vessels can navigate into the Banana River from the Main Channel to offload at Hangar AF Wharf. Figures 6 and 7 illustrate marine vessels that are used by the commercial space industry.

FIGURE 6 – EXAMPLE MARINE VESSEL TYPES



(Source: https://space-offshore.com/)

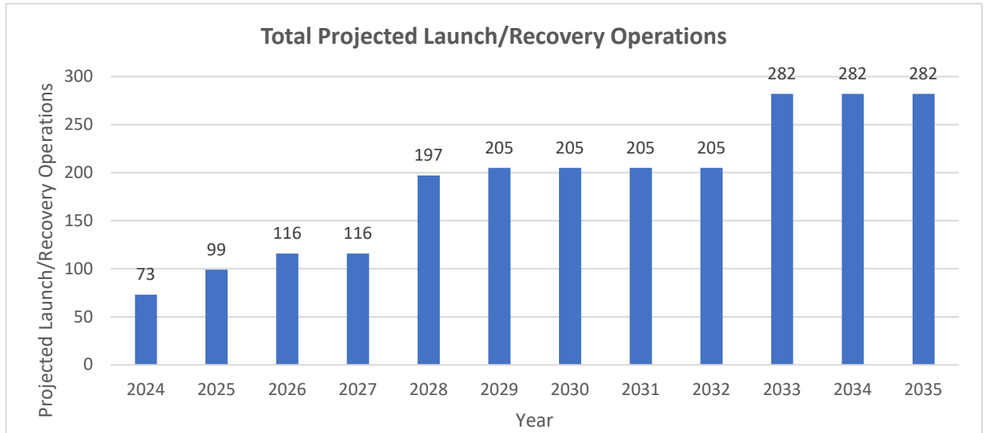
FIGURE 7 – FREEDOM STAR TOWING THE NASA PEGASUS BARGE

(Source: Cory Huston/NASA)

OPERATIONAL DEMAND

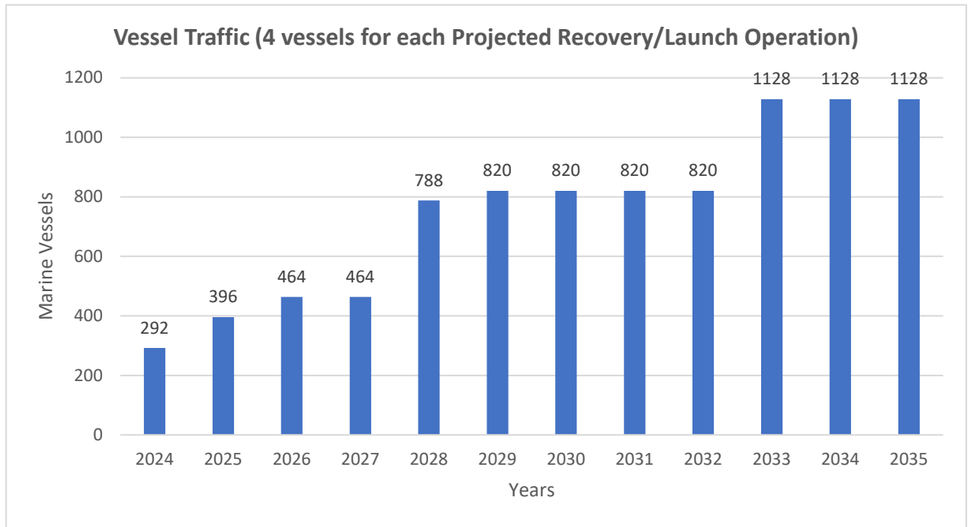
The LSPs' combined projected retrieval cadence for recovery operations through 2035 is presented in Figure 8. This includes projections from all interviewed LSPs and should be considered preliminary and subject to change; however, LSPs did inform us they are using similar data in their respective business plans. If current trends continue and the Eastern Range can support the launch cadence and the US Coast Guard (USCG) can continue to provide timely inspections of returning retrieval vessels, there could be as many as 600 marine retrievals per year by 2045. To determine the future cadence, the 10-year projected demands provided by LSPs were increased at a 4% compound annual growth rate (CAGR) through 2073 (shown in Table 6). The estimates were based on a conservative case that all retrieval vessels (for boosters, fairings, capsules, or other hardware) required a vessel length of 350 feet, which would provide an absolute maximum berth length for planning purposes. However, if the future launch cadence cannot be achieved or recovery vessel size can be reduced, the required berth length will decrease. Due to lack of data on the industry, the forecasts provided in the study are only for planning purposes. For any financing decision, an independent assessment should be performed.

FIGURE 8 – PROJECTED COMBINED RECOVERY OPERATIONS CADENCE



The anticipated marine vessel traffic associated with each recovery operation is assumed to be approximately four (4) vessels. The vessel traffic projections are shown in Figure 9.

FIGURE 9 – PROJECTED VESSEL TRAFFIC



Projected Launch/Recovery Operations Cadence vs. Vertical Launch Comparison

The total projected launch/recovery operations cadence cannot be compared one-to-one with an actual vertical launch as they do not directly correlate to actual launches. For example, a SpaceX Falcon 9 vertical launch could generate three (3) recovery operations: a booster, fairings, and a capsule. The booster and fairings recovery could be performed simultaneously; however, the capsule would be recovered at a different time. The total projected launch/recovery operations cadence also includes sea-based launches from sea via a launch pad on a marine vessel used as a platform and RoRo operations.

From the Eastern Range (KSC and CCSFS), the following total number of annual launches occurred: 57 (2022), 31 (2021), 30 (2020), and 15 (2019). The projected 1,152 recovery operations in 2073 (Table 6) could result in 200 to 500 vertical launches per year from land and/or sea. With the advent of Automated Flight Safety Systems (AFSS) required by 2025, USSF expects to be able to increase launch tempo beyond what is currently attainable.

Recovery Operations Turnaround Time

Several factors impact the turnaround time needed from offloading to vacating the wharf facilities to go back out to sea for additional recovery operations. Some key factors include:

- Weather – winds must be below 20 miles per hour and there can be no rain or lightning in the forecast for offloading operations to commence.
- USCG inspections of vessels and approval.
- Vessel damage assessment and vessel repairs.
- Support crew and contractor availability for maintenance.

The LSPs indicated that total offloading turnaround time, which includes refitting/servicing the marine vessels prior to the next mission, would be less than 72 hours. Some of the LSPs provided a best-case scenario of 12 to 48 hours and a worst-case scenario of up to two weeks required mooring time for maintenance and repair should a drone ship/marine vessel sustain damage during a retrieval.

TRANSLOAD SUPPORT FACILITIES

The LSPs all desire a landside area near the wharf to conduct company proprietary post-launch recovery operations processing. The LSPs are open to utilizing a common-use facility which can provide cranes, office space, and storage space for equipment. Due to the proprietary nature of operations, most LSPs recommended 5 to 15 acres.

Berth Capacity Analysis

Based on the projected demands, a preliminary capacity analysis was conducted to determine the required berth length to service the demand from 2024 through 2075. The 10-year projected demand provided by the LSPs was increased at a 4% CAGR through 2075.

Unit berth capacity (UBC) was calculated to determine the number of berths required in the future. Each unit berth was determined to be 435 LF in length to accommodate the design vessel of 350 LF as per stakeholders' input. Based on the calculations provided in Table 5, each unit berth provides the capacity to handle up to 68 vessels per year.

The UBC analysis accounted for maximum vessel class/linear feet of berth; work hours per vessel; unproductive times; workdays; and, practical peak week berth utilization. The design berth length used was 435 LF to allow for mooring line. The mooring lines are half the width of the vessel; the width of the vessel is 170 feet. Table 5 shows the input parameters for the UBC analysis.

TABLE 5 – UNIT BERTH CAPACITY ANALYSIS DESCRIPTIONS AND PARAMETERS

Description	Parameter
Number of Recovery Boosters per Vessel Call	1
Dock Cranes Assigned per Vessel	1
Work Hours per Vessel Call	72
Unproductive Time at Berth (Hours)	3
Total Vessel Time at Berth (Hours)	75
Calendar Hours per Week	168
Vessel Calls per Week at 100% Berth Utilization	2.24
Maximum Practical Peak Week Berth Utilization	65%
Maximum Practical Vessel Calls per Week	1.46
Peak/Mean Week Season Demand Factor	1.10
Mean Week Throughput Capacity (Moves)	1.32
Weeks per Year	52
Annual Berth Capacity (Number of Vessels/Year/Berth)	**68.83**
Typical Maximum Vessel Class LOA (LF)	350
Allowance for Mooring Lines (Half of Vessel Beam) (LF)	85
Total Berth Length Required to Accommodate Maximum Vessel Class (LF)	435

Table 6 shows a series of analyses indicating the projected demand and the minimum and preferred number of berths required. The minimum number of berths assumes that all LSPs can share the available berths, whereas the preferred number of berths calculation assumes that each LSP will require their own dedicated berth, regardless of how full or utilized they are.

TABLE 6 – ANALYSIS OF PROJECTED RECOVERY OPERATIONS AND MINIMUM AND PREFERRED NUMBER OF BERTHS NEEDED

Projected Recovery/Launch Operations per Year											
LSP/Year	**2024**	**2028**	**2033**	**2038**	**2043**	**2048**	**2053**	**2058**	**2063**	**2068**	**2073**
LSP A	73	104	104	117	142	173	211	256	312	379	462
LSP B	0	24	24	27	33	40	49	59	72	88	107
LSP C	0	52	52	58	71	87	105	128	156	190	231
LSP D	0	25	50	56	68	83	101	123	150	182	222
LSP E	0	12	52	58	71	87	105	128	156	190	231
Total	**73**	**197**	**282**	**317**	**386**	**470**	**571**	**695**	**846**	**1,029**	**1,252**
Shared Number of Berths Required to Meet Demand and Berth Linear Feet											
LSP/Year	**2024**	**2028**	**2033**	**2038**	**2043**	**2048**	**2053**	**2058**	**2063**	**2068**	**2073**
LSP A	1.06	1.51	1.51	1.70	2.07	2.52	3.06	3.72	4.53	5.51	6.71
LSP B	-	0.06	0.35	0.39	0.48	0.58	0.71	0.86	1.05	1.27	1.55
LSP C	-	0.76	0.76	0.85	1.03	1.26	1.53	1.86	2.27	2.76	3.35
LSP D	-	0.36	0.73	0.82	0.99	1.21	1.47	1.79	2.18	2.65	3.22
LSP E	-	0.17	0.76	0.85	1.03	1.26	1.53	1.86	2.27	2.76	3.35
Total	**1.06**	**2.86**	**4.10**	**4.61**	**5.61**	**6.82**	**8.30**	**10.10**	**12.29**	**14.95**	**18.19**
LF of Berth	**461**	**1,245**	**1,782**	**2,005**	**2,439**	**2,968**	**3,610**	**4,393**	**5,344**	**6,502**	**7,911**
Dedicated Number of Berths Required to Meet Demand and Berth Linear Feet											
LSP/Year	**2024**	**2028**	**2033**	**2038**	**2043**	**2048**	**2053**	**2058**	**2063**	**2068**	**2073**
LSP A	2	2	2	2	3	3	4	4	5	6	7
LSP B	-	1	1	1	1	1	1	1	2	2	2
LSP C	-	1	1	1	2	2	2	2	3	3	4
LSP D	-	1	1	1	1	2	2	2	3	3	4
LSP E	-	1	1	1	2	2	2	2	3	3	4
Total	**2**	**6**	**6**	**6**	**9**	**10**	**11**	**11**	**16**	**17**	**21**
LF of Berth	**870**	**2,610**	**2,610**	**2,610**	**3,915**	**4,350**	**4,785**	**4,785**	**6,960**	**7,395**	**9,135**

Docking/Mooring Capacity Analysis

No parking of marine vessels are allowed within CPA limits for extended amounts of time. For short durations, the LSPs and CPA collaborate and coordinate with the Harbormaster to move/relocate boats and marine vessels to unused docks/wharves. Space is limited in Port Canaveral and with increased cruise and cargo operations CPA and the LSPs are challenged to find alternate locations to park.

Based on the projected demand, a preliminary capacity analysis was conducted to determine docking/mooring space needed from 2024 to 2075. This would provide the homeporting option, which the LSPs prefer. It was assumed 3 to 4 vessels needing 450 linear feet would be required for docking/mooring against a wharf. Table 7 shows the minimum and maximum number of berth spaces that would be required for docking/mooring. The minimum analysis assumes 50% and maximum analysis assumes 100% of the support marine vessels would be docked at the berth.

TABLE 7 – MINIMUM AND MAXIMUM LF OF BERTH SPACE REQUIRED FOR DOCKING/MOORING

Support Vessels Docking/Mooring (Minimum at 50% Utilization)											
LSP/Year	**2024**	**2028**	**2033**	**2038**	**2043**	**2048**	**2053**	**2058**	**2063**	**2068**	**2073**
LSP A	239	340	340	382	465	566	689	838	1,019	1,240	1,509
LSP B	-	13	78	88	107	131	159	193	235	286	348
LSP C	-	170	170	191	233	283	344	419	510	620	755
LSP D	-	82	163	184	224	272	331	403	490	596	726
LSP E	-	39	170	191	233	283	344	419	510	620	755
Total	**239**	**644**	**922**	**1,037**	**1,262**	**1,535**	**1,867**	**2,272**	**2,764**	**3,363**	**4,092**
Support Vessels Docking/Mooring (Maximum at 100% Utilization)											
LSP/Year	**2024**	**2028**	**2033**	**2038**	**2043**	**2048**	**2053**	**2058**	**2063**	**2068**	**2073**
LSP A	900	900	900	900	1,350	1,350	1,800	1,800	2,250	2,700	3,150
LSP B	-	450	450	450	450	450	450	450	900	900	900
LSP C	-	450	450	450	900	900	900	900	1,350	1,350	1,800
LSP D	-	450	450	450	450	900	900	900	1,350	1,350	1,800
LSP E	-	450	450	450	900	900	900	900	1,350	1,350	1,800
Total	**900**	**2,700**	**2,700**	**2,700**	**4,050**	**4,500**	**4,950**	**4,950**	**7,200**	**7,650**	**9,450**

Note: Both analyses assume 450 LF per berth (250 LF support vessel + 2 tugs of 90 LF each per berth).

As launch cadences increase, it can be expected that support vessels will not have much downtime between missions, and therefore will not require mooring berth space for extended periods of time. Additionally, different size retrieval vessels (boosters, fairings, capsules, etc.) will need varying levels of support to navigate the port. In addition to accommodating transloading of rocket components, the alternatives analysis will include options for mooring of support vessels. As is common in the commercial space launch industry, changing technology can rapidly render older paradigms obsolete. For instance, should sea launches become a standard method, recovery cadence could increase sooner than expected. Alternatively, if a launch ceiling is reached due to the limitations of USSF to support multiple launches per day or if the USCG is unable to provide additional certifications/inspections, the increased recovery cadence may be delayed. However, regardless of the overall timeline, launch and recovery cadence is increasing and will soon outgrow the current capacity to accommodate booster recovery in the West Turning Basin and planning, permitting and design of a new or improved existing facility should begin within the next few years.

APPENDIX E – ALTERNATIVES ANALYSIS

Based on input received from stakeholders to date, along with completion of a thorough asset inventory, numerous sites within six (6) zones were advanced into the alternatives analysis process. These zones and sites are presented in Figure 10.

Each zone is evaluated using 11 criteria and ranked as part of a comparative analysis, with those zones that are fatally flawed being removed from further consideration. Items taken into consideration as part of the alternatives analysis include the following:

Developability – Ability to accommodate near- and long-term concepts.
Operability – Ability to maintain efficient transload operations.
Environmental Risk Factors – NEPA, mitigation strategies, potential impacts to natural systems, and permitting.
Land Market Value – Development value.
LSP Forecasts – Ability to adjust to changes in future projections.
Opportunity for future expansion.

After additional coordination with project stakeholders, the remaining alternatives will be reviewed and a recommended alternative can move into concept development.

AREAS OF ANALYSIS

There are six analyzed areas, or zones, in which potential wharf locations were studied. These zones are located in the following areas, which are illustrated in Figure 10:

West Turning Basin
Middle Turning Basin
East Turning Basin
Banana River/West of SR 401
North Turning Basin (Proposed)
Atlantic Ocean (Proposed)

A fatal flaw analysis was conducted as a part of the broader alternatives analysis. Zones with fatal flaws identified – as well as the sites within these zones – were removed from further consideration as part of the Study.

FIGURE 10 – ALTERNATIVES ANALYSIS ZONES

WEST TURNING BASIN ZONE

The sites considered within this zone include:

- NCB 5
- NCB 6
- NCB 8

Proposed wharf Southeast of NCB 8
All other sites that are within the Basin are occupied and cannot be used for spaceport operations

NCBs 5 and 6 share an existing wharf and are dedicated container terminals at Port Canaveral. NCB 5 is a multi-purpose berth that is owned and managed by CPA. NCB 6 is leased by Gulftainer USA (GT USA). NCB 6 has two gantry cranes and two (2) mobile harbor cranes. One of the mobile harbor cranes is the property of CPA and is used by various Port users, including LSPs, via fee-based agreements. The other mobile harbor crane is owned by LSP. NCB 6 currently services two (2) LSPs for booster recovery operations, with a pedestal mounted landside and specialty mobile cranes to move the booster from the drone ships to the pedestal or laydown areas.

NCB 8 Marine Vessels

NCBs 5 and 6 Marine Vessels and Cranes

NCB 8 is an existing wharf intended to accommodate heavy and oversized cargo, along with commercial spaceport operations. Port Canaveral's *2047 Strategic Master Plan Vision* identified NCB 8 as "Spaceport." There are no cranes or recovery operations performed at this site, but there are 17 acres of undeveloped land behind the wharf that may be available for development to support booster recovery and maintenance. This site is currently used for docking of drone ships and supporting marine vessels and supporting RoRo operations.

The West Turning Basin Zone is projected to be able accommodate the immediate needs of the commercial space industry (0-5 years) but may be unable to serve an increased cadence of marine retrievals beyond that window.

An illustration of the West Turning Basin Zone is shown in Figure 11, and a summary of its benefits and limitations is provided in Table 8.

FIGURE 11 – WEST TURNING BASIN ZONE

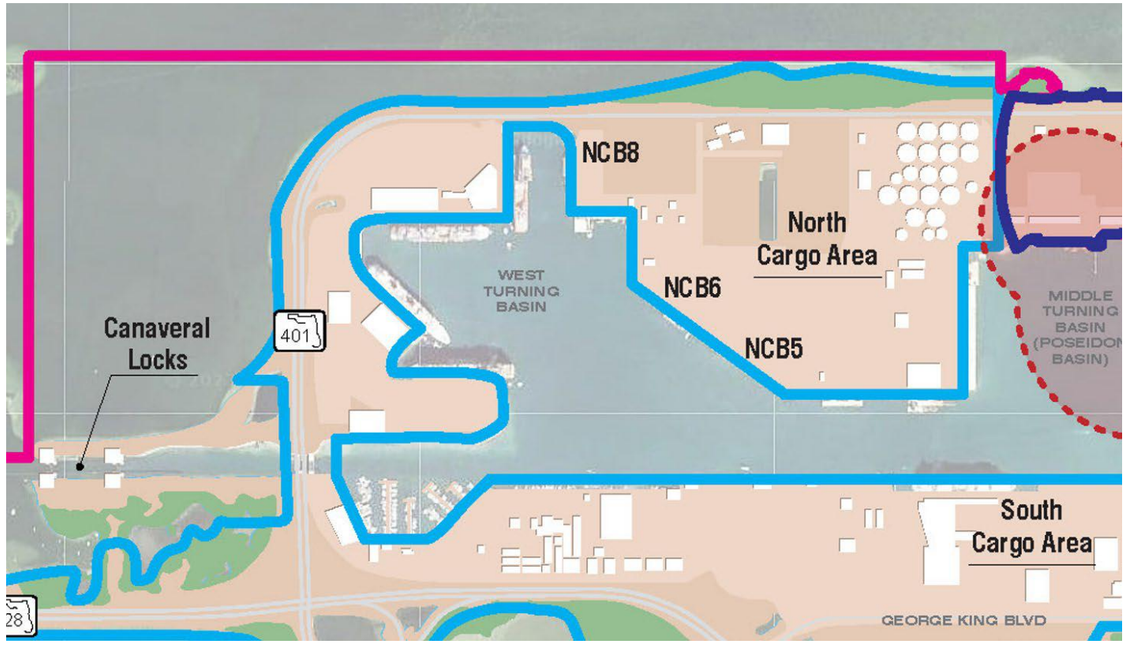


Table 8 – Benefits and Limitations of the West Turning Basin Zone

Benefits	Limitations
a. NCB 6 is used for existing booster recovery operations	a. Limited space
b. Subleases in place for NCB 6	b. Potential future congestion
c. NCB 8 identified as "Spaceport area" in CPA Master Plan and can only be used by LSPs for docking	c. No shipyard operations
d. Outside of ESQD arcs	d. No dedicated lease or long-term concession agreement
e. Access to SR 401/Phillips Parkway/CCSFS Gate 1	e. Long-term docking/mooring or homeporting not available
f. Proximity to utilities	f. Potential conflict with future CPA plans as primary cargo/container terminal areas
g. Dredging not required	g. May not accommodate future projected cadence
h. Can accommodate immediate needs	h. Primary cargo/container terminals
i. Up to 2,800 LF of existing wharf (shared use)	i. CPA more profitable from cargo industry than spaceport operations
j. Can potentially meet near-term demand	j. Cannot meet long-term demand
	k. Not within CCSFS or KSC gated/secured area

MIDDLE TURNING BASIN ZONE

The sites considered within this zone include:

- AF/Army Wharf (Military Only)
- Rocketship/Delta Mariner Wharf
- Poseidon Wharf (Military Only)
- All CPA facilities on the west side of the Basin are occupied and cannot be used for spaceport operations
- Proposed wharf west of Army Wharf – two separate options
- Proposed wharf east of Rocketship/Delta Mariner Wharf (reconstruction and extension)
- Proposed wharf north of Poseidon Wharf (Military Only)
- Proposed reconstruction of AF/Army Wharf and Rocketship/Delta Mariner Wharf

An illustration of the Middle Turning Basin Zone and sites considered within this zone is shown in Figure 12, and a summary of its benefits and limitations is provided in Table 9.

The Middle Turning Basin Zone is projected to be able accommodate the near-term needs of the commercial space industry (5-10 years) in cooperation with the West Turning Basin Zone.

Depending on the options selected, there will be existing facilities and utilities infrastructure that would be impacted and would have to be relocated. These facilities include Commissary Transit Warehouse 01062 (14,135 square feet), Army Transit Warehouse 01063 (37,123 square feet), and Port Maintenance Building 01069 (6,571 square feet). Impacted utilities would include communications, power, water, and sewer infrastructure.

FIGURE 12 – MIDDLE TURNING BASIN ZONE

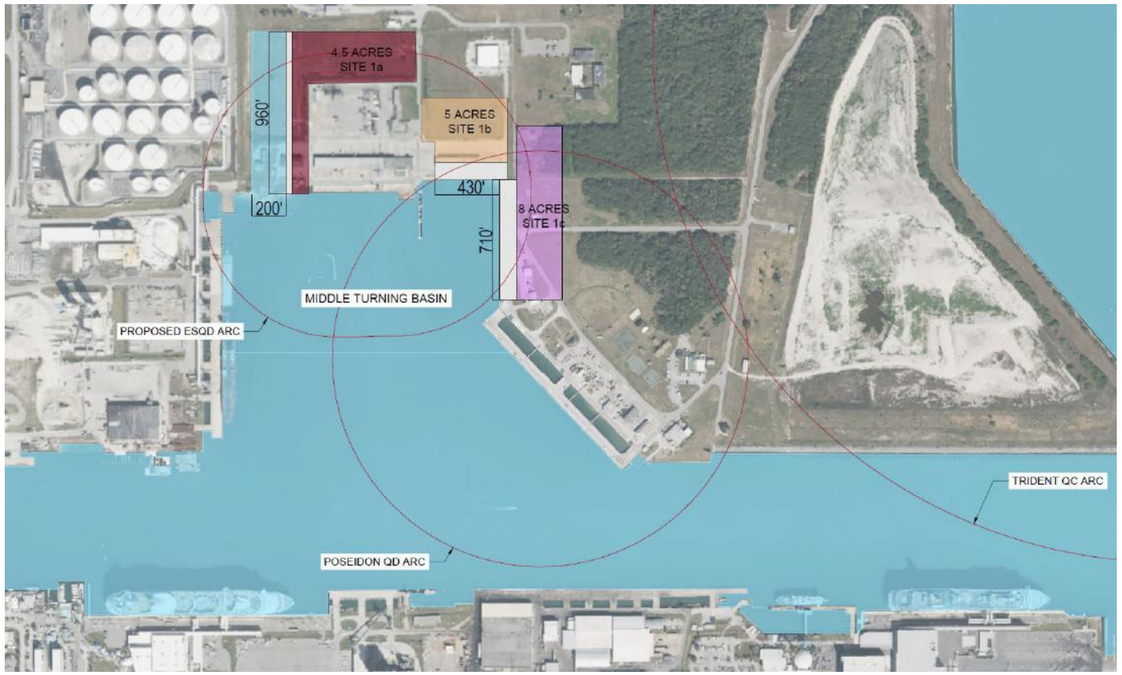


TABLE 9 – BENEFITS AND LIMITATIONS OF THE MIDDLE TURNING BASIN ZONE

Benefits	Limitations
a. Possible for landside development	a. Conflict with existing USSF Buildings
b. Can meet near-term demand if used in cooperation with West Turning Basin Zone	b. Potential conflict with future USSF plans
c. LSPs have used area for RoRo operations	c. May conflict with NOTU operations and utilities
d. Within CCSFS gated/secured area	d. Requires dredging
e. ESQD arc from US Army operations is small and is limited	e. Unimproved shoreline west of existing wharf
f. Potential to dock between loading operations	f. Limited wharf space available
g. Existing bulkhead (east of Army Wharf)	g. Within ESQD arcs
h. Access to SR 401/Phillips Parkway/CCSFS Gate 1	h. Environmental permitting
i. Proximity to utilities	i. Potential temporary relocation of tenants
j. Building west of Army Wharf has no use to occupy waterfront property	j. Cannot meet long-term demand

EAST TURNING BASIN ZONE

The sites considered within this zone include:

- Trident Wharf (Military Only)
- Proposed Western Wharf (to move Poseidon Wharf operations)

The East Turning Basin, or Trident Basin, is a high-security area serving the US Navy's submarine fleet. Due to the sensitive nature of military operations in this area, the restricted access, and the importance to national security, this site was eliminated from further consideration. The Trident Wharf is part of a nuclear exclusion zone, and when there are nuclear weapons present even civilian employees of the US Navy are restricted from accessing areas within the ESQD arcs. There are other NOTU missile and ammunition storage areas that further prevent any operations within the Basin.

An illustration of the East Turning Basin Zone is shown in Figure 13.

FIGURE 13 – EAST TURNING BASIN ZONE

BANANA RIVER/WEST OF SR 401 ZONE

The sites considered within this zone include:

- Proposed wharf extension, reconstruction, or new wharf near VAB Wharf, AF Hangar Wharf, ITL Area or adjacent to Banana River/CCSFS/KSC properties
- North and south of Canaveral Locks
- Banana River/Saturn Channel
- SR 401 Bascule Bridges
- Powerlines
- Proposed docking/mooring within Banana River southeast of Canaveral Locks or in between SR 401 Bridge and Canaveral Locks
- Proposed Atlantic Ocean to VAB Basin cut/channel south of LC-39A
- Proposed wharf/mooring between Canaveral Locks and SR 401 Bascule Bridges

All sites under consideration along the Banana River or west of SR 401 would be accessed via the Canaveral Locks between the West Turning Basin and the Banana River. As the Study progressed, and after stakeholder conversations, it became evident that there would be many challenges involved in moving retrieval vessels from the Atlantic Ocean into the Banana River. Table 10 provides an overall summary of the key technical, cost, and schedule challenges for alternative options west of SR 401. Due to the challenges involved in providing access to the Banana River for oversized vessels, alternatives within this zone were eliminated from further consideration. Please refer to Appendix K for more information on the fatal flaw analysis for the Banana River/West of SR 401 Zone.

An illustration of the sites considered in the Banana River/West of SR 401 Zone is shown in Figure 14, and a summary of their benefits and limitations is provided in Table 10.

FIGURE 14 – BANANA RIVER/WEST OF SR 401 ZONE

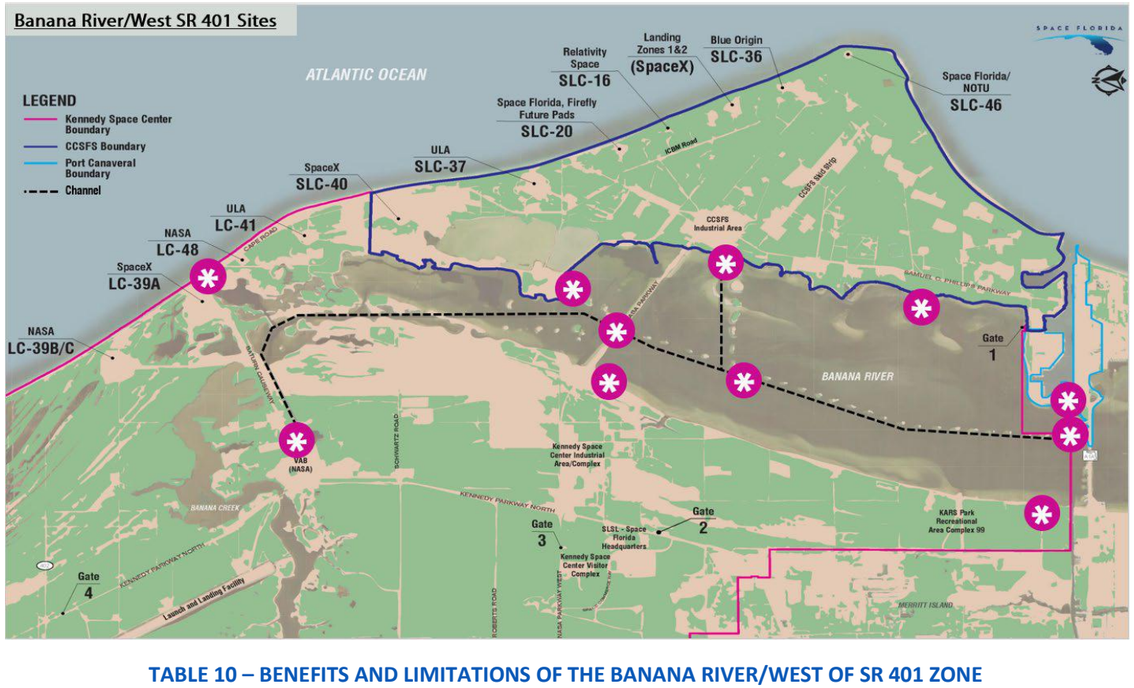


TABLE 10 – BENEFITS AND LIMITATIONS OF THE BANANA RIVER/WEST OF SR 401 ZONE

Benefits	Limitations
a. No conflict with existing port operations	a. Proposed maximum 65’ air draft at SR 401 bridge restricts vertical transport
b. Existing bulkhead in VAB Basin	b. High capital costs for dredging, SR 401 Bascule Bridges, Roy D. Bridges Bascule Bridge, and Canaveral Lock replacement to accommodate recovery vessels
c. Some support vessels can navigate locks	c. Requires disposal of dredge material
d. Outside of ESQD arcs	d. Analysis and feasibility studies required for Canaveral Locks replacement and dredging
e. Existing RoRo facilities at Hangar AF Wharf and VAB Basin	e. Would require multiple wharf sites to meet long-term demand
f. Access to CCSFS/KSC reduces roadway traffic associated with transporters	f. Lengthy feasibility and permitting process with USACE
g. Potential access to utilities	g. Cannot meet near-term demand due to permitting, design, and construction schedule
h. Within KSC or CCSFS gated/secured area	h. Lead agencies and ownership
	i. USACE owns/controls land north and south of lock

NORTH TURNING BASIN ZONE (PROPOSED)

The sites considered within this zone include two (2) options:

- North Turning Basin Zone Option 1 – Proposed new construction of a North Turning Basin north of the existing West Turning Basin
- North Turning Basin Zone Option 2 – Proposed new construction of a North Turning Basin north of the existing Middle Turning Basin

North Turning Basin Zone Option 1 – Proposed New Basin Construction North of West Turning Basin

The proposed North Turning Basin Option 1 is north of the West Turning Basin and could be an extension of Port Canaveral. A new channel would be cut between Cruise Terminal 18 and NCB 8, and SR 401 would be re-routed around the perimeter of the new basin. The area is within the KSC boundary on submerged lands deeded to CPA by NASA in the 1960s. Since this area is currently undeveloped, it offers the best chance to build a facility that could serve all future commercial space needs without conflicting with CPA or USSF operations.

A new facility in this zone would not be able to meet the near-term needs of the commercial space industry, due to the time required for permitting, design, and construction.

An illustration of the proposed North Turning Basin Option 1 is shown in Figure 15, and a summary of its benefits and limitations is provided in Table 11.

FIGURE 15 – PROPOSED NORTH TURNING BASIN ZONE OPTION 1

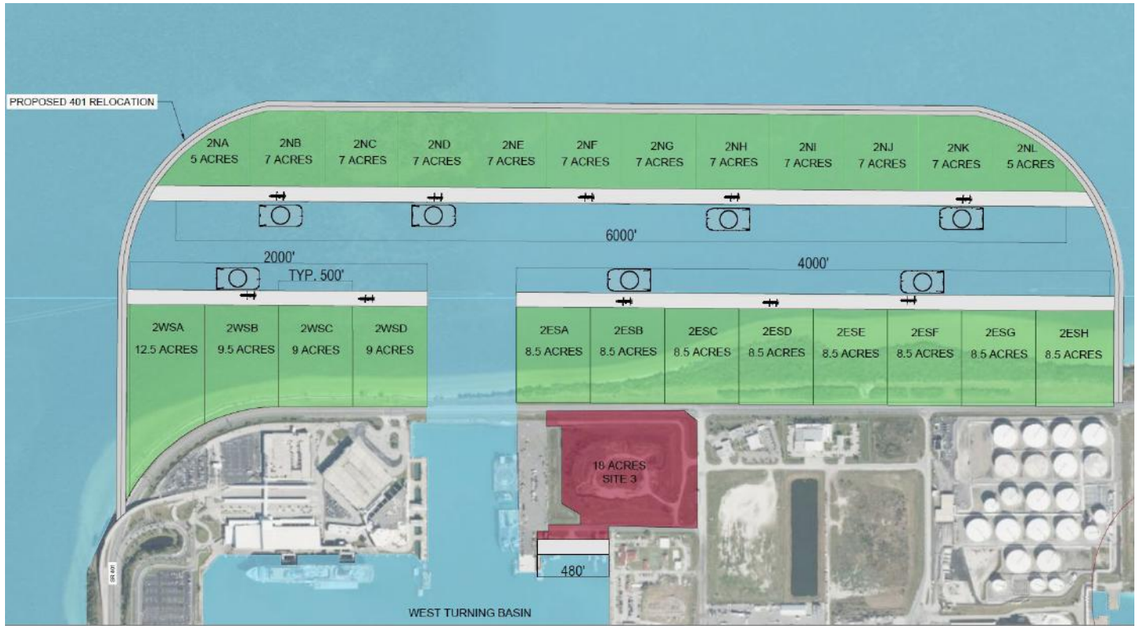


TABLE 11 – BENEFITS AND LIMITATIONS OF THE PROPOSED NORTH TURNING BASIN ZONE OPTION 1

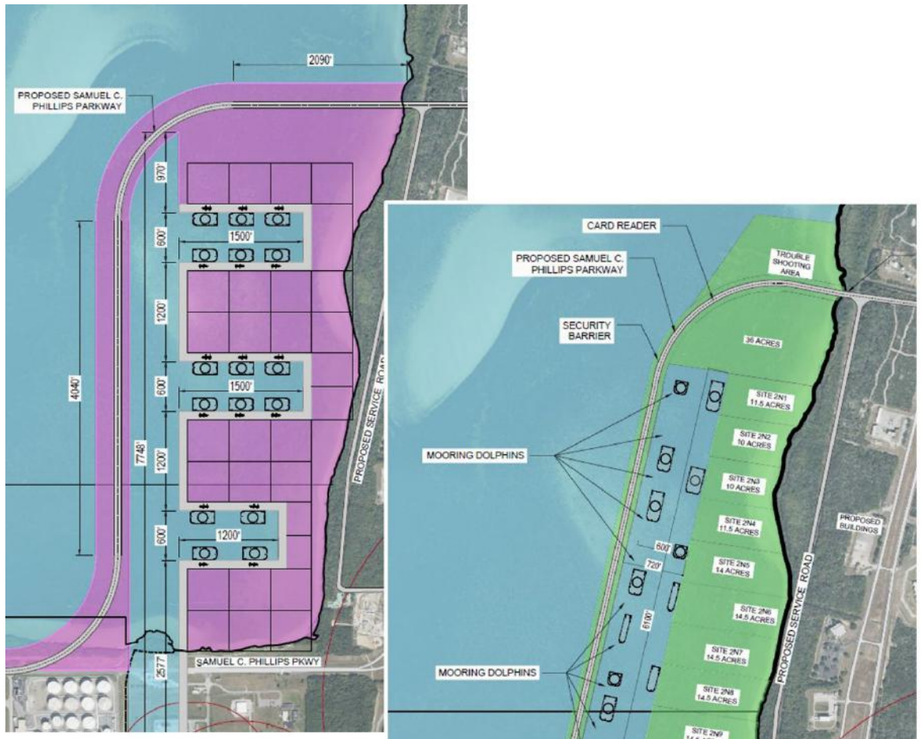
Benefits	Limitations
a. Access to SR 401 and CCSFS Gate 1	a. Requires dredging
b. Proximity to existing utilities	b. Requires relocation of SR 401
c. Landside development possible	c. NEPA/permitting
d. Long-term homeporting and docking possible	d. Large capital cost
e. Meets long-term demand	e. Property agreement/lead agency
f. Opportunity for permanent structures	f. Requires modification of overhead FPL transmission lines
g. Can support commercial space and port operations	g. Cannot meet near-term demand due to permitting, design, and construction schedule
h. Potential to support military operations	h. Impacts to Seaport Canaveral fuel lines
i. “Built to suit”	i. Not preferred by USCG as it would impact channel traffic
j. Not within ESQD arcs	
k. Opportunities to mitigate Banana River/Indian River Lagoon	
l. Additional development potential for CCSFS	
m. Ability to expand limits east/west/north	
n. Can be constructed in phases	

North Turning Basin Zone Option 2 – Proposed New Basin Construction North of Middle Turning Basin

The proposed North Turning Basin Zone Option 2 is north of the Middle Turning Basin and would be an extension of USSF and NASA port facilities. A new channel would be cut between CPA property and the Middle Turning Basin, and SR 401/Phillips Parkway would be re-routed. The area is within the KSC and USSF property boundary. Since this area is currently undeveloped, it offers the best chance to build a facility that could serve all future commercial space needs without conflicting with existing CPA or USSF operations. Discussions with USSF and NASA have not yet occurred and due to sensitivity and the chain-of-command approvals necessary for NASA/USSF, this option is subject to change.

A new facility in this zone would not be able to meet the near-term needs of the commercial space industry due to time required for permitting, design, and construction.

FIGURE 16 – PROPOSED NORTH TURNING BASIN ZONE OPTION 2



An illustration of the proposed North Turning Basin Zone Option 2 is shown in Figure 16, and a summary of its benefits and limitations is provided in Table 12.

Depending on the options selected, there will be existing facilities and utilities infrastructure that would be impacted and would have to be relocated. These facilities include Gate 1/Primary Access Gate, CCSFS Pass and ID Badging Office 1068 (3,518 square feet), Truck Inspection Facility 91923 (4,145 square feet), AF/Army Hangar Commissary Transit Warehouse 01062 (14,135 square feet), Army Transit Warehouse 01063 (37,123 square feet), and Port Maintenance Building 01069 (6,571 square feet). Impacted utilities would include communications, power, water, and sewer infrastructure.

TABLE 12 – BENEFITS AND LIMITATIONS OF THE PROPOSED NORTH TURNING BASIN ZONE OPTION 2

Benefits	Limitations
a. Access to Phillips Parkway	a. Requires relocation of SR 401/Phillips Parkway, Security and Admin Facilities and utilities infrastructure
b. Not within ESQD arcs and can open up southern portions of CCSFS for larger Navy or military operations	b. Requires reconstruction of Air Force/Army Wharf (Military Only) and support facilities.
c. Landside development possible	c. Requires reconstruction of facilities (non-port related) located west of Air Force/Army Wharf (Military Only)
d. Long-term homeporting and docking possible	d. Requires dredging
e. Meets long-term demand	e. Requires relocation of primary utilities currently within the right of way of Phillips Parkway
f. Opportunity for permanent structures	f. Large capital cost
g. Can support all commercial space operations	g. NEPA/permitting
h. Potential to support some military operations	h. Requires modification of primary overhead FPL transmission lines coming to CCSFS
i. "Built to suit"	i. Seismic activities interference due to proximity to testing sites
j. Proximity to utilities	j. Property agreement / Lead Agency
k. Opportunities to mitigate Banana River/Indian River Lagoon	k. Cannot meet near-term demand due to permitting, design, and construction schedule
l. Additional development potential for CCSFS	l. Potential conflicts with future USSF land uses
m. Ability to expand limits west/north	
n. Can be constructed in phases	
o. New facilities for security perimeter would replaces aged infrastructure	

ATLANTIC OCEAN ZONE (PROPOSED)

The sites considered within this zone include:

- Proposed new construction of a wharf along the Atlantic Ocean outside ESQD arcs of:
  - SLC-34
  - Between SLC-37 and SLC-40
  - Between SR 402 and LC-39B/C
  - Between Navy Operations Area and Explosive Ordnance Disposal Range and outside ESQD arcs of Magazine Assembly and Checkout Area (MACA), MSA, and Navy Trident Wharf

This zone can have sites within KCS or CCSFS property and could be built to serve the specific needs of the commercial spaceflight industry. The majority of the sites along the Atlantic Ocean fall within ESQD arcs of launch pads of the Eastern Range. Similar to the proposed North Turning Basin, it could be "built to suit"; however, being exposed to the Atlantic Ocean could pose difficulties during windy conditions or inclement weather. This site will be difficult to permit and could pose potential environmental impacts to both marine and land habitats. For these reasons, alternatives within this zone were eliminated from further consideration.

A new facility in this zone would not be able to meet the near-term needs of the commercial space industry, due to time required for permitting, design, and construction.

An illustration of the proposed Atlantic Ocean Wharf near CCSFS SLC-34 is shown in Figure 17, and a summary of its benefits and limitations is provided in Table 13.

FIGURE 17 – PROPOSED ATLANTIC OCEAN WHARVES (SLC-34 AND NORTH OF NAVY OPERATIONS AREA)

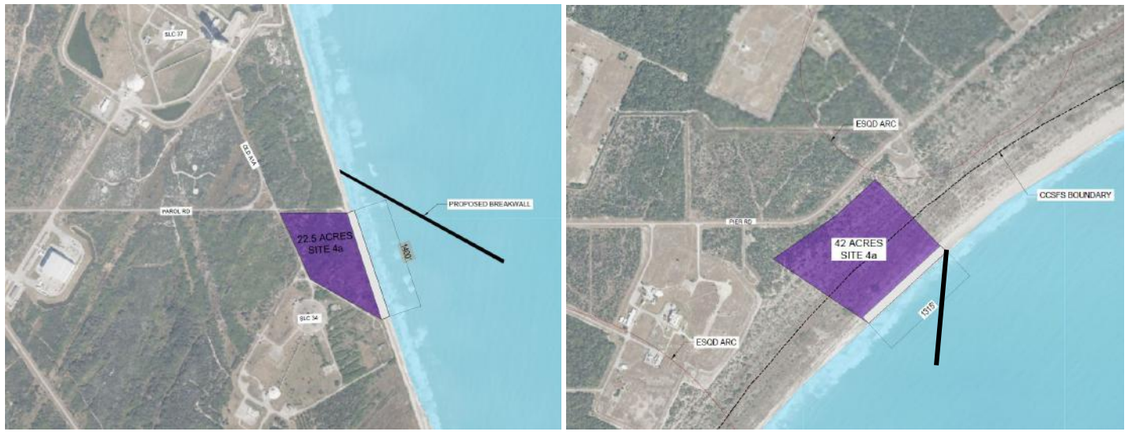


TABLE 13 – BENEFITS AND LIMITATIONS OF THE ATLANTIC OCEAN ZONE (PROPOSED)

Benefits	Limitations
a. Multiple locations	a. Potential environmental impacts
b. Access to Phillips Parkway	b. NEPA/permitting
c. Potential access to utilities	c. Requires dredging and disposal
d. Limited landside development possible	d. Large capital cost and for Operations and Maintenance (O&M)
e. Long-term docking possible	e. Requires protection from the Atlantic Ocean breakwaters and/or breakwall rocks
f. Meets long-term demand	f. Not in NASA KSC or USSF CCSFS master plans
g. Opportunity for permanent structures	g. ESQD arcs from launch pads will impact operations
h. Potential to support military operations	h. Cannot meet near-term demand due to permitting, design, and construction schedule
i. "Built to suit" – common use or LSP-specific	i. Liability of being ocean side/coastal resiliency
j. Can be located outside ESQD arcs	

COMPARATIVE ANALYSIS OF ALTERNATIVES

Alternatives Analysis Methodology

Each zone was assigned a score on a 1-to-5 scale which was then multiplied by the weighting for each criterion to generate a unitless number for each element, which were added together. Higher scores indicate more preferable options. AECOM used this method to determine the wharf development option which can meet the 5-year (near-term) and the 10- to 20-year (long-term) demand to service the LSP requirements.

Site Selection Criteria

There were six (6) alternative zones analyzed with the following 11 criteria, which are weighted as noted. A score of 1 was given for least desirable and 5 was given for most desirable. In cases where there are subtle differences between alternatives when assigning a score, a value of 2 or 4 was used.

A. **ESQD Arcs Interface Constraints**: The impact of existing ESQD arcs on operation and construction of a wharf was evaluated under this criterion. The Middle and East Turning Basins have multiple explosive siting ESQD arcs that restrict or prohibit operations due to critical military mission(s).

   A score of 5 is assigned to an alternative if there was no impact due to the ESQD arcs. A score of 1 is assigned if the alternative site boundaries were within these ESQD arcs. A score of 3 is assigned if the majority of the alternative site fell outside of the ESQD arcs.

B. **Capital Costs**: Probable estimated capital costs were considered as one of the keys to determine the most cost effective- alternative which will further enhance and support the business case of LSP operations. A very high-level qualitative cost assessment was performed to determine the relative comparison of estimated costs of the alternatives. For each alternative, the total estimated cost of a new wharf and developed landside space remained constant, and additional relevant cost elements were considered depending on the location of the alternative. Two main elements drive the differences between alternatives. The first and most important is dredging cost, which varies greatly across the set of alternatives considered based on their proximity to the existing Port Canaveral Navigation Channel. The second is the cost for raising the existing bridge on SR 401 and widening the existing Canaveral Locks system west of the SR 401 Bascule Bridges to be accessible to the projected demand and size of vessels.

   A score of 1 was assigned to an alternative with the highest probable cost, and score of 5 was assigned to an alternative with the lowest probable capital cost.

C. **5-Year Plan**: Each Alternative examined presents a varied mix of opportunities and constraints for further development. To meet the objective of the study, the final recommended site alternative must satisfy the near-term demand projected in the next 5 years. A site and development option is preferred if it can meet the near-term demand, and it will be less desirable if only a fraction of the near-term demand is met.

   A score of 5 was assigned to an alternative with ability to provide required wharf length, channel depth, and landside infrastructure to meet the 5-year demand. A score of 1 was assigned to an alternative if the 5-year demand cannot be met and score of 3 was assigned if only 50% of the demand can be met.

D. **10-20 Year Plan**: Similar to the 5-year plan, the preferred alternative should also meet the long-term (10- to 20-year) demand. A site and development option is preferred if it can meet the long-term demand, and it will be less desirable if only a fraction of the long-term demand is met.

   A score of 5 was assigned to an alternative with the ability to provide required wharf length, channel depth, and landside infrastructure to meet the 10- to 20-year demand. A score of 1 was assigned to an alternative if the long-term demand cannot be met and score of 3 was assigned if only 50% of the demand can be met.

E. **Land Use**: The preferred alternative should consider the adjacent land uses, landowners' preferences for their site development, landowners' plans for future development, landowners' business requirements, and highest and best use for the given site alternative. From the safety, security, environmental, and community impact perspective, the preferred alternative site for the proposed LSP operations should be segregated and distanced from the current operations, should be located outside of the ESQD arcs, and should have minimal operational interference with the launch pads, military operations, cruise and cargo operations, and other navigation activities in the Port Canaveral Navigation Channel area.

   Based on the feedback received from landowners and project stakeholders, a score of 5 was assigned to an alternative if it has minimum impact to current landowners' operations and plans for the site, and if the alternative presents an opportunity to create an integrated, well-planned LSP wharf and landside infrastructure complex. A score of 1 was assigned to an alternative that creates conflicting land use impacts with current landowners operational and business needs.

F. **Navigation Access/Dredging**: One of the primary requirements and criteria in selecting an alternative site is access to a deep navigation channel to allow seagoing drone ships, marine vessels, and service vessels the ability to operate. If there is already an existing navigation channel which is dredged to the required minimum depth of 30 feet to accommodate LSP marine vessels, then it is a preferred site in this context. If the proposed new wharf location requires new capital dredging in the navigation channel leading up to the wharf and in and around the berth pocket area, then the alternative is relatively less preferable.

   A score of 5 was assigned to an alternative with a readily accessible navigation channel with minimal capital dredging requirements. A score of 1 was assigned to an alternative with no access to existing navigation channel leading up to the wharf and significantly high capital dredging requirements.

G. **Potential Environmental Impact**: Timing of providing the required LSP infrastructure is critical to the space industry located in Florida. Historically, major infrastructure projects impacting the waters of the US and intracoastal waterways with perceived and measured impacts to fauna, flora, and endangered species have required extensive environmental permitting based on the requirements imposed by regulating agencies such as USACE and state and local environmental agencies. If an alternative development has a greater potential for environmental impact, costlier mitigation measures, additional indirect and cumulative impacts, and may take longer than 5 years to permit based on the historical timelines for a similar project, then that alternative is less preferred when compared to an alternative which has relatively smaller measured direct, indirect, and cumulative impact to the environment and resulting permitting of the proposed infrastructure development can be completed expeditiously.

   A score of 5 was assigned to an alternative with the shortest permitting timeline, least potential environmental impacts, and minimal burden of work required to procure the necessary permits from all federal, state, and local agencies. A score of 1 was assigned to an alternative with the greatest potential for environmental impacts, a significant burden of work for procuring the required permits, and a permitting timeline exceeding five years.

H. **Air Draft Restrictions/FAA Part 77 Surfaces:** The LSPs are planning to handle the significantly large, tall, and heavy components of space launch vehicles and rockets. These recovered rockets must be brought back in a vertical position by drone ships or marine vessels to a wharf and later transported back to the LSP service areas

in various locations throughout the CCSFS or KSC. The proposed bridge over SR 401 will introduce an air-draft restriction for some of the existing and future retrievable rocket components being planned by LSPs if they must transit under the future bridge via marine vessels in a vertical position. This criterion also considers if the site will impact any CCSFS skid strip runway's FAA Part 77 surfaces and impacts to existing overhead powerlines in the Banana River Channel.

An alternative is assigned a score of 5 if the site location does not require transiting under the future SR 401 bridge. A score of 1 is assigned to an alternative if the SR 401 air-draft restriction applies.

I. **Homeporting**: During the stakeholder interviews and coordination, several LSPs indicated the need for having homeporting capabilities for their support vessels, which are deployed along with drone ships and marine vessels during the marine operations related to space launches. During inclement weather and when space launch recovery operations are not being performed, these support vessels require a safe and dedicated docking/parking location. An alternative is preferred if it provides sufficient berthing space for homeporting of LSP support vessels.

   A score of 5 is assigned to an alternative if the location and the layout provides for additional berthing space for the support vessels. A score of 1 is assigned to an alternative with no capacity to accommodate homeporting operations of these support vessels.

J. **Roadway/Utilities Access**: After the recovered rocket booster or flight ware has been processed at the wharf it is reloaded on a transporter vehicle and is transported to the service areas in various locations within the CCSFS and KSC. The LSPs need access to basic utilities such as power, communications, water, and sewer as well as the ability to handle hazardous cargo and materials on-site requiring access to main utility lines. An alternative is preferred if the proposed site location has immediate access to the roadways and adjacent utility corridor. An alternative is less desirable if new roadways and utility corridors must be constructed.

   A score of 5 is assigned to an alternative which can capitalize on the existing roadway and utilities network surrounding the site. A score of 1 is assigned if new roadways and utility mainlines will need to be constructed to support the development and operation of the proposed wharf and landside facilities for supporting LSP and stakeholder goals.

K. **Safety/Security**: The CCSFS and KSC undertake nationally important, mission-critical, and highly classified activities, along with the operations undertaken by the USSF, US Navy NOTU, US Army, and the commercial space industry. Safety of people and assets are very critical when locating the new site for the wharf. Impact to military operations and proximity to the secured gate entry and exit location becomes critical when selecting a site. Mixing of cruise passenger activities during peak cruise season with the LSP activities can trigger major security risks. Therefore, an alternative site which considers the existing safety and security protocols of stakeholders and enhances overall safety and security of people and stakeholder assets is preferred, versus an alternative where the proximity of the proposed LSP operations compromises the safety and security aspects of the adjacent land uses.

   A score of 5 is assigned for an alternative when adjacent land uses are in sync and no adverse security or safety risks are triggered from expanding the LSP activities at the proposed alternative site. A score of 1 is assigned to an alternative with a direct conflict and impact to the safety and security of the LSP operations or adjacent land uses.

Site Selection Criteria Weight

Not all criteria carry equal importance, and the evaluation process was designed to allow for variable weighting of a group of criteria based on the feedback received from the stakeholder coordination task.

The 11 criteria were categorized in the following three major categories:

A. **Primary:** A combined weight of 50% was given to the set of criteria in this category. The following five (5) criteria were the most critical in the selection of an alternative and equal weight was provided to these criteria with a total sum weight of 50%, resulting in an average weight of 10% per criterion.

   - ESQD Arcs Interface Constraints
   - Capital Costs
   - 5-Year Plan
   - 10- to 20-Year Plan
   - Land Use

B. **Secondary:** A combined weight of 35% was given to the set of criteria in this category. The following four criteria were desired criteria for consideration and equal weight was provided to these criteria with a total sum weight of 35% and an average weight of 8.75% per criterion. To meet the objectives of this study and goals of LSPs, it is desirable to meet these criteria but not mandatory.

   - Navigation Access/Dredging
   - Potential Environmental Impact
   - Air Draft Restrictions/FAA Part 77 Surfaces
   - Homeporting

C. **Tertiary:** A total weight of 15% was given to the set of criteria in this category. The following two criteria were relatively less important in the selection of a preferred wharf site compared to the other criteria. Equal weight was provided to these criteria, with the total sum weight of 15% and an average weight of 7.5% per criterion. To meet the objectives of this study and goals of LSPs, it is useful to meet these criteria, but not critical.

   - Roadway/Utilities Access
   - Safety/Security

Summary of Alternatives Analysis

Of the six (6) alternative analysis zones, three (3) alternative analysis zones were selected to conduct scenario concept planning:

- West Turning Basin – North Cargo Berths & Landside w/ Long-Term Concession
- Middle Turning Basin – North of Poseidon Wharf (Proposed)
- North Turning Basin Options 1 and 2 – New Basin North of Existing West or Middle Basins (Proposed)

The following three (3) alternative analysis zones were determined to include fatal flaws and so were removed from further consideration.

- Atlantic Ocean (Proposed) – Atlantic Ocean Side New Wharf and Landside
- Banana River/West of SR 401 – Sites West of SR 401 Bascule Bridges (Banana River)
- East Turning Basin – Trident Basin/Military Only

The comparative evaluation matrix is presented in Table 14.

TABLE 14 – COMPARATIVE EVALUATION OF ALTERNATIVES

Sites	Zones/Area	Owner	QD Arcs Interface Constraints	Capital Costs	5-Year Plan	10- to 20-Year Plan	Land Use	Navigation Access/ Dredging	Potential Environmental Impact	Air Draft Restrictions/ FAA Part 77 Surfaces	Homeporting	Roadway/ Utilities Access	Safety/ Security	Totals
		Weight	10.00%	10.00%	10.00%	10.00%	10.00%	8.75%	8.75%	8.75%	8.75%	7.50%	7.50%	100%
1	Middle Turning Basin	CCSFS	3	3	3	2	3	3	3	5	3	5	5	**3.38**
2	North Turning Basin (Proposed)	CPA/KSC	5	2	1	5	5	2	2	5	5	3	3	**3.48**
3	West Turning Basin	CPA	5	5	3	1	1	5	3	5	1	5	3	**3.33**
4	Atlantic Ocean Proposed	KSC/CCSFS	3	1	1	5	1	2	1	5	5	3	5	**2.84**
5	Banana River/West of SR 401	KSC/CCSFS	5	1	1	3	5	1	3	1	5	3	3	**2.83**
6	East Turning Basin	USSF	1	3	1	1	1	3	5	5	1	2	5	**2.45**

(Source: CPA)

APPENDIX F – SCENARIO PLANNING

PORT OPERATIONS AND OPERATIONAL REGULATIONS

Many of the services and operations within the port are provided by private companies, such as terminal operators, shipping lines, and stevedores. All maritime ports have similar operations, regulatory requirements, and infrastructure constraints. The main purpose of a maritime port is to facilitate the intermodal movement of goods between ships and other modes of transportation, such as trucks or rail.

Ports within the US typically operate under revenue stream systems consisting of:

- Dockage, the fee associated with the accommodation of berthing ships. This system is usually based on the length of vessel and typically charged in 24-hour increments.
- Wharfage, the fee associated with using the berth for the import or export of cargo.
- Land leases of land used for maritime operations or used to support maritime operations.
- Other fees related to the use of port equipment, personnel, or resources.

These fees are used to support the infrastructure requirements needed to provide continuous development, repairs, and employment of the maritime/multimodal-related workforce.

Military ports are strategically located throughout the US and support military operations around the world. Many of the military ports have entirely different financial systems and do not typically operate as described above. Military budgets are typically designated to supplement the financial requirements needed for infrastructure and military personnel or government civilian employees typically operate port facilities within the boundaries of these ports.

Regulation of Ports

Ports are also rigorously regulated by Federal and state agencies to ensure safety and security of the waterways and related infrastructure. Agencies such as the USCG are the primary Federal agency responsible for regulating US ports. The Maritime Transportation Security Act (MTSA) of 2002 i was designed to improve the security of the US maritime transportation system, which includes vessels, ports, and waterways. The MTSA requires USCG to develop and implement security regulations for vessels and facilities. The regulations cover a wide range of topics, including access control, security assessments, and training. The USCG also conducts regular inspections of vessels and facilities to ensure that they follow the regulations.

The MTSA also gives the USCG the authority to respond to security incidents in the US maritime transportation system. This includes incidents such as suspicious activity, maritime terrorism attacks, and oil spills. The USCG works closely with other federal agencies, such as US Customs and Border Protection (CBP) and the Federal Bureau of Investigation (FBI), to implement and enforce the MTSA.

The U.S. Army Corps of Engineers (USACE) regulates and builds waterway infrastructure under the authority of several Federal laws, including the Rivers and Harbors Act of 1899 and the Clean Water Act. The USACE also regulates activities that may affect navigable waters and wetlands. The USACE also builds and maintains waterway infrastructure, such as ports, harbors, dams, locks, and levees. This work is done to support navigation, flood control, and other water resources needs.

Other Federal agencies that regulate ports include:

- U.S. Customs and Border Protection (CBP): CBP is responsible for inspecting all imported goods and collecting import duties and taxes. Since most ports are considered “Ports of Entry” into the US, CBP also inspects and clears cruise passengers or people attempting to enter the US through ports around the country.
- Food and Drug Administration (FDA): The FDA is responsible for inspecting imported food and drugs to ensure that they are safe for consumption.
- Environmental Protection Agency (EPA): The EPA is responsible for regulating air and water pollution at ports.
- Occupational Safety and Health Administration (OSHA): OSHA is responsible for ensuring the safety of workers at ports.

BERTH DEVELOPMENT STRATEGIES

The availability and development of each of the alternatives analyzed in the previous appendix were reviewed. The following three (3) strategies were identified, and relevant assumptions are described below.

Table 15 shows the minimum and preferred berth lengths along with capacity needs and projected development within each alternative zone.

Strategy 1: Build North Turning Basin Option as Late as Possible

This strategy maximizes the potential opportunities to utilize existing infrastructure in the West and Middle Turning Basins and delay construction of a new North Turning Basin option as much as possible. This scenario assumes CPA will continue to dedicate and provide the wharf and landside space to support the aerospace and LSP industry as further described below. This scenario also assumes that USSF and the military will accommodate LSP operations in the Middle Turning Basin as further described below.

i. 1,220 LF of common-use berth within CPA property to accommodate 5-year and future demands. Utilize existing Alternative 1 West Turning Basin’s capacity; assumes 50% of existing cargo berth areas via long-term concession agreements with LSPs.
ii. 430 LF of proposed wharf within Alternative 2 Middle Turning Basin or construct new 480 LF berth southeast of NCB 8 to accommodate 10-year demand.
iii. 960 LF of proposed wharf within Alternative 2 Middle Turning Basin to accommodate 20-year demand.
iv. 500 LF of proposed wharf within Alternative 3 North Turning Basin to accommodate 25-year demand.
v. 2,500 to 7,000 LF of proposed wharf within Alternative 3 North Turning Basin to accommodate 50-year demand.

Strategy 2: Build North Turning Basin Option Intermittently

This strategy was developed to find a reasonable middle point in development of the North Turning Basin option while continuing to capitalize on the existing assets owned by CPA and the military as further described below.

i. 1,220 LF of common-use berth within CPA property to accommodate 5-year demand only. Utilize existing Alternative 1 West Turning Basin's capacity; assumes 25% to 50% of wharf berths at existing cargo berths via long-term concession agreements with LSPs.
ii. 430 LF of proposed wharf within Alternative 2 Middle Turning Basin or construct a new 480 LF berth southeast of NCB 8 to accommodate 10-year demand.
iii. 1,500 LF of proposed wharf within Alternative 3 North Turning Basin to accommodate 10-year demand.
iv. 960 LF of proposed wharf within Alternative 2 Middle Turning Basin to accommodate 20-year demand. 700 LF of proposed wharf within Alternative 3 North Turning Basin to accommodate 20-year demand.
v. 2,500 to 8,000 LF of proposed wharf within Alternative 2 North Turning Basin to accommodate 50-year demand.
vi. Alternative 3 North Turning Basin expansion allows for interim homeporting and boat docking/mooring.

Strategy 3: Build North Turning Basin Option as Early as Possible

This strategy begins construction of the North Turning Basin option as soon as possible knowing that eventually the need will arise to capture the forecasted LSP growth. This option assumes that CPA and military assets will not be available for LSPs as time progresses forward as further described below.

i. 1,220 LF of common-use berth within CPA property to accommodate up to a 5-year demand. Utilize existing Alternative 1 West Turning Basin's capacity; assumes 25% to 50% of wharf berths at existing cargo berths via long-term concession agreements with LSPs.
ii. 1,500 LF of proposed wharf within Alternative 3 North Turning Basin to accommodate 5-year demand.
iii. 500 LF of proposed wharf within Alternative 3 North Turning Basin to accommodate 10- to 15-year demand.
iv. 3,000 to 8,000 LF of proposed wharf within Alternative 2 North Turning Basin to accommodate 50-year demand.
v. Allows for interim homeporting and boat docking/mooring.

TABLE 15 – STRATEGIES 1 TO 3 FOR MINIMUM AND PREFERRED BERTH LENGTHS ALONG WITH CAPACITY NEEDS AND PROJECTED DEVELOPMENT WITHIN ALTERNATIVES OR ZONES

Strategy 1: Build North Turning Basin as Late as Possible										
Description/Year	**2028**	**2033**	**2038**	**2043**	**2048**	**2053**	**2058**	**2063**	**2068**	**2073**
Shared Berth Length Required to Meet Demand (LF)	1,245	1,782	2,005	2,439	2,968	3,610	4,393	5,344	6,502	7,911
Dedicated Berth Length Required to Meet Demand (LF)	2,610	2,610	2,610	3,915	4,350	4,785	4,785	6,960	7,395	9,135
Total Capacity Provided (LF)	1,220	1,650	2,610	2,610	3,110	3,720	4,720	5,720	6,720	8,220
Alternative Analysis Zone 1 - Middle Turning Basin (LF)		430	1,390	1,390	1,390					
Alternative Analysis Zone 2 - North Turning Basin Proposed (LF)					500	2,500	3,500	4,500	5,500	7,000
Alternative Analysis Zone 3 - West Turning Basin (LF)	1,220	1,220	1,220	1,220	1,220	1,220	1,220	1,220	1,220	1,220
Delta Capacity (LF) [Shared Berth minus Total Capacity]	*25*	*132*	*(605)*	*(171)*	*(142)*	*(110)*	*(327)*	*(376)*	*(218)*	*(309)*

Strategy 2: Build North Turning Basin Intermittently										
Description/Year	**2028**	**2033**	**2038**	**2043**	**2048**	**2053**	**2058**	**2063**	**2068**	**2073**
Shared Berth Length Required to Meet Demand (LF)	1,245	1,782	2,005	2,439	2,968	3,610	4,393	5,344	6,502	7,911
Dedicated Berth Length Required to Meet Demand (LF)	2,610	2,610	2,610	3,915	4,350	4,785	4,785	6,960	7,395	9,135
Total Capacity Provided (LF)	1,220	1,930	2,090	2,500	3,000	4,000	4,500	5,500	6,500	8,000
Alternative Analysis Zone 1 - Middle Turning Basin (LF)		430	1,390							
Alternative Analysis Zone 2 - North Turning Basin Proposed (LF)		1,500	700	2,500	3,000	4,000	4,500	5,500	6,500	8,000
Alternative Analysis Zone 3 - West Turning Basin (LF)	1,220									
Delta Capacity (LF) [Shared Berth minus Total Capacity]	*25*	*(148)*	*(85)*	*(61)*	*(32)*	*(390)*	*(107)*	*(156)*	*2*	*(89)*

Strategy 3: Build North Turning Basin as Early as Possible										
Description/Year	**2028**	**2033**	**2038**	**2043**	**2048**	**2053**	**2058**	**2063**	**2068**	**2073**
Shared Berth Length Required to Meet Demand (LF)	1,245	1,782	2,005	2,439	2,968	3,610	4,393	5,344	6,502	7,911
Dedicated Berth Length Required to Meet Demand (LF)	2,610	2,610	2,610	3,915	4,350	4,785	4,785	6,960	7,395	9,135
Total Capacity Provided (LF)	1,500	2,000	2,000	2,500	3,000	3,500	4,500	5,500	6,500	8,000
Alternative Analysis Zone 1 - Middle Turning Basin (LF)										
Alternative Analysis Zone 2 - North Turning Basin Proposed (LF)	1,500	2,000	2,000	2,500	3,000	3,500	4,500	5,500	6,500	8,000
Alternative Analysis Zone 3 - West Turning Basin (LF)										
Delta Capacity (LF) [Shared Berth minus Total Capacity]	*(255)*	*(218)*	*5*	*(61)*	*(32)*	*110*	*(107)*	*(156)*	*2*	*(89)*

DOCKING/MOORING OPTIONS

The options below indicate five (5) docking/mooring options: one (1) existing and four (4) proposed docking locations. The existing berth space would be wherever the CPA Harbormaster directs marine vessels. The proposed mooring offshore locations may not have utilities or landside access like a typical anchorage location. Refer to Figure 18 and Table 16 for additional details.

The docking/mooring shown can also occur as part of the strategies listed in the previous appendix for Alternative 3 North Turning Basin.

FIGURE 18 – POTENTIAL DOCKING/MOORING OPTIONS

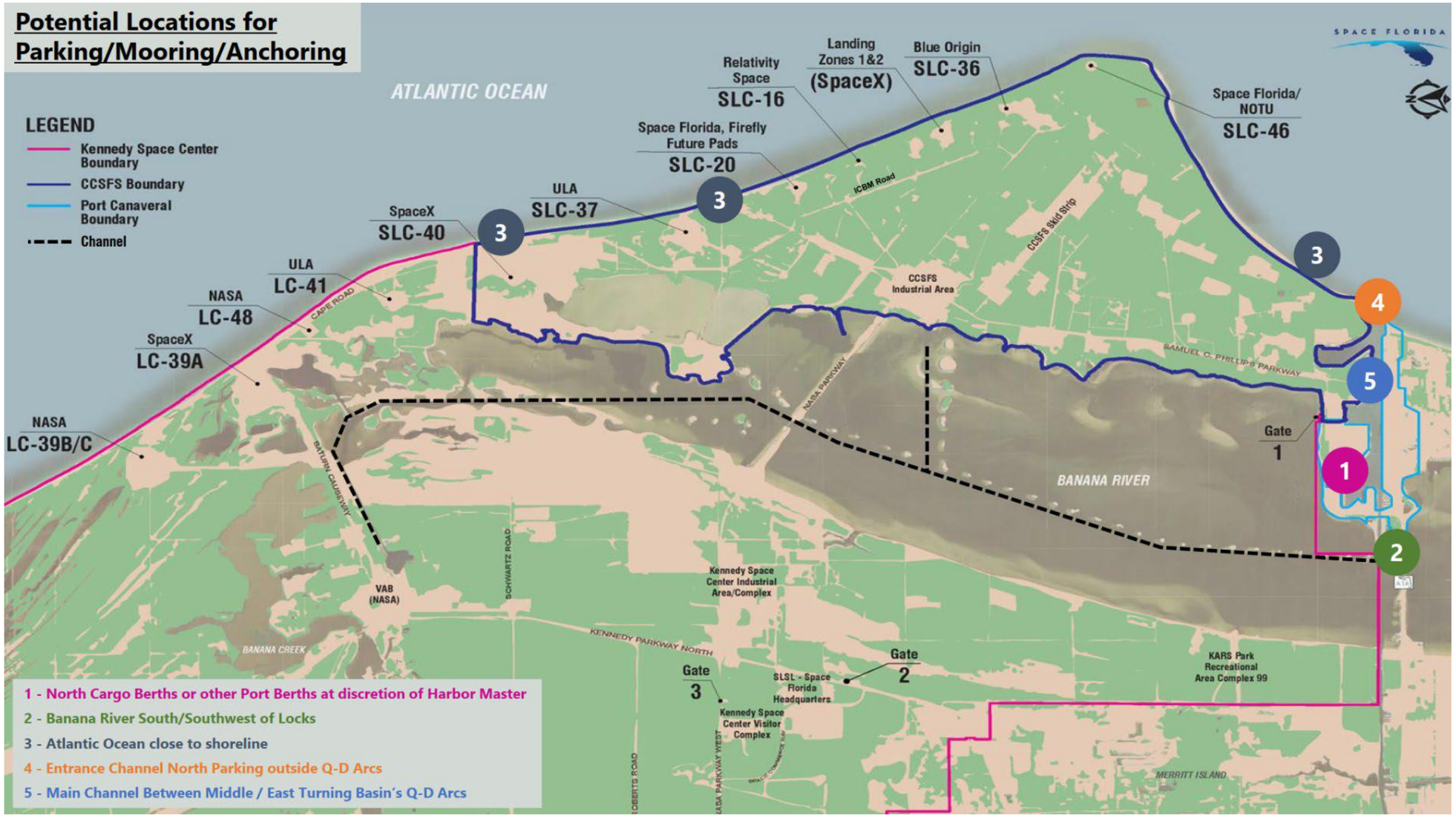


TABLE 16 – POTENTIAL LOCATIONS FOR PARKING/MOORING/ANCHORING

Sites	Potential Locations for Parking/Mooring/Anchoring	Owner	Off-Shore*/ On-Shore**	Max. Draft Allowed (ft.)	Max. Width Allowed (ft.)	Support Vessels	Barges
1	North Cargo Berths or Other Port Berths at Discretion of Harbormaster	CPA	On-shore	30	N/A	Yes	Yes
2	Banana River South/ Southwest of Locks (Proposed)	CPA/USACE	Off-shore	12	90	Yes	No
3	Atlantic Ocean Close to Shoreline (Proposed)	USACE	Off-shore	30	N/A	Yes	Yes
4	Entrance Channel North Parking Outside ESQD Arcs (Proposed)	CCSFS/USACE	Off-shore	30	N/A	Yes	Yes
5	Main Channel Between Middle and East Turning Basin's ESQD Arcs (Proposed)	CCSFS/USACE	On-shore	30	N/A	Yes	Yes

**Off-shore: Remote parking where a vessel can drop an anchor or tie off to mooring piles. Support boat would be needed to transport personnel. The locations have no land connectivity for support personnel to walk onto the boat via walkway or have any utilities present.*

***On-shore: Parking areas that are connected to a wharf or landside facilities via a walkway. There would be access to general utilities like power and water.*

There may be limited opportunities for temporary mooring of vessels that can navigate the Canaveral Locks to do so at the Hangar AF Wharf or the VAB Wharf, where there is 1,200 feet of existing bulkhead. However, this introduces additional use of the Banana River, which typically does not see much boat traffic. This increased use could pose some environmental risks to manatees and other marine species not accustomed to larger vessels or increased vessel frequency. Providing mooring along USACE land north and south of the lock could interfere with lock operations and land set aside for stormwater management by CPA. Mooring on the Atlantic side may not be feasible due to the unprotected nature of these areas during storm events or rough seas.

The next appendix presents additional discussion regarding mooring options.

APPENDIX G – CONCEPT DESIGN

The items below summarize design criteria, issues, perspectives, and concerns of each landowner and leaseholder (government entity) in the project area that were incorporated into the final concept(s). The formal meeting minutes from these meetings are proprietary and have only been provided to SF.

- A relocated entry gate must include a Pass and Identification Building and Truck Inspection Facility and meet all DoD Unified Facilities Criteria.
- The expanded USSF South Administration District must be accommodated.
- Plans are still moving forward for a USSF museum that will be accessible to the public.
- A secondary access control near Seaport Canaveral fuel depot/proposed north turn of Phillips Parkway for long-term option should be provided along with fencing.
- Do not impact USSF facilities with new ESQD arcs (residual propellant, etc.).
- Do not impact Seaport Canaveral fuel depot with new ESQD arcs.
- Wharf access road should not be on USSF property.
- Show vessel access and naval protective zones surrounding wharves on concept.
- Consider maintaining access through the south port gate.
- US Army must maintain operations through construction.

The conceptual design for a transload wharf facility took the following into consideration:

- Water depth/navigational channel requirements – 30-foot depth.
- Dredging requirements – obtain USACE permit and utilize dredge material for fill area.
- Pier/wharf requirements – offload/laydown areas and maintenance/transport.
- Cargo cranes/lifting capacity – proprietary for each LSP.
- Security requirements – must be maintained for CCSFS (LSPs to provide own security).
- Intermodal Connectivity – Roadway and transporter infrastructure requirements and vehicle circulation.
- Hazardous materials and explosive site distances – cannot interfere with existing port or DoD operations.
- Safe harboring – potential to leave boats during severe weather.
- Coastal resiliency/sea level rise (SLR) – 50-year planning window must consider accepted SLR projections.
- Utility access points, power, and other parameters identified with stakeholders.
- Acreage to provide structures and support facilities, including maintenance facilities and office space.
- Right of way or property lease area.
- Fuels and commodities.
- Storage and staging areas.
- Mooring of retrieval and/or support vessels.

Implementation of the project will require:

- Property and/or user agreements, and landowner approval processes.
- Partnership and funding agreements.
- Construction phasing plan.
- NEPA/regulatory/permit approvals.
- Implementable mitigation strategies.
- Continual community engagement and agency coordination.
- Project phasing schedule, including environmental impact assessment, final design, permitting, environmental mitigation, and construction.

NEAR-TERM AND LONG-TERM CONCEPT

Following the 60% Workshop held on August 15, 2023, the project team met with stakeholders, including USSF, NOTU, US Army, and CPA to discuss feedback received at the workshop, share comments and/or concerns, and refine the recommended near- and long-term concepts. Figures 19 and 20 illustrate the near- and long-term concepts to move into the next phase of the project and Figures 21a and 21b show project renderings.

Further coordination with CPA, US Army, and LSPs confirmed that the near-term option illustrated in Figure 19 is acceptable to support projected launch/retrieval cadence potentially through 2033. Two of the LSPs have agreements in place to utilize CPA cargo berths for offloading rocket components in the near-term and, by 2033, an expanded facility in the Middle Turning Basin east of the existing Army Wharf could support expanded operations for 10 more years while the expansion of the Middle Turning Basin to the north begins construction. Facilities in the West Turning Basin can only support offloading of rocket components and long-term mooring cannot be guaranteed.

Construction of the expanded Middle Turning Basin to the north can begin in phases to accommodate projected needs. While the first phase includes construction of the final realigned SR 401 to form the perimeter of an ultimate basin, wharf facilities can be phased and built as needed. The following sections describe the construction phasing of the long-term recommendation and includes estimated project costs.

The standard terminal could feature approximately 500 feet of wharf with approximately 10 acres of dedicated backland space for a combination of direct recovery, cleaning, maintenance, and administrative functions. Additionally, 40% of overall parcel areas are reserved for stormwater management.

Construction of the new wharf facility would be accomplished in phases. Phase 1 builds a 430-foot wharf within the Middle Turning Basin immediately east of the Army Wharf, which can supplement the use of Port Canaveral's facilities in the near-term. Phase 2 is the first step in an expansion of the Middle Turning basin to the north as part of the long-term concept and begins construction of a new channel to the north. As part of this phase, infrastructure related to US Army operations would be relocated prior to construction of a new cut. Phase 2 does not develop past SR 401 and maintains the existing security complex while adding 1,000 feet of new wharf. The construction of Phase 2 removes a berth currently used by the US Army. Although 1,000 feet of new wharf is created as part of Phase 2, only about 500 feet (one berth) will be available for the commercial space industry, with the remaining 500 feet for the US Army. Phases 1 and 2 are projected to accommodate needs in the near term.

Phase 3, which is the first phase of the long-term recommendation, relocates SR 401 to form a new dike structure that will separate the Atlantic Ocean within the Port from the brackish Banana River to the west. This new roadway will create over 6,000 linear feet of new protected channel. This channel will be 30 feet deep and wide enough for barge transload operations on the east side and designated mooring on the west side. To the greatest extent possible, material dredged to create this new channel will be re-used as fill to create new rocket handling terminals along the east side of the channel.

Phase 3 involves a great deal of construction but only adds a single operational berth; however, this construction sets the ultimate footprint of the ultimate wharf. Phases 4 through 7 leverage the protected water created in Phase 3 and add capacity in increments of approximately 1,500 feet per phase (or whatever is required should future conditions change). This allows for expenditure on development to match demand for facilities. Material used for surcharge in one phase will be recycled as fill for the subsequent phase.

FIGURE 19 – NEAR-TERM RECOMMENDED CONCEPT

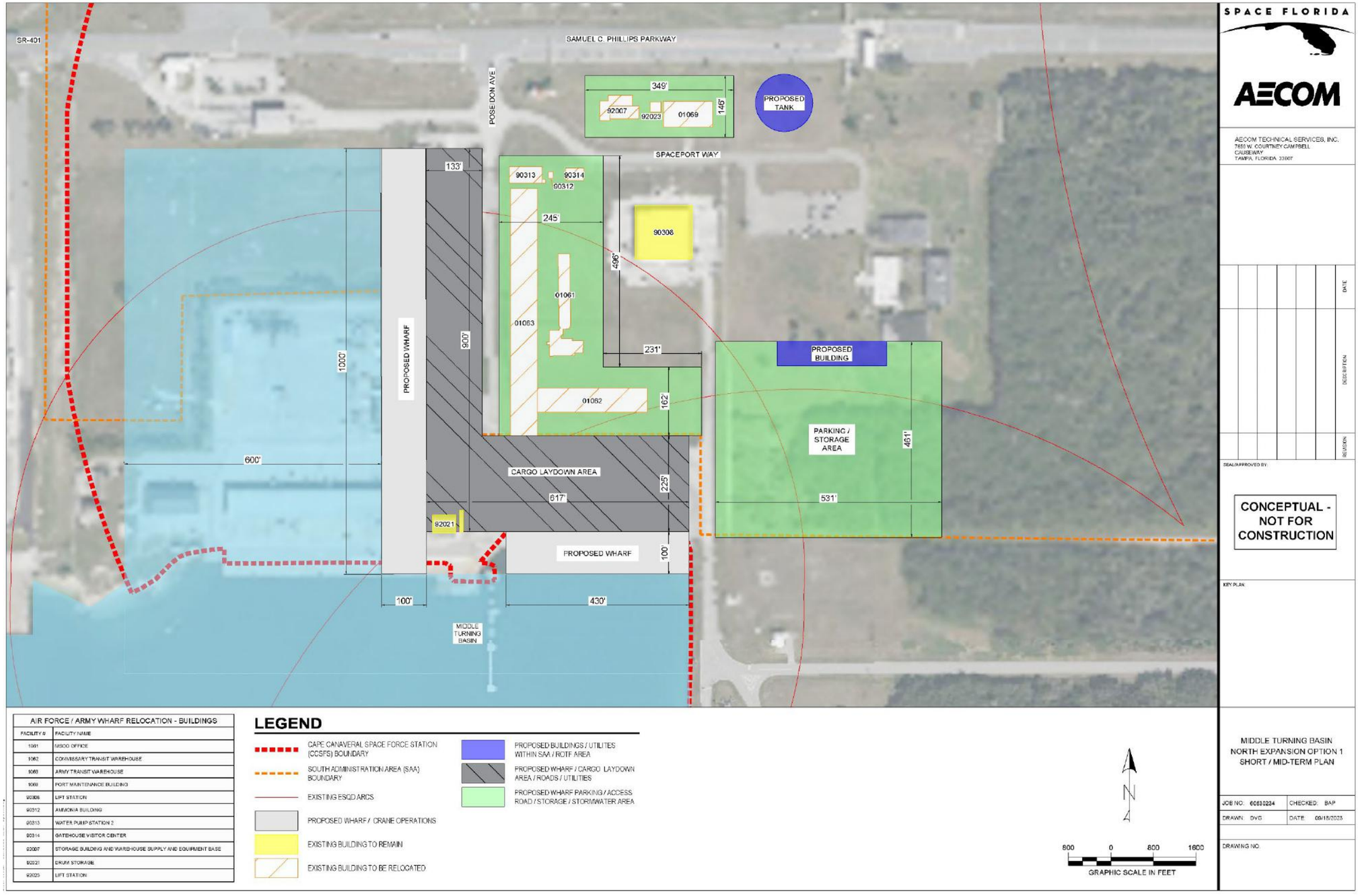


FIGURE 20 – LONG-TERM RECOMMENDED CONCEPT

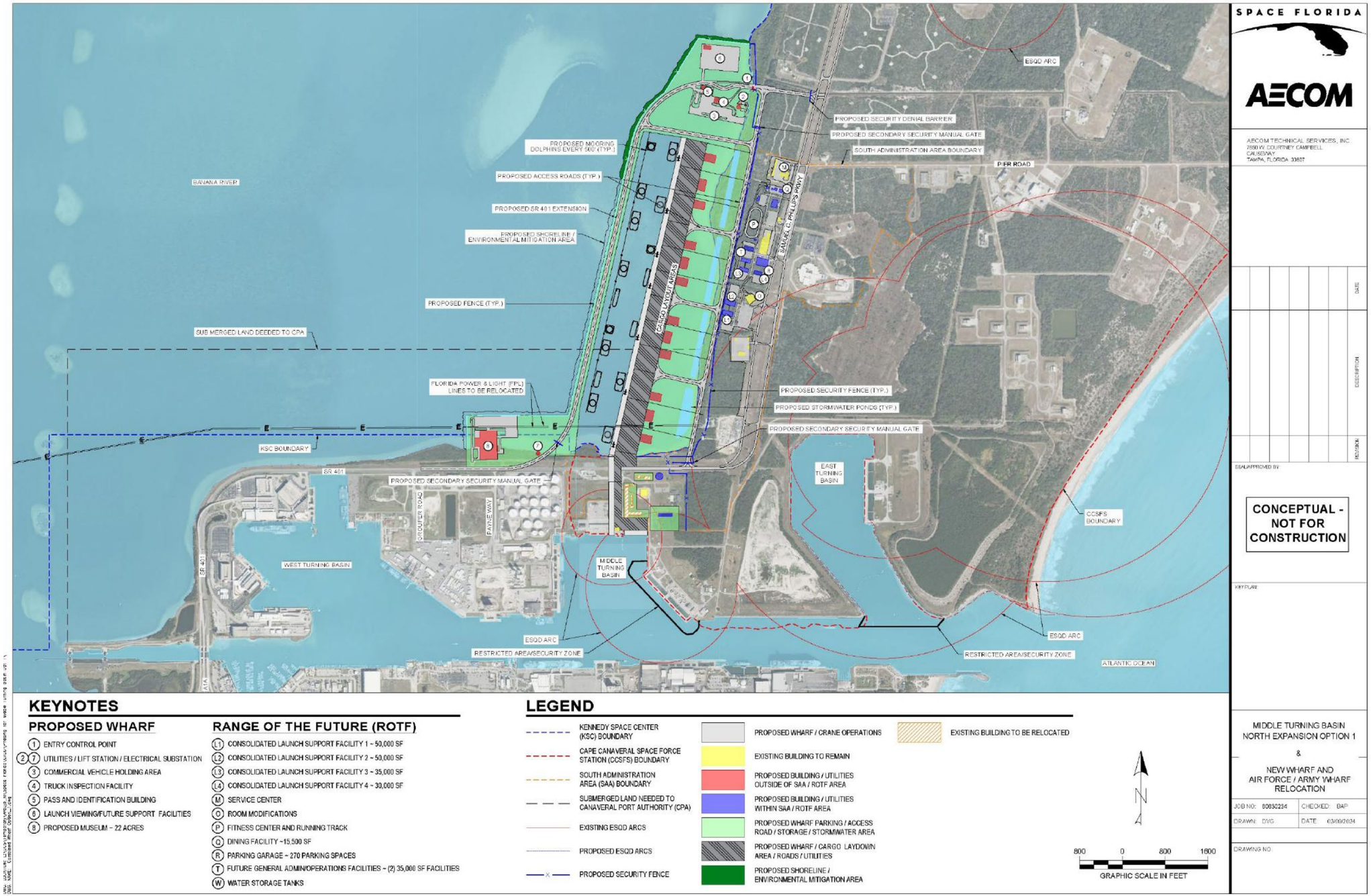
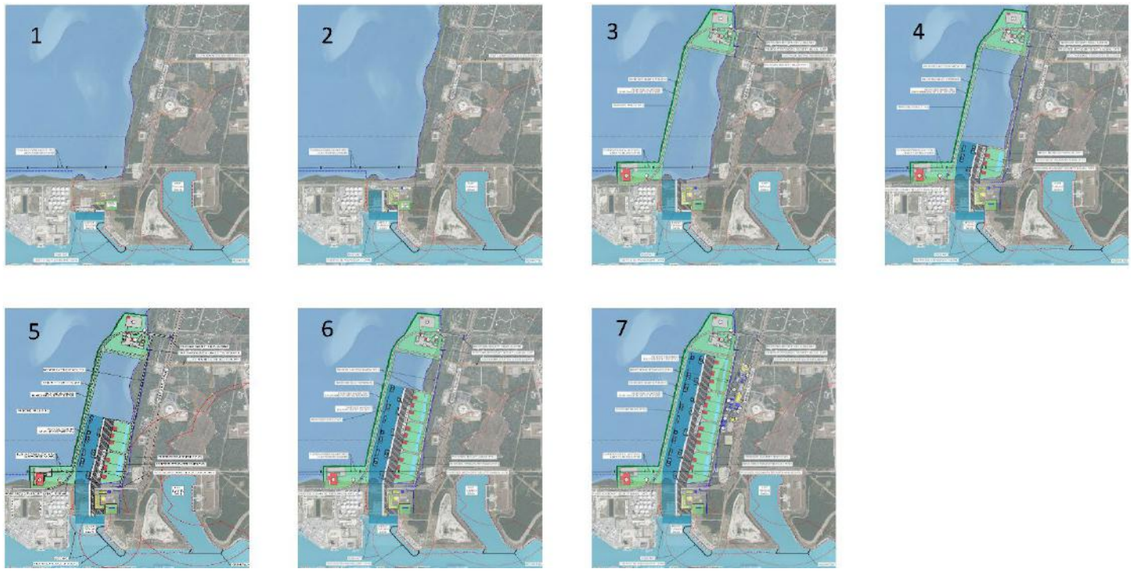


FIGURE 21A – RECOMMENDED NEAR-TERM CONCEPT RENDERING

FIGURE 21B – RECOMMENDED LONG-TERM CONCEPT RENDERING

A full set of phasing drawings is provided separately in Appendix O, and a thumbnail progression of phasing is shown in Figure 22 below.

FIGURE 22 – CONSTRUCTION PHASES 1-7 FOR NEAR- AND LONG-TERM OPTIONS



For port operations, the general business case philosophy for landlord ports is to identify opportunities for rental fees that will offset construction costs and become a source of revenue. The proposed development plan features one new berth in Phase 1 that is relatively inexpensive to develop, followed by 14 additional berths that are more expensive because they depend on the creation of a new roadway, channel, and security gate complex on new landfill.

The rough order magnitude construction cost estimates of each phase are included in Appendix H – Business Case.

Mooring

Mooring options were refined based on discussions with project stakeholders. Until the ultimate concept is built, which will include mooring piles available along the west side of the expanded basin as shown in Figures 20 and 21b, other options will need to be explored since there are no long-term mooring options available within Port Canaveral. Of the locations identified in Figure 18, Sites 1, 2 and 5 could potentially be used for mooring.

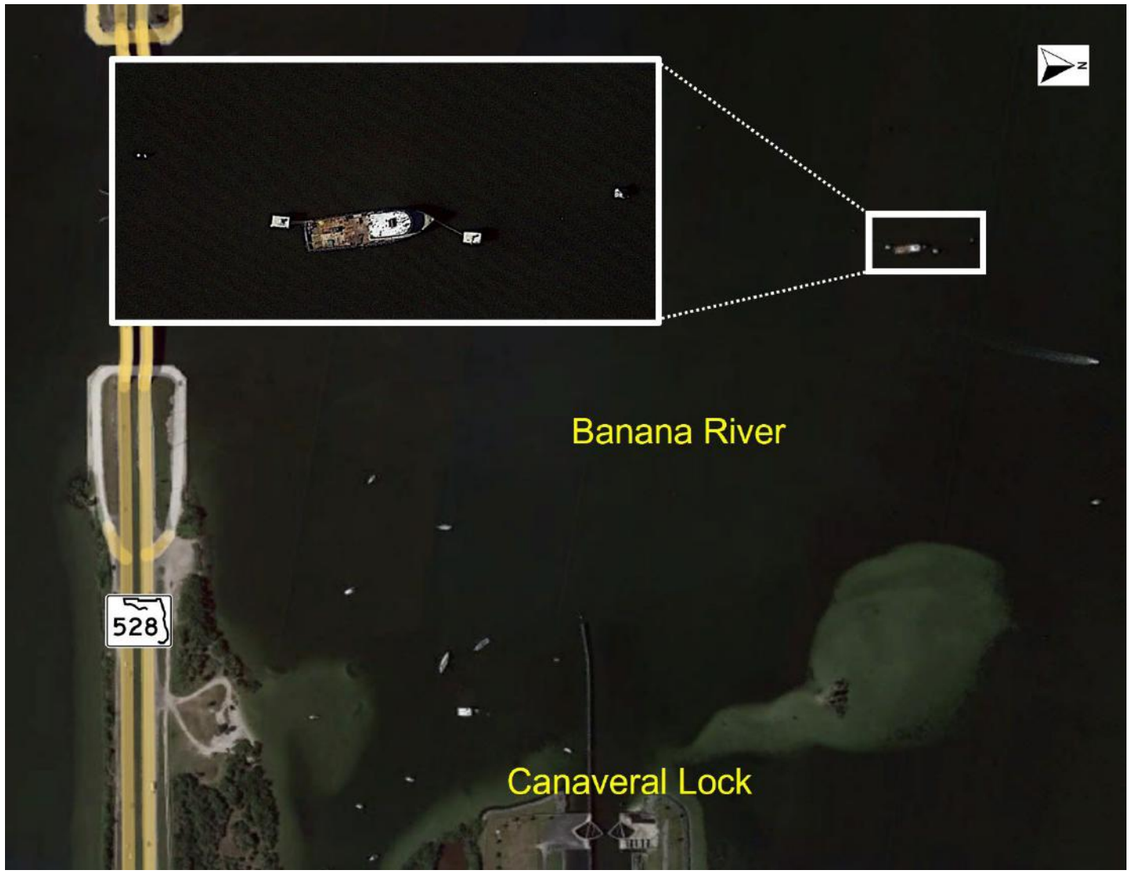
Site 1 – Middle Turning Basin

As part of Phase 1 and Phase 2 of the recommended concept, mooring would not be prohibited along the new wharf facilities in the Middle Turning Basin. However, any moored vessels would not be permitted to interfere with U.S. Army operations.

Site 2 – Banana River

There are existing concrete piles in the Banana River immediately north of the Barge Canal and west of the Banana River Channel, with room for additional piles west of the main channel and south of the channel to Kars Park. Dredging in this area is maintained by NASA and can be maintained for use by any vessel that can safely navigate the Canaveral Locks. This area is illustrated in Figure 23.

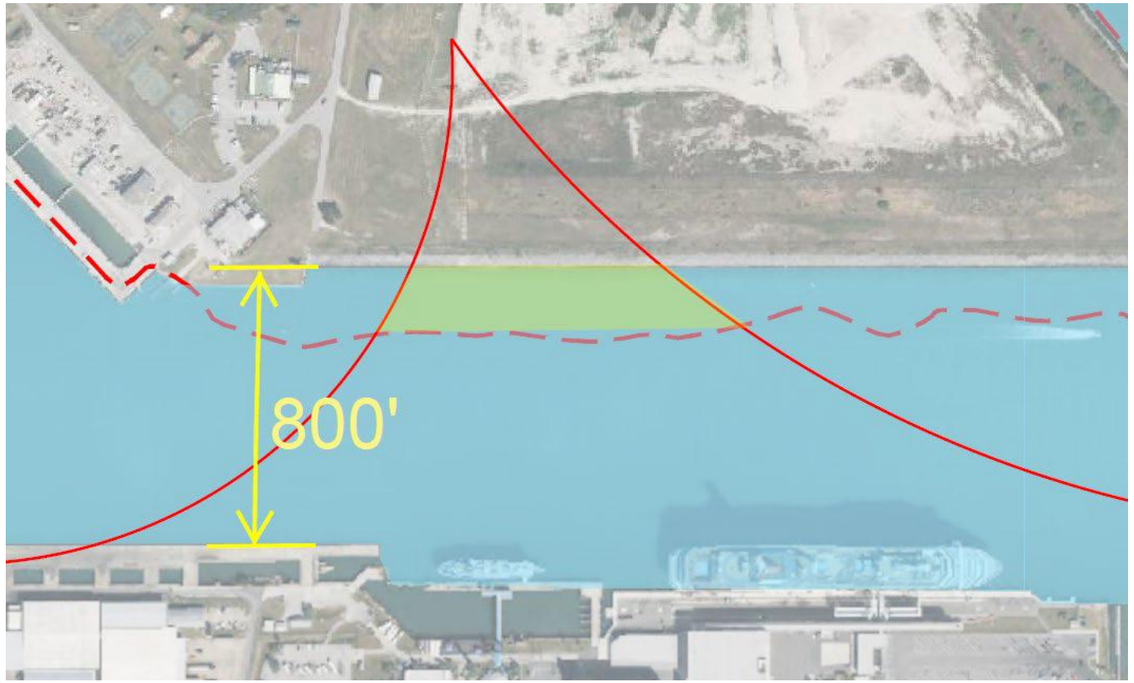
FIGURE 23 – MOORING SITE 2



Site 5 – Canaveral Channel between Middle and East Turning Basins

There is a small area on the north side of the Canaveral channel between the Middle and East Turning Basins not within the existing Poseidon and Trident ESQD arcs where it may be possible to add mooring piles. There is a 500-foot clearance that must be maintained within the Canaveral channel; however, there appears to be ample space in this area to accommodate limited mooring. This area is highlighted in Figure 24, with the ESQD arcs in red and the original shoreline shown as a dashed red line.

FIGURE 24 – MOORING SITE 5



Resiliency

Changes in sea levels impact local water levels, wave action, and currents, potentially impacting the existing shoreline configuration through flooding and increased erosion. To provide flood protection for existing adjacent properties, design elevations of the terminal bulkhead for a new wharf facility should consider water level design criteria that includes future sea level rise projections to provide long-term flood protection during initial construction or be designed for phased elevating with sea level rise.

APPENDIX H – BUSINESS CASE

The charges applied to commercial LSP vessels and their cargo are unique to the maritime industry; however, the charges summarized in this section are based off the commercial port model used by the Canaveral Port Authority to charge vessel owners for the use of its deepwater berths, heavy load infrastructure, and other charges to support the business model for maritime infrastructure. These charges are an estimate and based off publicly available data. As with all business models, individual contracts can be negotiated, and reduced rates with minimum annual guarantee (MAG) limits can be established to ensure berth and infrastructure availability for long-term needs. All estimated costs are reported in 2023 dollars.

CONSTRUCTION COST ESTIMATE

Table 17 shows the rough order magnitude construction cost estimates per phase, as well as an annual cost based on a 30-year amortization and 6% interest rate. The cost per barge call is also included based on an expected rate of 60 barge calls per year.

An expanded cost estimate table is provided in Appendix Q.

PRICING AND SOURCES OF REVENUE

Long-term maritime cargo and cruise industry contracts can be negotiated for prolonged periods, including 10- to 50-year agreements with multiple concessions or potential cost savings agreed upon by both parties. For this analysis, only publicly available rates based on the Canaveral Port Authority Tariff (October 2023), shown in Appendix N, were used to calculate potential fees. Given the specialized cargo typically moved across the dock by commercial LSP vessels, typical fees are based on weight or measurement charges; these rates shall be charged on the basis of weight (per ton) or measurement (per 40 cubic feet), whichever produces the greater revenue amount.

The developer has two options for pricing:

1) Price all facilities at the same level based on the pro-rata share of the long-term total construction project.
2) Offer a discount for early users on the first three berths, and then reassess the future phases based on commitments for additional capacity at a higher rate.

BUSINESS CASE SCENARIOS

For this Study, three scenarios have been developed, as follows:

- Scenario 1 – Assumes that only Phase 1 will be developed.
- Scenario 2 – Assumes that only Phases 1 and 2 will be developed.
- Scenario 3 – Assumes that all Phases 1-7 will be developed. This Scenario recognizes that the large outlay of capital expenditure required in Phase 3 can only be justified if all remaining Phases are developed to spread the cost across a greater number of berths and maximize the return on investment (ROI).

SCENARIO 1 – DEVELOP PHASE 1 ONLY

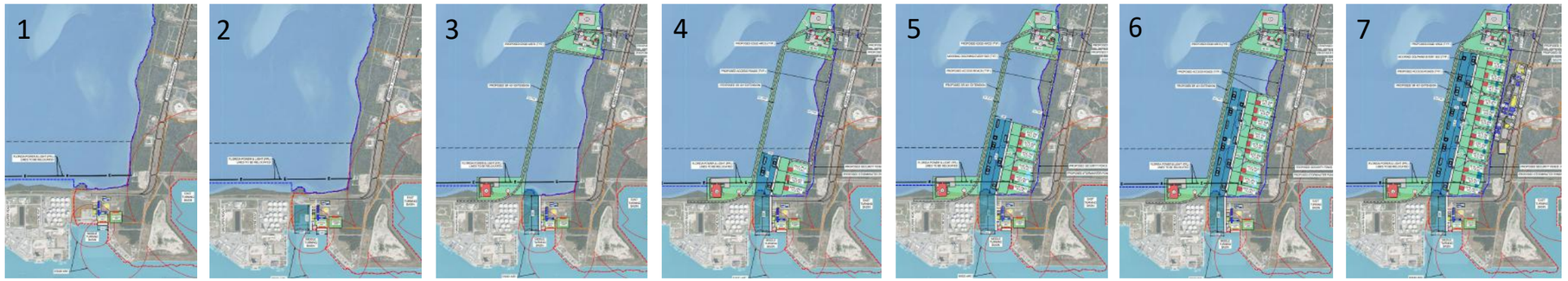
As shown in Table 18, the estimated development cost for Phase 1 only – including costs for design, permitting, construction management, and contingency – is approximately $42.2M.

TABLE 18 – ESTIMATED COSTS FOR PHASE 1 ONLY

Cost Item	Phase 1
Raw Cost Subtotal	**$28,110,037**
Design, Permitting, and CM (10%)	$2,811,004
Contingency (40%)	$11,244,015
Total Cost	**$42,165,055**
Annualized Cost	$3,063,245
Number of Berths	1
Average Annualized Cost Per Berth	**$3,063,245**

Amortized over 14 years with an interest rate of 6%, the annual development cost for Phase 1 only is approximately $3.1M. The total capacity gained by the entire project is one new berth dedicated to the commercial space industry.

TABLE 17 – CONSTRUCTION COST ESTIMATE PER PHASE



Phase	1	2	3	4	5	6	7
Construction Cost ($M)	$42	$179	$672	$342	$269	$264	$316
Annual Cost ($M)	$3.1	$13.0	$48.8	$24.9	$19.6	$19.2	$23.0
Cost per Barge Call @ 60 Calls/Year	$51,000	$ 216,000	$ 814,000	$ 138,000	$ 109,000	$ 107,000	$ 128,000
Cumulative Cost per Barge Call	$51,000	$ 134,000	$ 360,000	$ 249,000	$ 202,000	$ 178,000	$ 168,000

SCENARIO 2 – DEVELOP PHASES 1 AND 2

As shown in Table 19, the estimated development cost for Phases 1 and 2 – including costs for design, permitting, construction management and contingency are approximately $221 million.

TABLE 19 – ESTIMATED COSTS FOR PHASES 1 AND 2

Cost Item	Phase 1	Phase 2	Total
Raw Cost Subtotal	**$28,110,037**	**$119,113,333**	**$147,223,370**
Design, Permitting, and CM (10%)	$2,811,004	$11,911,333	$14,722,337
Contingency (40%)	$11,244,015	$47,465,333	$58,889,348
Total Cost	**$42,165,055**	**$178,670,000**	**$220,835,055**
Annualized Cost	$3,063,245	$12,980,181	$16,043,426
Number of Berths	1	1	2
Average Annualized Cost Per Berth	**$3,063,245**	**$12,980,181**	**$8,021,713**

Amortized over 14 years with an interest rate of 6%, the annual development cost for Phases 1 and 2 is approximately $16 million. The total capacity gained by the entire project is two new berths dedicated to the commercial space industry.

SCENARIO 3 – DEVELOP ALL PHASES 1-7

As shown in Table 20, the total estimated development cost for all seven phases – including costs for design, permitting, construction management, and contingency, is approximately $2.1 billion.

TABLE 20 – SUMMARY OF TOTAL ESTIMATED COSTS

Cost Item	Total
Raw Cost Subtotal	**$1,390,114,693**
Design, Permitting, and CM (10%)	$139,011,469
Contingency (40%)	$556,045,877
Total Cost	**$2,085,172,039**
Annualized Cost	$151,485,479
Number of Berths	15
Average Annualized Cost Per Berth	**$10,099,032**

If this is amortized over 30 years with an interest rate of 6%, the annual development cost for the entire project is approximately $150 million. The total capacity gained by the entire project is 15 new berths dedicated to the commercial space industry. The average annual development cost per berth (in 2023 dollars) is therefore approximately $10 million.

These numbers suggest that the expected annual tenant rent on a per-terminal basis would need to be at least $4 million and perhaps as high as $7-$8 million per year per terminal. This is substantially higher than historical revenue from rocket recovery operations at Port Canaveral. There are two primary options to develop a viable business case for this long-term- development. The first is to secure development grants from the Federal government so that the developer, and eventually the tenants, are not burdened with the full cost of development. The second is simply to charge a higher rent than has historically been charged for use of existing shared facilities within the port.

The business case risk with the development includes national or global economic changes that could negatively impact the industry or uncertainty for revenue guarantees that could result in default on construction bonds. The largest risk is for Phase 3 and beyond because a cost of over $300 million is required for roadway relocation and landform creation for the security gate, museum, and other ancillary facilities that do not directly contribute to space operations.

CURRENT REVENUE VS. FUTURE DEVELOPMENT COST

Long-term maritime cargo and cruise industry contracts can be negotiated for prolonged periods, including 10- to 30-year agreements with multiple concessions or potential cost savings agreed upon by both parties. For this analysis, only publicly available rates based on the Port Canaveral Tariff (Oct. 2023) were used to calculate potential fees.

Given the specialized cargo typically moved across the dock by commercial aerospace vessels, typical fees are based on weight or measurement charges, and these rates shall be charged on the basis of weight (per ton) or measurement (per 40 cubic feet), whichever produces the greater revenue amount. Information regarding CPA Tariff (No. 16) including dockage fees, commercial lay berth, minimum dockage, wharfage, and crane fees can be found in Appendix N.

In summary, per CPA Tariff (No. 16), the estimated charges for a 350-foot barge vessel offloading a standard rocket booster with a three-day turnaround time are shown in Table 21 below.

TABLE 21 – ESTIMATED STANDARD BOOSTER OFFLOAD CHARGES

Cost Item	Current Charge
Dockage (Rule 605)	$5,198
Wharfage (Rule 705)	$102,789
Crane Rental Mob./Demob. (Rule 902)	$730
Crane Rental per 4-Hour Block (Rule 902)	$13,230
Misc. (Rules 572, 1100, 1110)	$1,121
Total	**$123,068**

Table 22 shows an estimated fee for a larger rocket type using the same vessel and estimated three-day turnaround time. This is for illustrative purposes only to compare current 2023 charges for different rocket types under the current tariff.

TABLE 22 – ESTIMATED LARGE BOOSTER OFFLOAD CHARGES

Cost Item	Estimated Charge
Dockage (Rule 605)	$5,198
Wharfage (Rule 705)	$208,319
Crane Rental Mob./Demob. (Rule 902)	$730
Crane Rental per 4-Hour Block (Rule 902)	$13,230
Misc. (Rules 572, 1100, 1110)	$1,121
Total	**$228,598**

By way of comparison, Figure 25 shows the break-even revenue per barge call based on 60 calls per year. This is shown both for each individual phase as well as on a cumulative development basis. For example, the cost per call for Phase 3 as a stand-alone project is over $800,000, but the total cost for Phases 1-3 combined is a still very high but relatively lower $340, 000.

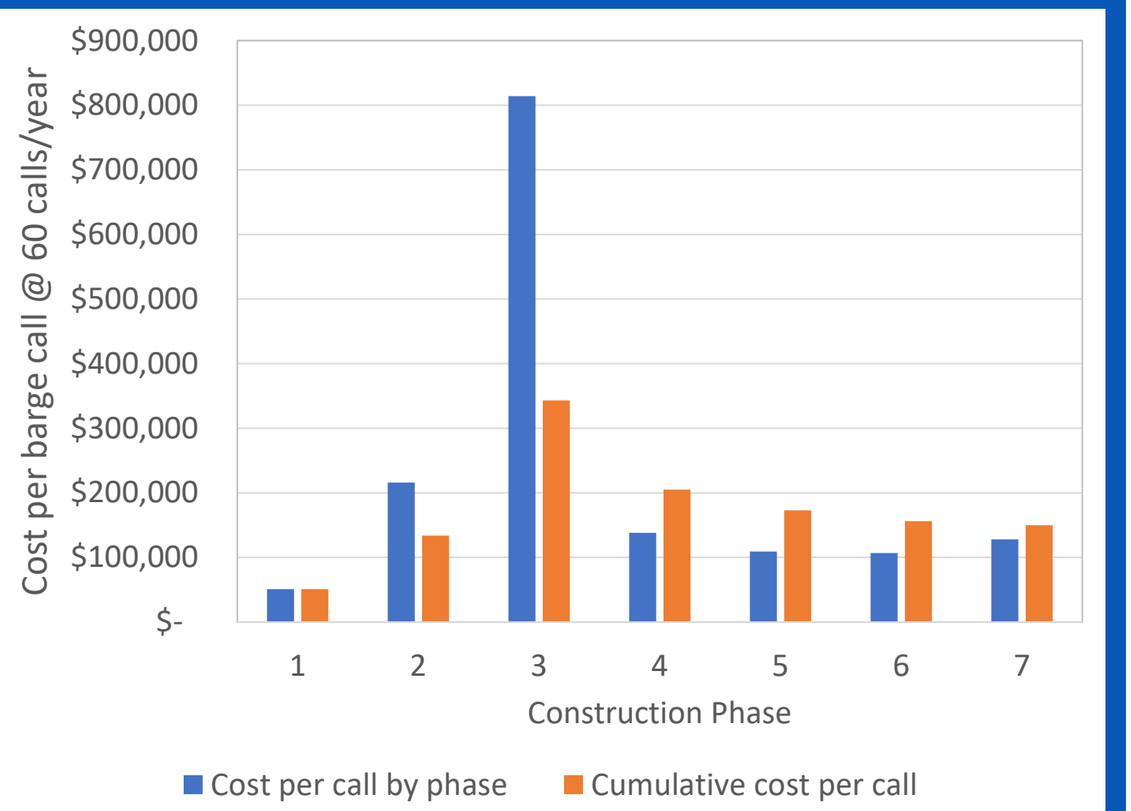
As indicated in Figure 25, the current revenue rate for barge calls undertaking rocket recovery at approximately $60k per call is lower than the rate of over $100k per call that will need to be charged to cover future development of capacity for this type of activity at Port Canaveral. Future development will depend on a combination of grants or other external sources of funding combined with perhaps much higher rates of rent and/or use fees from private operators.

The future phases of this Study must identify the new facility's operator. Potential operators may include:

- FDOT
- A "Spaceport Authority," created by the Florida Legislature
- An LSP Consortium
- CPA
- USSF
- NASA

During stakeholder coordination, NASA and USSF indicated a preference for other entities to operate the new wharf so as not to interfere with their primary missions.

FIGURE 25 – COST PER CALL



APPENDIX I – FUNDING OPTIONS

Given the project's high cost, it is likely that several funding sources will be required. To understand the funding options for the project, a number of potential funding sources and scenarios were assessed to help illustrate the various options available for financing this project. This is not a complete funding strategy, but rather an illustration of the types of sources that might apply and the considerations in using them. Potential funding sources may include:

- Loan Financing
  - Including loan financing from the Transportation Infrastructure Finance and Innovation Act (TIFIA)
- Federal Funding Programs
  - U.S. Department of Transportation (USDOT) Discretionary Grants
  - DoD/Military Grants
- State Funding Programs
  - State of Florida/FDOT Grants
- Private Funding
  - LSP Partnerships
  - Private Developer/Public-Private Partnership

This section discusses key information, eligibility requirements and cost implications associated with these funding sources. An analysis of potential funding scenarios is provided for illustrative purposes.

LOAN FINANCING

Loans or bonds are potentially large instruments for supporting large-scale infrastructure projects of this nature. On the one hand, they provide immediate access to funds during the construction phase, when large capital outlays are required. However, depending on interest rates and terms, loan financing can be an expensive funding option and may need to be repaid by subsequently high user fees/prices.

The TIFIA may provide the possibility of loan financing at a lower rate, 4.37% for a 35-year loan[1]. However, TIFIA typically only funds 33% of project costs – rising to 49% if a strong rationale for assistance is provided – and to be eligible for TIFIA projects must:[2]

- Show creditworthiness,
- Foster partnerships that attract public and private investment for the project,
- Have the ability to proceed at an earlier date,
- Reduce contribution of federal grant assistance, and
- Be able to begin construction contracting process within 90 days of TIFIA credit instrument receipt.

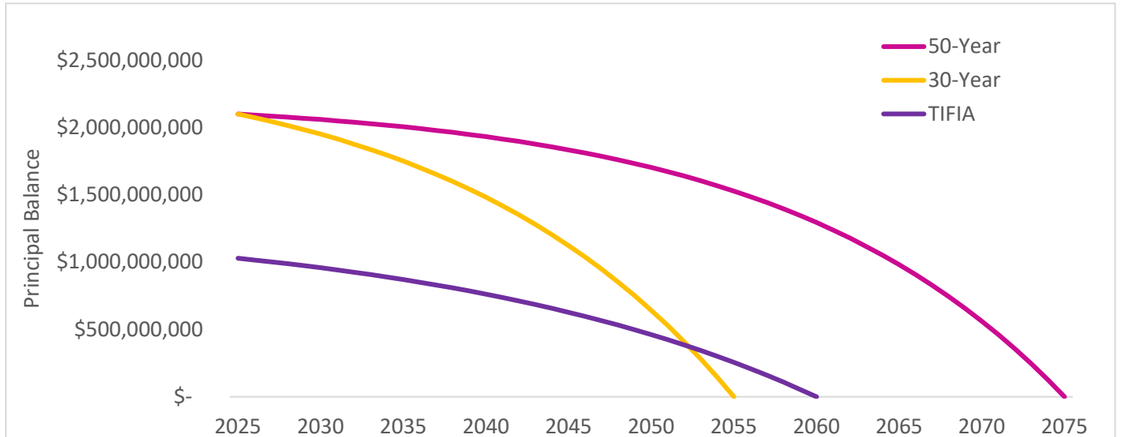
As shown in Table 23 and Figure 26, the various interest rates and loan terms available on the market can have a significant impact on project costs. The annual payment (including interest and principal) for a 30-year loan to cover all 7 phases of the project would be approximately $152.6 million – assuming a 6% interest rate. Spread over 50 years, the annual payment would be $133.2 million. Alternatively, funding 49% of the project through TIFIA would result in an annual payment of $57.9 million.

[1] TIFIA rate of 4.37% at December 5, 2023
[2] Further analysis will be conducted to determine eligibility for TIFIA financing

TABLE 23 – ANNUAL PAYMENTS FOR DIFFERENT LOAN FINANCING OPTIONS

Loan Type	Principal Balance	Interest Rate	Loan Term	Annual Payment
30-year	$2.1 billion	6%	30	$152.6 million
50-year	$2.1 billion	6%	50	$133.2 million
TIFIA	$1.02 billion	4.37%	35	$57.9 million

FIGURE 26 – REPAYMENT SCENARIOS – LOAN FINANCING



Further monitoring and assessment of loan financing opportunities will continue for the project. This will, for instance, include an evaluation of the opportunity of loan financing from Florida's State Infrastructure Bank – a revolving loan and credit enhancement program that provides loans and other assistance to public and private entities proposing to carry out projects which:

- Are on the State Highway System,
- Provide for increased mobility on the state's transportation system, or
- Provides for intermodal connectivity with airports, seaports, rail facilities, transportation terminals, and other intermodal options for increased accessibility and movement of people, cargo, and freight.

FEDERAL FUNDING PROGRAMS

Federal funding programs, primarily in the form of discretionary grant opportunities, provide an additional potential source of funding for this project. Assessing the size of the opportunity from this funding source is a multi-step process that requires targeted approach, including:

- Program evaluation and identification of suitability for candidate project (ongoing),
- Project positioning,
- Identifying partnering opportunities, and
- Taking interim steps to improve competitiveness.

To date, various federal funding programs have been identified which may be suitable for the project. Most notably, the project aligns with the objectives of the Port Infrastructure Development Program (PIDP), which provides over $650 million annually to projects which improve the safety, efficiency, or reliability of the movement of goods into, out of, around, or within a port. As shown in Table 24, there are a variety of other federal funding programs which may be considered at this stage of planning. Many of these programs target a broader range of infrastructure typologies, which can include ports. For instance, the Multimodal Projects Discretionary Grants (MPDG) Program includes MEGA, INFRA and Rural grants, which have significant annual funding pools of between $675 million and $1.5 billion. Other funding programs worth consideration, given the rural location and potential for economic development, are USDOT's RURAL grant program, and the Economic Development Administration's grant for Public Works and Economic Adjustment Assistance.

TABLE 24 – FEDERAL FUNDING OPPORTUNITIES

Funding Program	Applicable Infrastructure	Annual Funding Pool	Minimum Match
Port Infrastructure Development Program (PIDP)	Port and Related Freight Infrastructure	$662 million	20% (or lower if rural)
National Infrastructure Project Assistance (MEGA)	Highways, Bridges, Intermodal Freight Intercity Passenger Rail	$1 billion	40%
Rebuilding American Infrastructure with Sustainability and Equity (RAISE)	Roads, Bridges, Transit, Rail, Ports, and Intermodal Transportation	$1.5 billion (max $45m award)	20% (lower for rural, HDC, Area of Persistent Poverty
Economic Development Administration (EDA) Public Works and Economic Adjustment Assistance Programs (PWEAA)	All Public Works	$121 (max $30m award)	50%
Infrastructure for Rebuilding America (INFRA)	Highways, Bridges, Freight, Grade Separation/Crossing, Marine Highway	$1.5 billion	40%
Rural Surface Transportation Grant Program (Rural)	Highway, Bridge, Tunnel, or Highway Freight	$675 million	20%

Further analysis and discussions with stakeholders will be required to determine the extent to which these federal funding programs provide achievable funding opportunities for the project. This will include exploring the feasibility of obtaining federal grants for the site, which may involve issues because of funding rules regarding federal lands.

State Funding Programs

In addition to Federal funding programs, there may also be grant opportunities available at the State level which can be targeted – albeit with significantly lower funding pools.

As in the case of federal funding programs, further analysis and discussions with stakeholders (including state funding program officials) will clarify the projects eligibility and likelihood of success for receiving these State grants.

Loan and/or Grant Funding Scenarios

In Order to illustrate the range of potential funding scenarios the following figures are included.

Figure 27, which illustrates cost per call with TIFIA, includes the following alternatives:

TIFIA (0% Grants) Cumulative – Phases 1-3 are funded through the TIFIA program at an interest rate of 4.37% and a 35-year amortization. Phases 4-7 are funded at a 6% interest rate and 30-year amortization.
TIFIA (20% Grants) Cumulative – This scenario has an identical loan structure to the previous scenario with 20% of project costs covered by grant funding.
TIFIA (40% Grants) Cumulative – 40% of project costs are funded through grant programs.

Figure 28, which illustrates cost per call without TIFIA, includes the following alternatives:

No TIFIA (0% Grants) Cumulative – All project costs are financed with a 6% interest rate and 30-year amortization.
No TIFIA (20% Grants) Cumulative – 6% interest rate and 30-year amortization. 20% of project costs are covered by grant funding.
No TIFIA (40% Grants) Cumulative – 6% interest rate and 30-year amortization. 40% of project costs are covered by grant funding.

FIGURE 27 – COST PER CALL WITH TIFIA

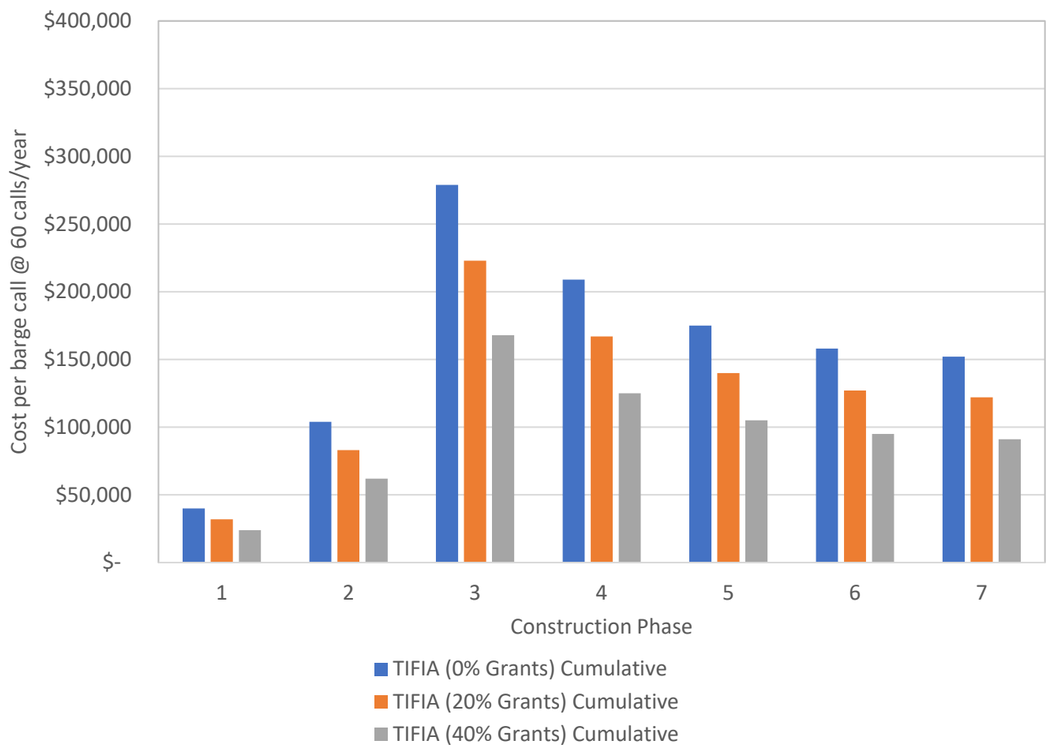
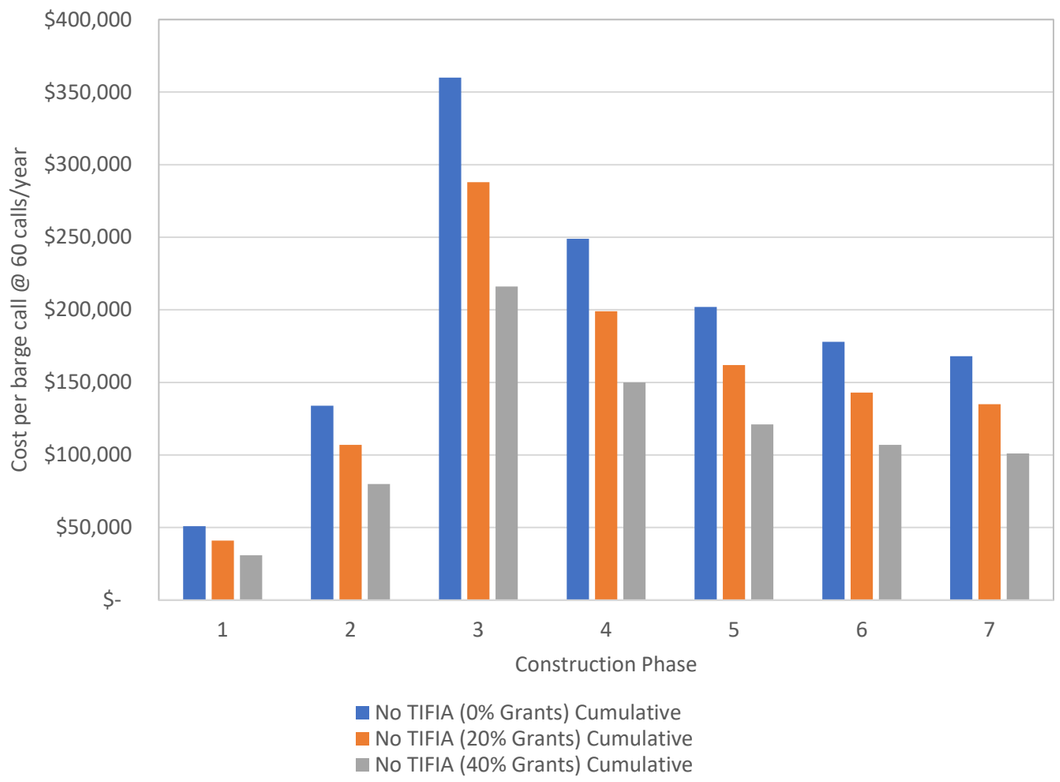


FIGURE 28 – COST PER CALL WITHOUT TIFIA



TIFIA funding scenarios result in the following costs per barge call:

- TIFIA (0% grants) - $152,000
- TIFIA (20% grants) - $122,000
- TIFIA (40% grants) - $91,000

Funding scenarios which do not use TIFIA financing result in the following costs per barge call:

- No TIFIA (0% grants) - $168,000
- No TIFIA (20% grants) - $135,000
- No TIFIA (40% grants) - $101,000

Note that 60% grant funding, with TIFIA, would result in a $61,000 cost per barge call (in line with current revenue rates). However, given the size of the investment, this level of grant funding is not likely to be feasible.

PRIVATE FUNDING SOURCES

It is important to explore the possibility of non-public funding sources for the project. A variety of private companies (e.g., commercial LSPs) will be in place to benefit from the port development, and therefore may be willing to contribute and/or partner with Space Florida on the project financing. This will be explored in future planning phases.

CONCLUSION AND NEXT STEPS

As demonstrated in Appendix H, the current revenue rate for barge calls undertaking rocket recovery is approximately $60k per call, which is significantly lower than the estimated rate of over $150k per call that needs to be charged to cover the planned development. In addition, the expenditure required for all seven phases of the proposed development has a significant capital outlay, which will require the availability of funds in the near term.

This section has identified and assessed some of the different funding pathways which Space Florida could consider addressing the funding gap and reduce the cost per barge call borne by the Port, including:

Loan financing: A 6% loan over 30 years would lead to a cost per barge call of $168,00 at the end of the 7-stage development period. However, this could be reduced to $152,000 per call through TIFIA loan financing, which offers a lower interest rate (4.37%) for approximately half of the investment.

Grant opportunities: A range of federal and state funding programs offer grant opportunities which may be available to Space Florida for this development, including the Port Infrastructure Development Program (PIDP) and Strategic Port Investment Initiative (SPII). While eligibility for these funds will need to be further investigated, these can help to reduce the cost per call to $122,000 per call if they were to cover 20% of the total costs. To keep the development costs in line with the $60k per call, which is currently charged, grant funding would need to cover approximately 60% of total funds, with the remainder financed through TIFIA.

Private funding: Given the costs associated with loan financing, and the limited availability of State and Federal grant opportunities, there is a need to explore potential partnerships and contributions from the private sector.

APPENDIX J – QUESTIONNAIRES

Space Florida and FDOT
Maritime Intermodal Transportation Study (Wharf Study)
Stakeholder Operations Questionnaire

Aerospace Company Name:
Point of Contact:
Phone:
Email:

1. What type of vessel do you anticipate using for ocean recovery that would be moored for offloading (e.g., Barge, Modified Cargo Vessel, Modified Tug, Other). What is the minimum amount of dock space (linear feet) to moor your vessel or vessels? Minimum draft for your vessel or vessels?
2. What will the frequency/cadence of this look like for recovery? Please provide short term (2 years), medium term (5 years) and long term (10 years) outlook for demand for your business.
3. Once equipment has been transported to a wharf, what landside equipment (e.g., stand-alone cranes, fixed rail gantries, trailer tug/bobtails, etc.) do you anticipate you will require for recovery operations from vessel to dockside to landside transport to off-site? What type of equipment do you plan to use for unloading and loading from barge or support vessels?
4. What emergency and/or hazardous materials response equipment would be most appropriate? Do you plan to have ordnance or hazardous propellants on the vehicle during recovery operations? Are there any third-party services needed during offload activities (fire, hazmat, or inspection services)? If so, how often and would this influence offload times?
5. Do you anticipate requiring a permanent berth to dock your vessel during non-operational time? How many homeporting docks do you anticipate for your business?
6. The transient nature of wharf operations is intended to support loading/unloading only. What is the anticipated "turn-time" for offloading (from mooring to casting off)?
7. Do you foresee the need for surface infrastructure (office/operations/communications/storage/hazmat storage buildings) at a potential site? If yes provide type, estimated size and estimated occupancy.
8. Do you anticipate any of your operations restricting the movement of other vessels or being near occupied facilities or within a given radius? Quantity Distance (ESQD) arc, Public Transit Route, safety, security, etc.
9. On average, how long does it take to remove your rocket booster or other aerospace equipment from barge or support vessel?
10. How long does the booster remain on the dock after it has been removed from the barge? How long does it take for a booster to be moved/transferred off the dock?
11. Does your company anticipate passenger-related operations (for instance, moving passengers from maritime vessels to shore facilities)?

Disclaimer: The Aerospace Company Name or Contacts will not be shared with the general public. All data will be considered proprietary and will only be used to make common wharf sizing assumptions. The Study will summarize types of vessels, fleet projections, wharf space and operating models/scenarios-based information received from all stakeholders.

Space Florida and FDOT
Maritime Intermodal Transportation Study (Wharf Study)
Follow-Up Stakeholder Operations Questionnaire

Aerospace Company Name:
Point of Contact:
Phone:
Email:

1. Which vessels do you currently use or plan to use that can fit through the Canaveral Locks (600 feet long, 90 feet wide, and 12 feet deep)?
2. There are 2 sets of powerlines west of the SR 401 bascule bridges that restrict the air drafts to 65 feet. What type of vessels does your company plan to use or currently uses that can go under the existing power lines?
3. What is the offload time for RoRo Operations for non-recovery operations, i.e., horizontal or vertical rocket infrastructure?
4. What is the duration for booster recovery operations for the following:
    i. When a barge comes in with a recovered booster, how long does it take between the time the barge docks and the booster is unloaded?
    ii. How long is the barge docked during recovery (assuming no maintenance is required)?
    iii. How long are support vessels docked?
    iv. How long is the recovered booster on the dock (within 200' of water) prior to transport where no other ops can occur?
    v. Can a recovered booster be removed from berth/CPA property after offloading directly onto transporter? If yes, how long does that take?
5. What is the duration of post-launch processing either at a berth/cargo storage area/shipyard in the following scenarios:
    i. If a recovered booster is moved into the cargo area for further maintenance/processing, how long is it there until the booster is transported off CPA property? Is the maintenance performed while the vehicle is on the transport vehicle, or does it require additional transport?
    ii. How long does a recovery barge/vessel need to sit at a dock/wharf for maintenance/repairs to the vessel?
6. Is it feasible to offload a recovered booster and immediately move the vessel to another area for maintenance/shipyard operations?

APPENDIX K – FATAL FLAWS DEVELOPMENT BANANA RIVER/WEST OF SR 401

Several sites on the Banana River were under consideration as part of this Study, including AF Wharf in the CCSFS Industrial Area, the VAB Basin, which supports RoRo operations for SLS components, and the ITL Area. All sites under consideration would be accessed via the Canaveral Lock between Port Canaveral and the Banana River. As the Study progressed, and after stakeholder conversations, It became evident that there would be many challenges involved in moving retrieval vessels from the Port side of SR 401 into the Banana River. The list below provides an overall summary of the key technical, cost, and schedule challenges for alternative options west of SR 401.

1. *Restricted Navigation Channel*: The existing Saturn Channel (Banana River Channel) and Barge Canal channel (between Canaveral Locks and West Turning Basin) can only accommodate vessels under 90 feet wide and 600 feet long. The navigable channel depth is restricted to 12 feet, which cannot accommodate the draft requirements of existing and proposed retrieval vessels.

2. *Canaveral Lock*: The existing lock is 90 feet wide and 600 feet long and can accommodate marine vessels with drafts of less than 12 feet. Based on discussions with the US Army Corps of Engineers (USACE), it is not feasible to replace the Canaveral Locks to allow transiting of the projected future fleet of launch support vessels, which would require dimensions of 600 feet long, 150 to 200 feet wide, and a channel depth of 30 feet. The replacement of the locks could require congressional approval to change the usage type (recreation) or purpose of the locks.

3. *Existing SR 401 Bridge Replacement* (3 segment bascule bridges): The horizontal clearance of the existing SR 401 Bascule Bridges is 90 feet, so passage under the bridges is restricted to vessels less than 90 feet wide. Due to the roadway geometry of SR 528 and SR 401, there are land constraints that limit changes to roadway geometry. To accommodate future vessels, a fixed replacement bridge (as of July 2023, a 65-foot fixed bridge is the Preferred Alternative from FDOT's PD&E Study) would need a horizontal and vertical clearance of at least 150 feet each just to support current commercial space operations, which is not feasible due to the aforementioned geometric constraints of the existing roadway network.

4. *Saturn/Banana River Channel Dredging* (widening and deepening): The extent of new capital dredging work required would be significant along the Banana River. The dredging and disposal of material will mainly depend on where the wharf is to be located: i.e., in the VAB Basin, adjacent to Cape Canaveral Space Force Station (CCSFS) Hangar AF Wharf, or other areas on KSC/CCSFS property north and south of the Roy D. Bridges Bridge (bascule bridge).

5. *Existing Roy D. Bridges Bridge Replacement* (2 segment bascule bridges): It is not feasible to replace this bridge with a fixed-span bridge because of similar concerns mentioned above for the SR 401 Bascule Bridges. Replacement with a new bascule bridge would need to allow for vessel widths of up to 150 feet.

6. *Replacement of Existing Florida Power and Light (FPL) Powerlines*: The vertical clearance of FPL's primary distribution lines crossing the Banana River and secondary distribution lines adjacent to and west of SR 401 are 85 feet to account for 65 feet of navigable clearance plus 20 feet of arc flash. These lines will need to be relocated and/or raised to allow the future vessel fleet to pass safely. As a reference point within KSC/CCSFS, the highest FPL overhead powerlines provide vertical clearance of 100 feet to accommodate rocket stages.

7. *No Existing Support Facilities or Assets for Recovery Cadence*: There are no existing wharves west of the Canaveral Lock that can support current or future operations.

8. *Environmental Considerations and Constraints*:

    a. USACE lead Environmental Impact Statement for lock replacement and dredging.

    b. FDEP and St. Johns River Water Management Permitting for impervious area and water quality impacts, wetland impacts, and mitigation.

    c. USFWS and NMFS consultation for potential impacts to wildlife species (manatee and wood stork) and habitat (essential fish habitat, seagrasses).

9. *Very High Capital Costs*: Several infrastructure projects will be required to accommodate a new wharf and/or additional maritime facilities West of SR 401 which include:

    a. Canaveral Lock replacement.

    b. Dredging of channels (widening/deepening and disposal of materials).

    c. Roy D. Bridges Bridge replacement.

    d. SR 401 Bridge replacement.

    The total additional cost of these infrastructure projects' reconstruction or upgrades will be excessive (on the order of $1.5B-$2B), which does not include the planning or construction of the wharf and support area and is unlikely to be feasible to support the business case.

10. *Schedule:*

    a. Any modification to locks would require 5 to 10 years.

    b. Additional 2 to 4 years for feasibility and/or NEPA studies.

Due to the reasons indicated above, sites within the Banana River/West of SR 401 were removed from further consideration.

APPENDIX L – ASSET PHOTOS

KEY ASSET PHOTOS

Canaveral Locks (closeup)


Main Channel


Rocketship Wharf (Delta Mariner Wharf)


Canaveral Locks/Channel


SR401 Bascule Bridges


FPL Powerlines w/ of SR 401 Bridges

KEY ASSET PHOTOS

LSP Proposed Recovery Boat


Hangar AF Wharf - CCSFS


SPACEX booster/drone ship/SSV


VAB Turn basin/wharf/dock- KSC


The Spaceport Company Launch from Sea

Blue Origin overland transporter near LC39A/KSC

APPENDIX M – PRELIMINARY ENVIRONMENTAL CONSIDERATIONS

ENVIRONMENTAL PERMITTING

Depending on the type of project proponent and project location, an assortment of local, state, and/or federal environmental permit authorizations may be required. Generally, resource agencies evaluate impacts based on the degree of adverse impacts (commensurate to impact). As the number and/or significance of project impact(s) grows, so may the overall review time and/or level of studies/documentation necessary to obtain an authorization.

The following sections will briefly discuss the potential environmental permit requirements and identify their applicability based on project zone and project activity.

State Permits

There are two (2) primary state environmental permitting authorities in the study area: Florida Department of Environmental Protection (FDEP) and St. Johns River Water Management District (SJRWMD). Between these two (2) agencies, three (3) principal permit authorizations may be required:

Environmental Resource Permit (ERP) - Required for work that affects state waters, including wetlands. FDEP has responsibility for the review and issuance of ERPs in whole or in part, seaward of the coastal construction control line, navigation dredging conducted by government entities, seaports, and docking facilities.
Submerged Land Lease (SLL) - Required for any construction on or use of submerged lands owned by the state of Florida.
Joint Coastal Permit (JCP) - Required for all coastal construction including, "*any work or activity on or encroaching upon sovereignty lands of Florida, below the MHW Line of any tidal water of the state, which is likely to have a material physical effect on existing coastal conditions or natural shore and inlet processes.*" When an activity requires a JCP, FDEPs BIPP also processes any required ERP and/or SLL as part of the JCP review.

All six (6) of the alternatives may require both an ERP and JCP. The only alternative on state submerged lands appears to be the Zone 4-Atlantic zone. The typical review time for these is 1 to 2 years. The higher the level of complexity, the longer the review required. Therefore, alternatives that require changes to Canaveral Lock, construction of a new facility, or dredging a new channel would likely require more studies and increase scrutiny then alternatives that involve modification or expansion of an existing facility or modification to an existing dredged channel.

Depending on the project location and/or activities, additional state authorizations may be required. Any construction (land clearing) or industrial (operational) stormwater discharge into a surface water or municipal separate storm sewer system (MS4) must comply with a state National Pollution Discharge Elimination System (NPDES) Generic Permit or obtain an individual NPDES state permit authorization.

Certain additional state authorizations are required when either the project proponent is a federal agency, or the activity also requires a federal permit. Section 401 of the Clean Water Act requires certification or a waiver from the state that the federal action (activity or permit) involving the discharge of a pollutant to state waters complies with state water quality standards. Similarly, any federal agency action in Florida Coastal Zone as defined in their federally approved state coastal zone management (CZM) plan requires certification to the state that the project is consistent with Florida's CZM plan. Any federal permit requires certification from the state that the permitted activities are consistent with the CZM plan prior to issuance.

Note that while Florida's plan expressly excludes federal land from the state coastal zone, given all the alternatives on federal property also include impacts within (state waters) or adjacent to the coastal zone, compliance with the state CZM plan is likely required for all the alternatives. If an alternative occurs on state land including submerged lands and the federal permit review requires a survey for historical or archaeology resources, a state 1A-32 Archaeology Research Permit (ARP) may be required. A summary of potential state permit authorizations that may be required based on zone location and project activities is depicted in Table 25.

TABLE 25 – POTENTIAL STATE PERMIT/AUTHORIZATION REQUIRED BY LOCATION AND ACTIVITY

Permit	Location						Activity				
	1- Middle Turning Basin	2 - North Turning Basin	3 - West Turning Basin	4 - Atlantic Ocean	5 - Banana River West of SR 401	6 - East Turning Basin	Wharf (Structure and Work only)	Fill (Dredged and Fill Material)	Pile Driving[1]	Geotechnical	Dredging[2]
Joint Coastal Permit (JCP)	■	■	■	■	■	■	■	■	■	■	■
Environmental Resource Permit (ERP)	■	■	■	■	■	■	■	■	■	■	■
Submerged Lands Lease (SLL)				■			■	■	■	■	■
§401 Water Quality Certification[3]	■	■	■	■	■	■	■	■		■	■
§402 Stormwater (Construction)	■	■	■	■	■	■	■	■		■	■
§402 Stormwater (Operation/Industrial)	■	■	■	■	■	■	■	■		■	■
Coastal Zone Management Certification	■	■	■	■	■	■	■	■	■	■	■
1A-32 Archaeology Research Permit	■		■	■			■	■	■	■	■

Notes: (1) Large piles and footings that affect the reach of waters or create dry land (ex. an 8-foot diameter pile) can be treated as fill. The threshold where a pile becomes a fill is at the discretion of the agencies. (2) Dredging here is limited to dredging only. Discharge of dredged material into a regulated water would fall under the fill activity. (3) Normally pile driving is not considered a discharge under 402 or 401, but the discretion to regulate nonetheless may lie with the agency.

Federal Permits

The primary federal environmental permitting authority is the United States Army Corps of Engineers (USACE), and the three principal federal permit requirements are the following:

§10 Rivers and Harbors Act Permit - Required for structures, work, fill, or excavation in/under/over Navigable Waters of the United States. The Banana River, Canaveral Harbor, and the Atlantic Ocean are all Navigable Waters.

§404 Clean Water Act Permit - Required for the discharge of dredged or fill material in Waters of the United States. Navigable Waters are by definition waters of the United States.

§14 Rivers and Harbors Act (§408) - Required for use or alteration of a USACE federally authorized civil works project. Canaveral Harbor and Canaveral Lock are both USACE federally authorized civil works projects.

Depending on the activities, all six (6) of the alternatives likely require both Section 10 and Section 404 permit from USACE. The typical review time for these is 1 to 2 years. However similar to the state permit requirements, the higher the level of complexity, the longer the review required. Therefore, alternatives that require changes to Canaveral Lock, construction of a new facility, or dredging a new channel may require more studies and increase scrutiny then alternatives that involve modification or expansion of an existing facility or modification to an existing dredged channel. Modification of Canaveral Lock in particular may add years to the review time.

Depending on the project location and/or activities, additional federal authorizations may be required. Adverse effect to Endangered Species Act (ESA) listed species could require a permit from the United States Fish and Wildlife Service (USFWS) or National Marine Fisheries Services (NMFS), Protected Resource Division (PRD) for any incidental take of a federally listed threatened or endangered species. A Special Use permit from the USFWS may be required for any activities that are within the boundary (land/water) of Merritt Island National Wildlife Refuge (excluding existing KSC/CCSFS operational areas). Similar to the state 1A-32 ARP, an Archaeological Investigations (ARPA) permit from USFWS may be required to conduct any archaeological field investigations within the boundaries of the Merritt Island National Wildlife Refuge (NWR). A summary of potential federal permit authorizations that may be required based on zone location and project activities is depicted in Table 26.

TABLE 26 – POTENTIAL FEDERAL PERMIT/AUTHORIZATION REQUIRED BY LOCATION

Permit	Location						Activity				
	1- Middle Turning Basin	2 - North Turning Basin	3 - West Turning Basin	4 - Atlantic Ocean	5 - Banana River West of SR 401	6 - East Turning Basin	Wharf (Structure and Work only)	Fill (Dredged and Fill Material)	Pile Driving[1]	Geotechnical	Dredging[2]
§10 Rivers and Harbors Act Permit	■	■	■	■	■	■	■	■	■	■	■
§14 Rivers and Harbors Act (§408 Permit)	■	■	■		■	■	■	■	■	■	■
§404 Clean Water Act Permit	■	■	■	■	■	■		■		■	
Archaeological Investigations (ARPA) Permit	■	■	■		■	■	■	■	■	■	■
USFWS Special Use Permit		■		■	■		■	■	■	■	■

Notes: (1) Large piles and footings that affect the reach of waters or create dry land (ex. an 8-foot diameter pile) can be treated as fill. The threshold where a pile becomes a fill is at the discretion of the agencies. (2) Dredging here is limited to dredging only. Discharge of dredged material into a regulated water would fall under the fill activity.

Local Permits

Depending on the project proponent and location, environmental permits from Brevard County and/or Canaveral Port Authority may be required. If the project proponent is a private entity, they will be required to obtain all local permit authorizations. If the project proponent is the state, there is generally state guidance on the processes required, including whether a state agency must obtain a local permit authorization or comply with a local regulation. Federal agencies generally do not require local permits, however, under Florida's CZM program, federal agencies are required to coordinate through the Florida State Clearinghouse to obtain state permits or authorizations. During that process, the state will coordinate with regional planning councils and accept comments from local governments regarding the project's compliance with local planning priorities and regulations.

ENVIRONMENTAL PERMIT RISK

Environmental permit risk can vary depending on the site-specific elements of a given project. In order to estimate possible environmental compliance risk, six (6) categories of possible environmental constraints were identified including:

Special Aquatic Areas
Designated Critical Habitat
Other Protected Areas
USACE Permitting and NEPA
State of Florida Permitting
Coastal Hazards

Each category was further divided into screening criteria and risk. Tables 27, 28, 29a, 29b, and 30 identify each environmental screening criterion and the basis for assigning the level of risk [High (red), Medium (orange), Low (yellow)]. These screening criteria were then used to perform a high-level, geospatial-based screening of the six (6) project alternatives.

TABLE 27 – SPECIAL AQUATIC AREAS

Risk	Seagrass[3]	Wetland Potential[4,5]	National Wildlife Refuge (NWR)	Marine Protected Area (MPA)[6]	National Estuary (NE)[7]
High	Continuous	Wetland Present/ Undeveloped	In NWR, New Facility-New Dredging	In MPA, New Facility-New Dredging	In NE, New Facility-New Dredging
Medium	Discontinuous/or patched continuous	Wetland Present/ Developed	In NWR, Expansion Facility-New Dredging	In MPA, Expansion Facility-New Dredging	In NE, Expansion Facility-New Dredging
Low	None mapped, but possible presence	None mapped, but presence possible based on LIDAR	In NWR, Modification Existing Facility-New Dredging	In MPA, Modification Existing Facility-New Dredging	In NE, Modification Existing Facility-New Dredging

TABLE 28 – OTHER PROTECTED AREAS

Risk	Outstanding Florida Water[8]	National Register of Historic Places[9]	National Historical Landmark[10]	Section 4F
High	Outstanding FL Water-New Facility-New Dredging	Direct Impact-New/Expansion Facility	Direct Impact-New/Expansion Facility	Direct Impact-New/Expansion Facility
Medium	Outstanding FL Water-Expansion Existing Facility-New Dredging	Direct Impact-Existing Facility	Direct Impact-Existing Facility	Direct Impact-Existing Facility
Low	Outstanding FL Water-Modification of Existing Facility-New Dredging	Indirect-Viewshed	Indirect-Viewshed	Indirect-Constructive

[3] Bureau of Ocean Energy Management (BOEM) and the National Oceanic and Atmospheric Administration (NOAA). MarineCadastre. Seagrass Map Server. https://coast.noaa.gov/arcgis/rest/services/MarineCadastre/Seagrasses/MapServer. Accessed on August 07, 2023.
[4] Florida Fish and Wildlife Conservation Commission (FWC). Marine Resources Geographic information System. https://atoll.floridamarine.org/arcgis/rest/services/FWC_GIS/OpenData_MarineEco/MapServer. Accessed August 07, 2023.
[5] USFWS. National Wetland Mapper. Wetlands Map Server. https://fwspublicservices.wim.usgs.gov/wetlandsmapservice/rest/services/Wetlands/MapServer. Accessed August 07, 2023.
[6] FWC. Marine Resources Geographic information System. https://ocean.floridamarine.org/arcgis/rest/services/FWC_GIS/MRGIS_ManagedAreas/MapServer. Accessed on August 07, 2023.
[7] Environmental Protection Agency (EPA). National Estuary Study Area (NEP) Boundaries. https://epa.maps.arcgis.com/home/item.html?id=bc9b4c2e29ff4112a9d05cd030fff9fd. Accessed on August 07, 2023.

TABLE 29A – USACE PERMITTING AND NEPA

Risk	Rivers and Harbours Act Section 14 (§408) Permit	USACE Outgrant/Easement[11]	Rivers and Harbours Act Section 10 Permit	Clean Water Act Section 404 Permit	Environmental Impact Statement
High	Canaveral Lock	Outgrant/New Assumption Maintenance	New Facility New Channel	New Facility-Special Aquatic	Canaveral Lock or New Facility New Channel
Medium	Canaveral Harbor Expansion	Outgrant	Expansion Existing Deepen Channel	Existing Facility-Special Aquatic	Expansion Existing Deepen Channel
Low	Canaveral Harbor Modification	Easement	Modification Existing Deepen Existing	Existing Facility-No Special	Modification Existing/Deepen Existing

TABLE 29B – STATE PERMITTING

Risk	Joint Coastal Permit	Environmental Resource Permit	State Submerged Land Lease[12]
High	Alteration of Longshore Drift/Canaveral-New Facility New Channel	New Facility New Channel	New Facility New Channel
Medium	Alteration of Longshore Drift/Canaveral-Expansion Facility Deepen Channel	Expansion Existing Deepen Channel	Expansion Existing Deepen Channel
Low	Located on Beach or Inlet-Modification of Existing Facility	Modification Existing Deepen Existing	Modification Existing Deepen Existing

[8] FDEP. Outstanding Florida Waters. https://ca.dep.state.fl.us/arcgis/rest/services/OpenData/OFW/MapServer. Accessed on August 07, 2023.
[9] National Park Service (NPS). National Register of Historic Places. https://mapservices.nps.gov/arcgis/rest/services/cultural_resources/nrhp_locations/MapServer. Accessed on August 07, 2023.
[10] NPS. National Historic Landmarks. https://mapservices.nps.gov/arcgis/rest/services/cultural_resources/nrhp_locations/MapServer. Accessed on August 07, 2023.
[11] USACE. South Atlantic Division, Jacksonville District (SAJ) Land Tracts. https://services7.arcgis.com/n1YM8pTrFmm7L4hs/ArcGIS/rest/services/SAJ_Land_Tracts/FeatureServer. Accessed on August 07, 2023.
[12] FDEP. State Land Records. https://ca.dep.state.fl.us/arcgis/rest/services/OpenData/DSL_PARCEL_COMP/MapServer/0. Accessed August 07, 2023.

TABLE 30 – COASTAL HAZARDS[13]

Risk	High Tide Flooding	FEMA Flood Hazard Area	NOAA Category 3 Hurricane Storm Surge Water Level Risk	NOAA Category 5 Hurricane Storm Surge Water Level Risk	NOAA Flood Hazard Composite #
High	Landside/Large Area	1% V zone	Greater than 9 feet	Greater than 9 feet	9-11
Medium	Landside/Small Area	1% A zone	Less than 9 feet, greater than 6 feet	Less than 9 feet, greater than 6 feet	5-8
Low	Shoreline	0.2%	Less than 6 feet	Less than 6 feet	1-4

Using the screening criteria, each alternative was given an overall risk score. Where criteria did not apply, the risk box was left blank. For Alternatives 4 (Atlantic Ocean) and 5 (Banana River West of SR 401), both of which had multiple possible sites, each subsite was scored and then the alternative was assigned the highest risk. The results of the alternative screening are summarized in Table 31.

The criteria risks for each category were averaged and then risks for each category were averaged to assign an overall risk for each alternative. Those risks were then used to score the Potential Environmental Impacts as part of the overall Alternative Analysis.

TABLE 31 – ALTERNATIVE ENVIRONMENTAL SCREENING RESULTS

Alternative	Seagrass	Wet land Potential	National Wildlife Refuge	Marine Protected Area	National Estuary	Red Knot Critical Habitat –(Proposed)	Loggerhead Sea Turtle Nesting Critical Habitat	Manatee Critical Habitat	Loggerhead Sea Turtle Breeding Critical Habitat	Loggerhead Sea Turtle Nearshore Reproductive	Right Whale-Calving Critical Habitat	Green Sea Turtle Reproductive Critical Habitat	Outstanding Florida Water	National Register of Historic Places	National Historical Landmark	Section 4F	Rivers and Harbours Act Section 14 (§408) Permit	USACE Out Grant/Easement	Rivers and Harbours Act Section 10 Permit	Clean Water Act Section 404 Permit	Environmental Impact Statement	Joint Coastal Permit	Environmental Resource Permit	State Submerged Land Lease	High Tide Flooding	FEMA Flood Hazard Area	NOAA Category 3 Hurricane Storm Surge Water Level	NOAA Category 5 Hurricane Storm Surge Water Level	NOAA Flood Hazard Composite
	Special Aquatic Areas					Designated Critical Habitat							Other Protected Areas				USACE Permit / NEPA					State Permit			Coastal Hazards				
1																													
2																													
3																													
4																													
5																													
6																													

[13] NOAA. Coastal Flood Exposure Mapper. https://coast.noaa.gov/arcgis/rest/services/FloodExposureMapper/CFEM_NHC_Surge_Cat3/MapServer. Accessed August 07, 2023.

APPENDIX N – INFORMATION TAKEN FROM CPA TARIFF (NO. 16)

DOCKAGE FEES BASED ON CPA TARIFF

Dockage shall be based on the length overall of the vessel or the highest gross registered tonnage. Length overall is the linear distance as expressed in feet of the extreme length of the vessel. Lloyd's Register of Shipping shall be used in determining the length overall of a vessel. If the vessel is not in Lloyd's registry, then the vessel will be required to show a Certificate of Registry.

Dockage is calculated per twenty-four (24) hour period and begins when a vessel is secured to a wharf, pier, bulkhead structure or alongside another vessel so berthed and each 24 hours or portion thereof constitutes as an additional day's dockage. Dockage is based on straight running time and shifting from one adjoining berth to another shall not interrupt the straight running time.

The approximate daily dockage rates based on various commercial LSPs for this Study's vessels would be as shown in Table 32.

TABLE 32 – APPROXIMATE DAILY LSP DOCKAGE FEES

LSP	Length (ft)	Tariff Rate Per Day	Monthly Rate (30 Days)
A	300	$1,044.00	$31,320.00
B	350	$1,732.50	$51,975.00
C	280	$974.40	$29,232.00
D	340	$1,683.00	$50,490.00
E	150	$522.00	$15,660.00

COMMERCIAL LAYBERTH

Upon application to and acceptance by the Port Director for a lay berth rate, and subject to availability of a suitable berth, vessels that are in Port for reasons other than for cargo or cruise operation:

Days 1-7 will be charged dockage at a rate of 100% of the current Tariff rate.
Days 8-30 will be charged dockage at a rate of 75% of the current Tariff rate.

Requests for lay berth must be submitted to the Port Director by the ship agent, in writing, within seventy-two (72) hours of the vessel's departure from Port Canaveral. Vessel lay-up in excess of thirty (30) days shall be by contract only.

MINIMUM DOCKAGE EXCEPT CRUISE VESSELS

Except as provided in Rule 620, the minimum dockage invoice will be as follows:

Per 24-hour day or fraction thereof: $344.52

WHARFAGE

Wharfage shall be based on the cargo type and rates provided below. Unless otherwise noted, fractional tons will be used when calculating wharfage. For example, if the manifest indicates 2,500 pounds, wharfage rates will be computed at 1.25 tons.

Where wharfage is denoted as weight or measurement (W/M), rates shall be charged on the basis of weight (per ton) or measurement (per 40 cubic feet), whichever produces the greater revenue. The number of cubic feet in the measure is determined using the number of cubic feet which could be contained within the largest 6-sided box (having all right angles) required to contain the cargo had the cargo been shipped in such a rectangular box.

Machinery, manufactured equipment, or parts (NOS): $8.46 W/M

CRANE FEES

CPA Crane Rental Fee

Monday through Friday, 0800 – 1200 and 1300 – 1700 (minimum 4 hours):

Ship to Shore Gantry Crane Standby Time:	$ 420.00
Ship to Shore Gantry Crane:	$ 735.00
Mobile Harbor Crane (MHC) Standby Time:	$ 420.00
Mobile Harbor Crane (MHC):	$ 735.00

Monday through Friday, 1701 – 0759, meal hour and Saturdays, Sundays, and holidays (minimum 4 hours): Equipment Type Rate

Ship to Shore Gantry Crane Standby Time:	$ 470.00
Ship to Shore Gantry Crane:	$ 785.00
Mobile Harbor Crane (MHC) Standby Time:	$ 470.00
Mobile Harbor Crane (MHC):	$ 785.00

Note: Above rates include CPA-certified Operator and Technical Crew.

Rule 903: CPA Crane Rental Requests/Cancellations

Request for use of CPA crane(s) shall be made no later than 1400 hours on the business day prior to the intended use. Requests for use on weekends or Mondays must be made on the prior business day by 1400 hours. Contact Cargo Operations for all crane requests.

Cancellations Equipment Type Rate:

Ship to Shore Gantry Crane Standby Time:	$ 420.00
Ship to Shore Gantry Crane:	$ 735.00
Mobile Harbor Crane (MHC) Standby Time:	$ 420.00
Mobile Harbor Crane (MHC):	$ 735.00
Mobilization/Demobilization (1 hour each):	$ 365.00

APPENDIX O – CONSTRUCTION PHASING

FIGURE 29 – MIDDLE TURNING BASIN NORTH EXPANSION OPTION 1: PHASE 1

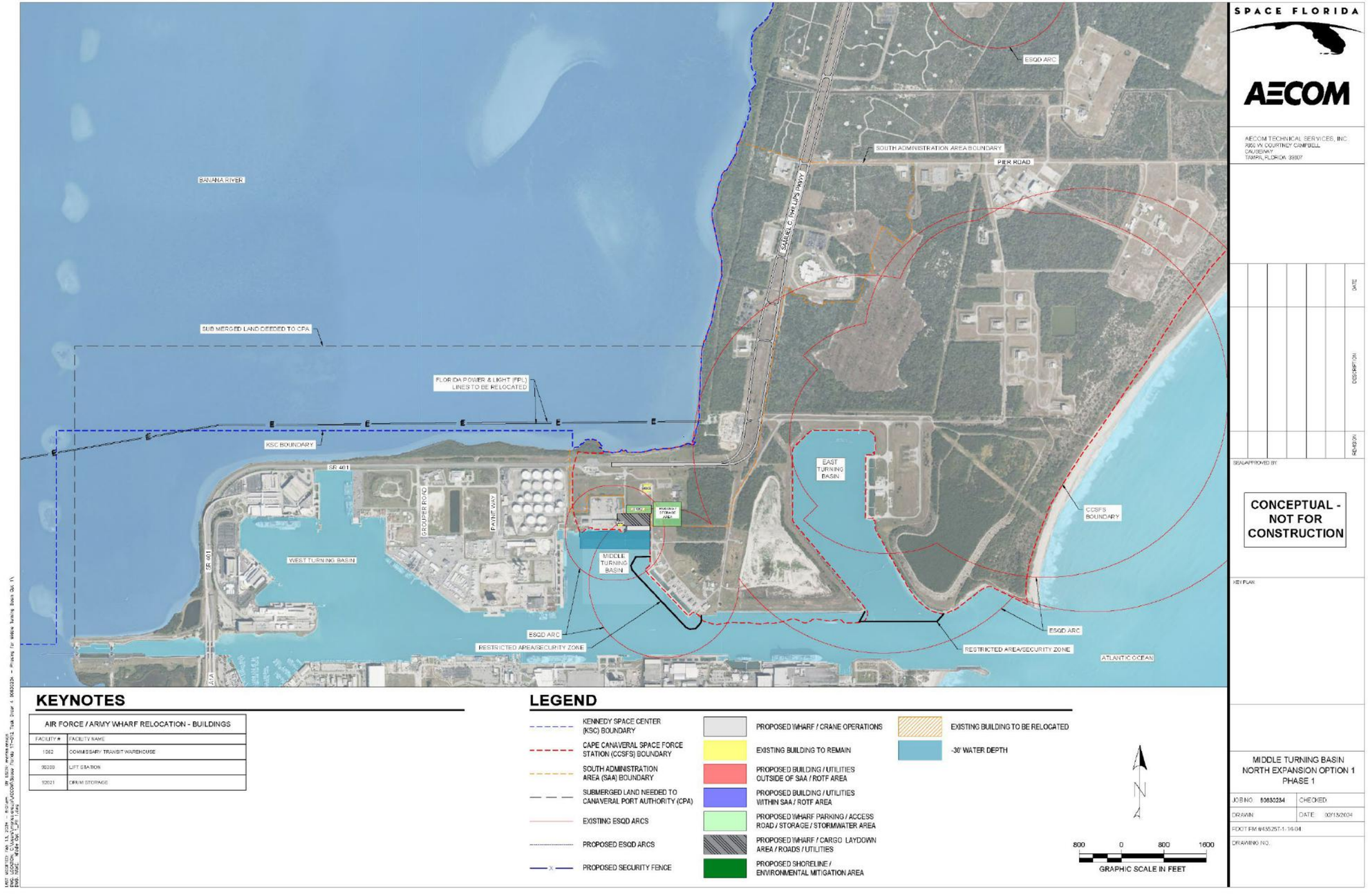
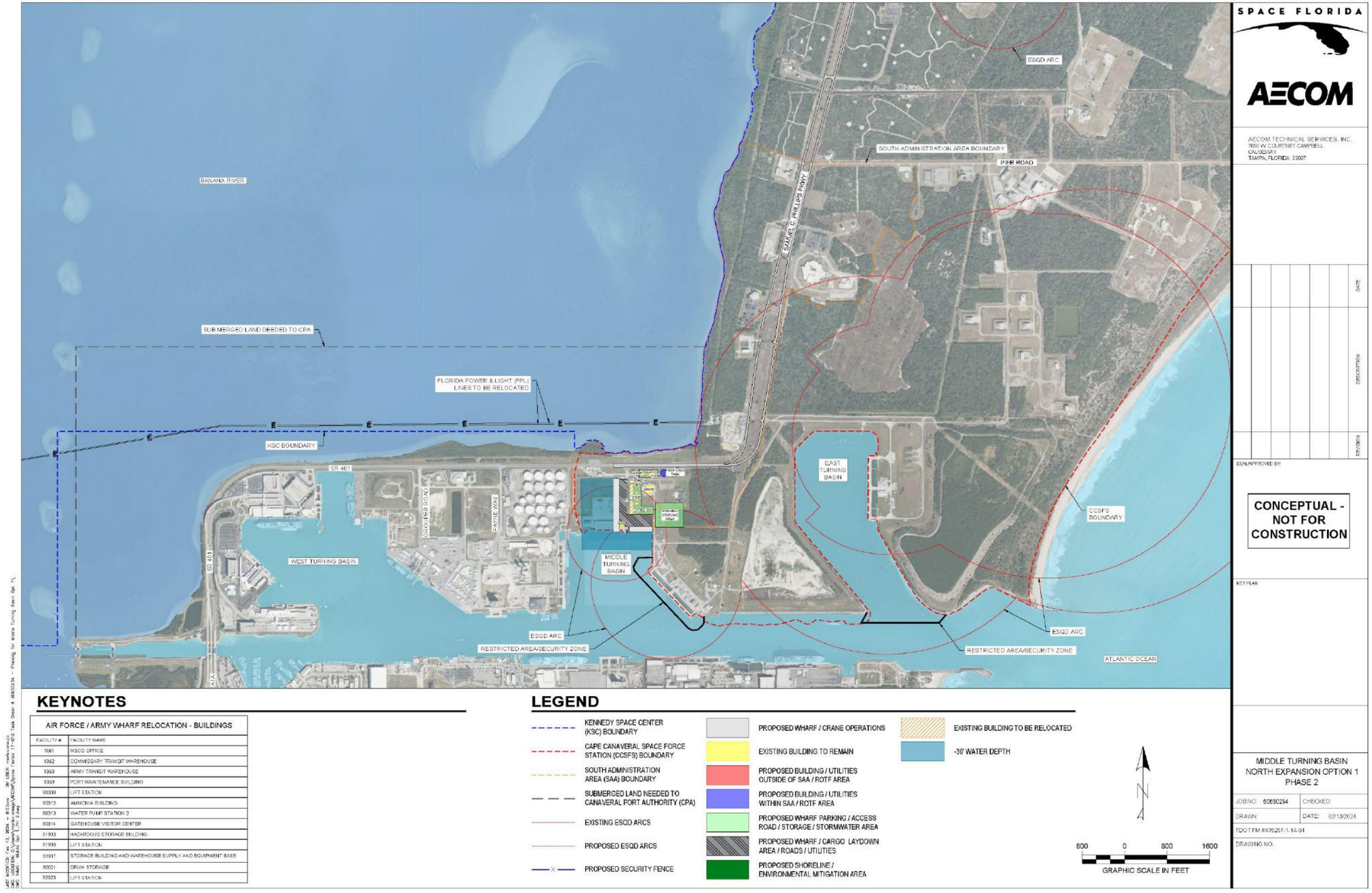


FIGURE 30 – MIDDLE TURNING BASIN NORTH EXPANSION OPTION 1: PHASE 2



KEYNOTES

AIR FORCE / ARMY WHARF RELOCATION - BUILDINGS	
FACILITY #	FACILITY NAME
1061	MSCO OFFICE
1062	COMMISSARY TRANSIT WAREHOUSE
1063	ARMY TRANSIT WAREHOUSE
1069	PORT MAINTENANCE BUILDING
90000	LIFT STATION
90312	AMMONIA BUILDING
90313	WATER PUMP STATION 2
90314	GATEHOUSE VISITOR CENTER
91900	HAZARDOUS STORAGE BUILDING
91909	LIFT STATION
92007	STORAGE BUILDING AND WAREHOUSE SUPPLY AND EQUIPMENT BASE
92021	DRUM STORAGE
92023	LIFT STATION

LEGEND

- KENNEDY SPACE CENTER (KSC) BOUNDARY
- CAPE CANAVERAL SPACE FORCE STATION (CCSFS) BOUNDARY
- SOUTH ADMINISTRATION AREA (SAA) BOUNDARY
- SUBMERGED LAND NEEDED TO CANAVERAL PORT AUTHORITY (CPA)
- EXISTING ESQD ARCS
- PROPOSED ESQD ARCS
- PROPOSED SECURITY FENCE
- PROPOSED WHARF / CRANE OPERATIONS
- EXISTING BUILDING TO REMAIN
- PROPOSED BUILDING / UTILITIES OUTSIDE OF SAA / ROTF AREA
- PROPOSED BUILDING / UTILITIES WITHIN SAA / ROTF AREA
- PROPOSED WHARF PARKING / ACCESS ROAD / STORAGE / STORMWATER AREA
- PROPOSED WHARF / CARGO LAYDOWN AREA / ROADS / UTILITIES
- PROPOSED SHORELINE / ENVIRONMENTAL MITIGATION AREA
- EXISTING BUILDING TO BE RELOCATED
- -30' WATER DEPTH

N

800 0 800 1600
GRAPHIC SCALE IN FEET

FIGURE 31 – MIDDLE TURNING BASIN NORTH EXPANSION OPTION 1: PHASE 3

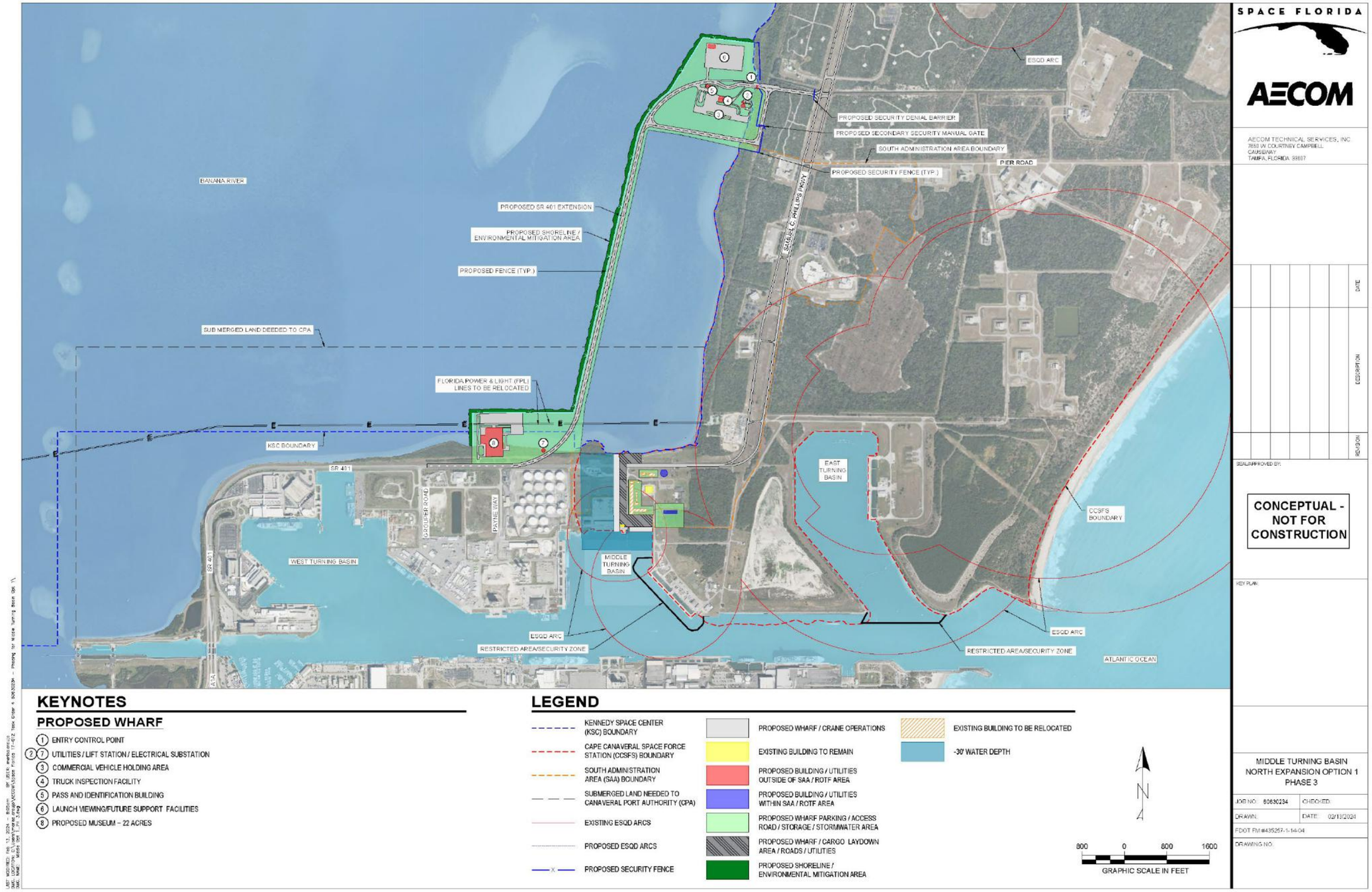


FIGURE 32 – MIDDLE TURNING BASIN NORTH EXPANSION OPTION 1: PHASE 4

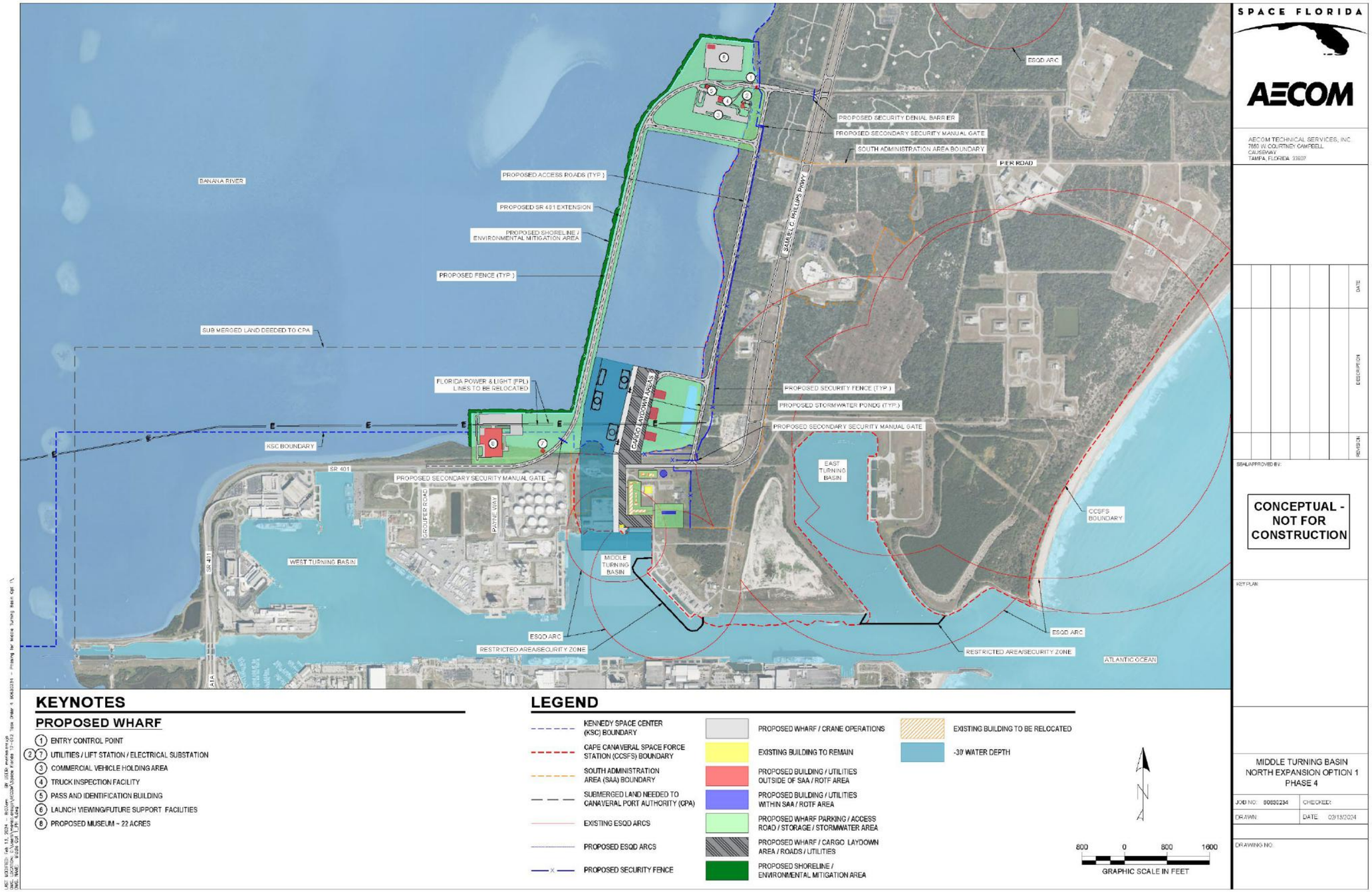


FIGURE 33 – MIDDLE TURNING BASIN NORTH EXPANSION OPTION 1: PHASE 5

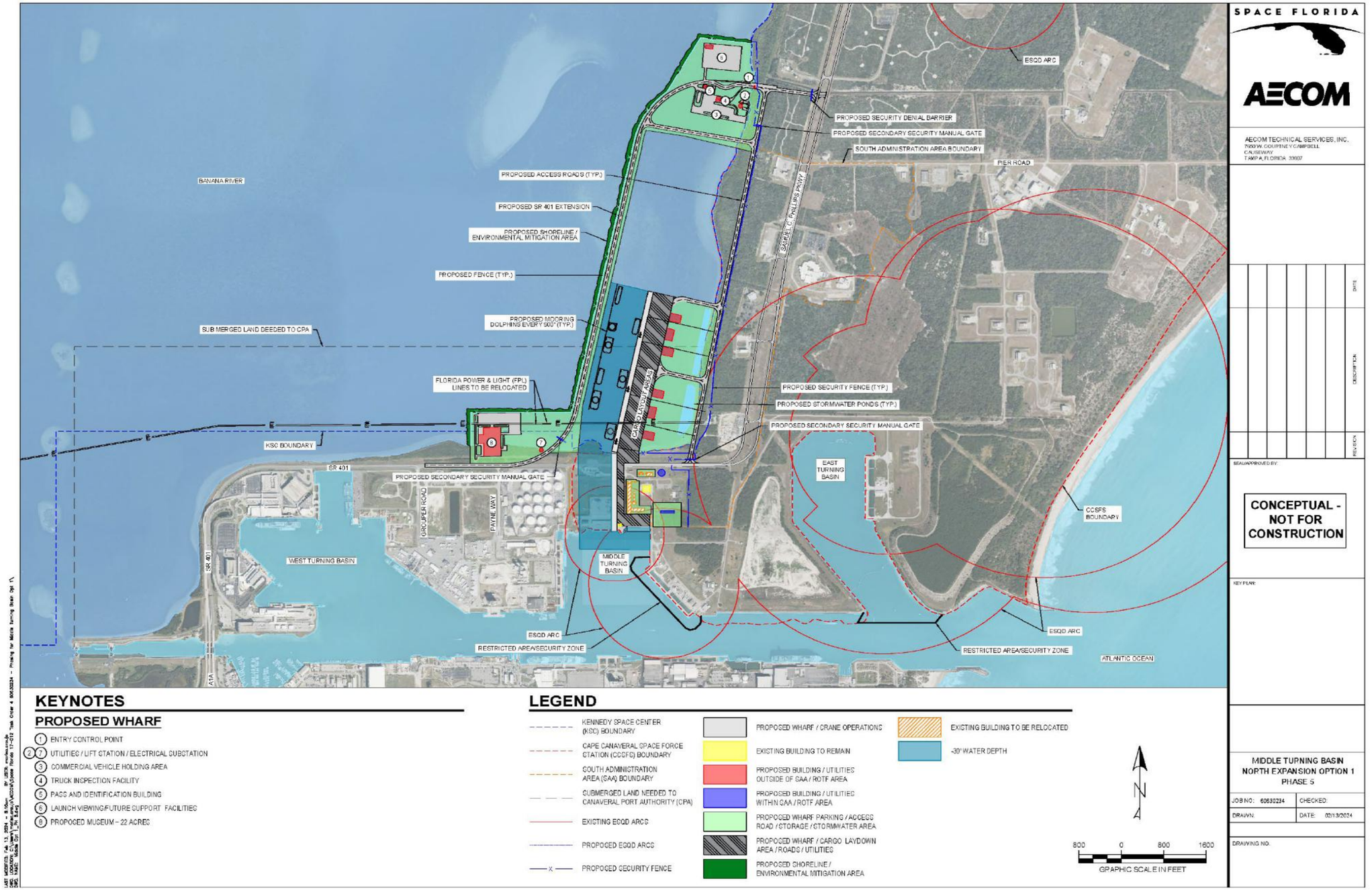


FIGURE 34 – MIDDLE TURNING BASIN NORTH EXPANSION OPTION 1: PHASE 6

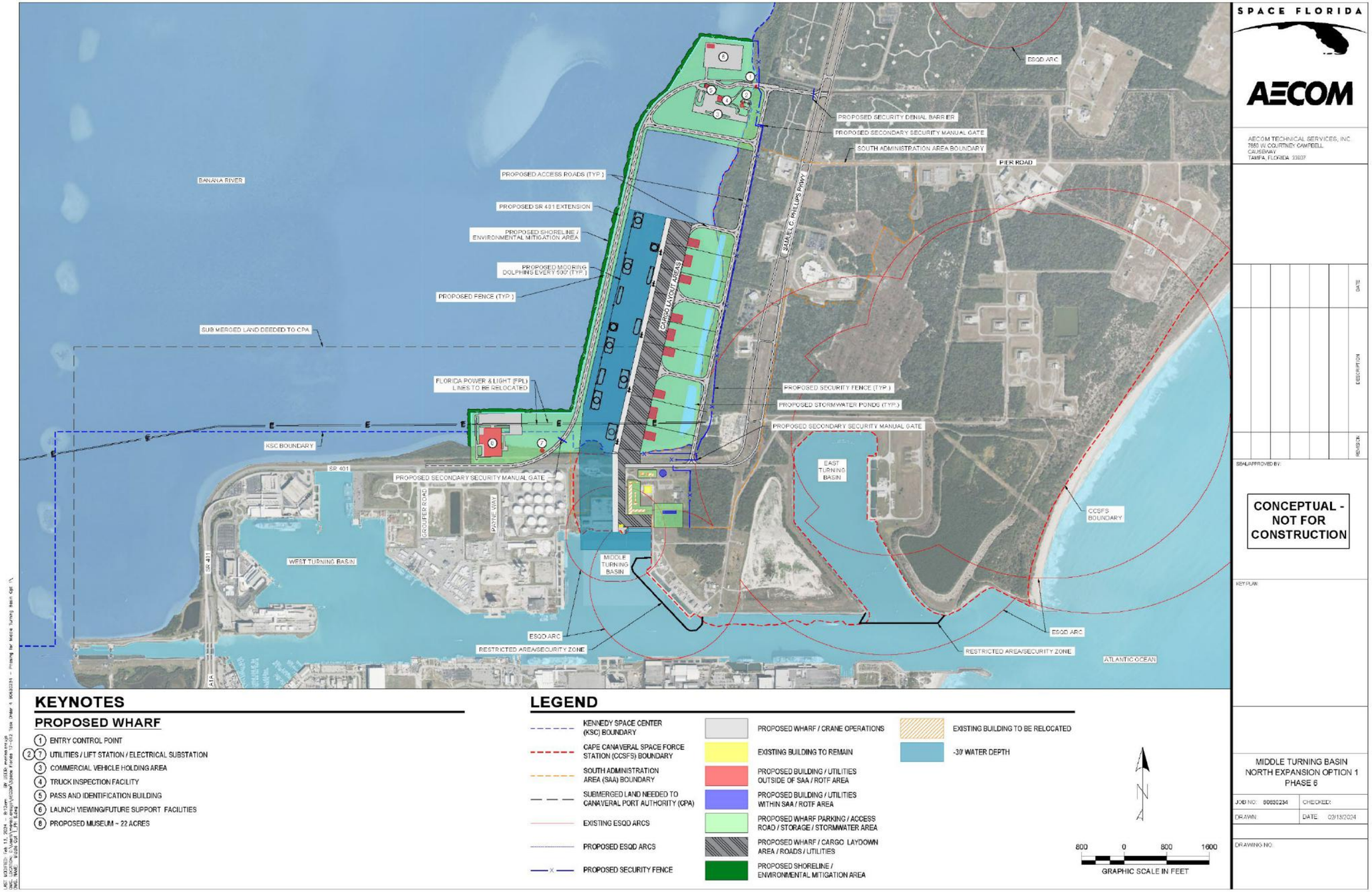
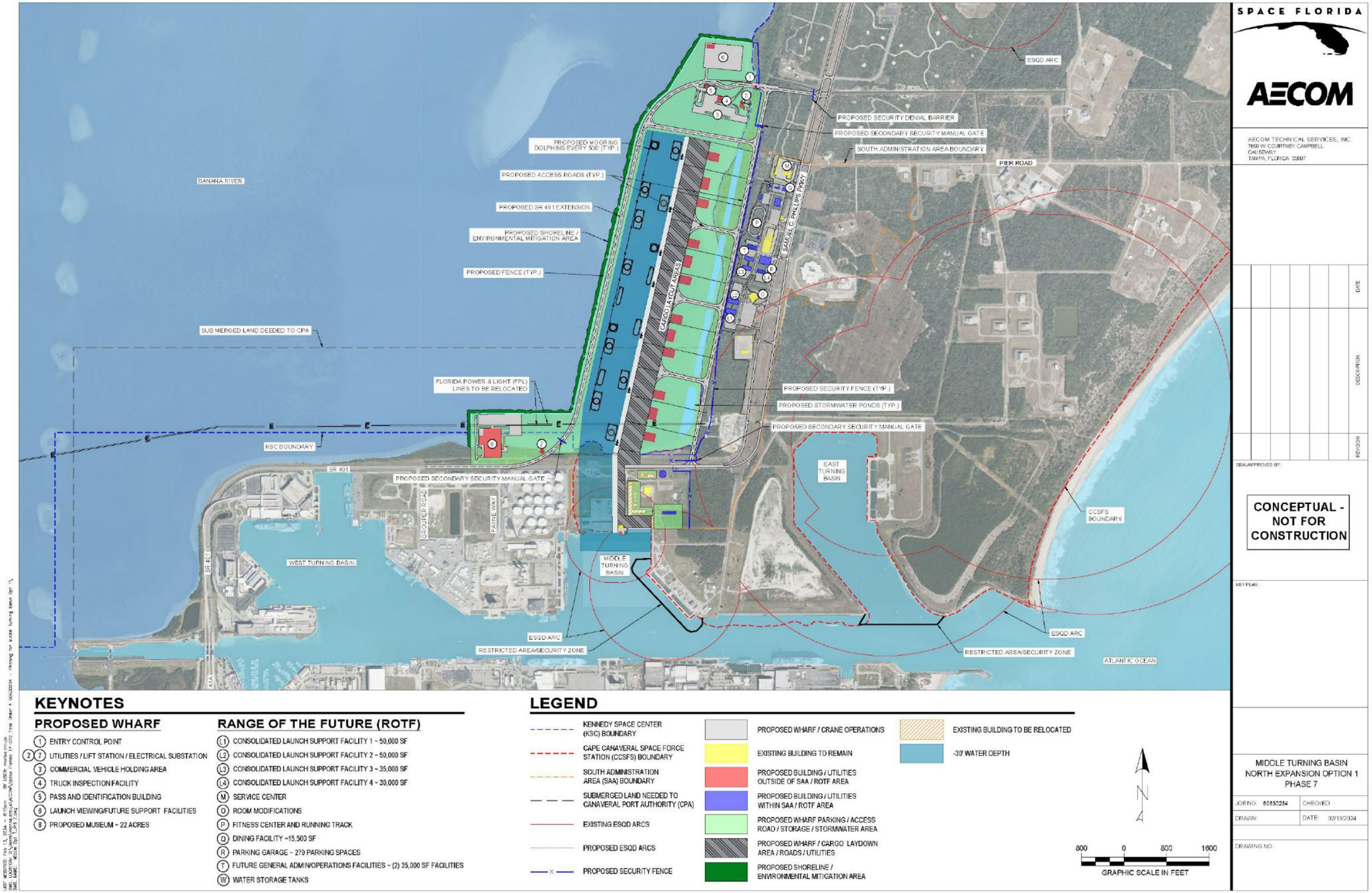


FIGURE 35 – MIDDLE TURNING BASIN NORTH EXPANSION OPTION 1: PHASE 7



APPENDIX P – RESILIENCE CONSIDERATIONS

Since the installation of the Trident Pier tide station (NOAA #8721604) at Port Canaveral in 1994, local sea levels have increased by 0.5 feet. Future projections indicate that local sea levels in the Port Canaveral area could increase by 0.5 to 1.9 feet by mid-century and 1.4 to 7.8 feet by end of the century (Table 33)[14].

TABLE 33 – SEA LEVEL RISE PROJECTIONS FOR TRIDENT PIER (FEET)

Year	Intermediate Low	Intermediate	Intermediate High	High
2020	0.0	0.0	0.0	0.0
2030	0.2	0.3	0.4	0.6
2040	0.4	0.6	0.8	1.1
2050	0.5	0.9	1.4	1.9
2060	0.7	1.3	2.0	2.7
2070	0.9	1.7	2.7	3.8
2080	1.1	2.2	3.5	5.0
2090	1.2	2.7	4.4	6.2
2100	1.4	3.3	5.4	7.8

To consider potential sea level rise hazards in the site selection process an initial sea level rise assessment was performed using inundation maps to evaluate the timing and extent of flooding for the potential terminal sites. Potential flood sensitivities of the surrounding facilities and environment areas were included to understand how selection of the terminal location could affect potential flood impacts for adjacent properties.

EXISTING WATER LEVEL CONDITIONS

Water level conditions and their fluctuations play an important role in flood vulnerability by controlling the inland extent of potential flood exposure.

The Indian River Lagoon, which includes the Banana River subbasin, is a restricted estuary with a complex tidal signal due to limited hydraulic connectivity between lagoons and the Atlantic Ocean. Local water levels in the Indian River Lagoon are strongly influenced by tides, oceanographic processes, local winds, seasonal precipitation inputs from the local watershed, and long-term regional sea level conditions. Daily water levels at the Trident Pier are shown in Table 34. This tide station represents the closest active tide observations to the potential terminal site locations but is located in close proximity to the open Atlantic Coast and may not reflect water level conditions occurring in the inland Indian River Lagoon Area. A seasonal high-water level (SHW) value is also included in Table 34 to represent the water levels in the Indian River Lagoon based on an analysis of annual mean water level data[15].

Storm surge elevations representing the 100-year storm conditions for the area are also reported in Table 34 and are based on modeled output of the FEMA Brevard County Flood Insurance Study. FEMA storm surge elevations were calculated by simulating a large number of storm events using a coupled hydrodynamic and wave model. Reported values for the 100-year storm represent stillwater (astronomical tides plus storm surge) elevations, including wave setup.[16]

TABLE 34 – EXISTING WATER LEVEL CONDITIONS

Datum	NAVD88 (Feet)
1-Percent Annual Chance Water Level	3.0
Mean Higher High Water (MHHW)	1.6
Seasonal High Water (SHW)	0.7
North American Vertical Datum of 1988 (NAVD88)	0.0
Mean Lower Low Water (MLLW)	-2.8

Note: Daily water level and storm surge conditions have been adjusted by 0.5 feet for sea level rise based on an assessment of local sea level rise observed at the Trident Pier tide station from 2014 to 2020.

HIGH TIDE INUNDATION

Due to the required waterfront access and proximity to the Indian River Lagoon and Atlantic Ocean, terminal site locations may be impacted by rising sea levels, which will elevate future daily high tides and exacerbate flooding from storm surge. Figure 36 shows the approximate timing that the adjacent properties to the terminal site options may be impacted by daily high tides, considering the NOAA Intermediate Low, NOAA Intermediate High, and NOAA High projections. In general, average daily high tides are projected to cause regular inundation of shoreline vegetation, but infrastructure and facilities at adjacent properties to the site options are not anticipated to be affected by daily high tides until end-of-century conditions.

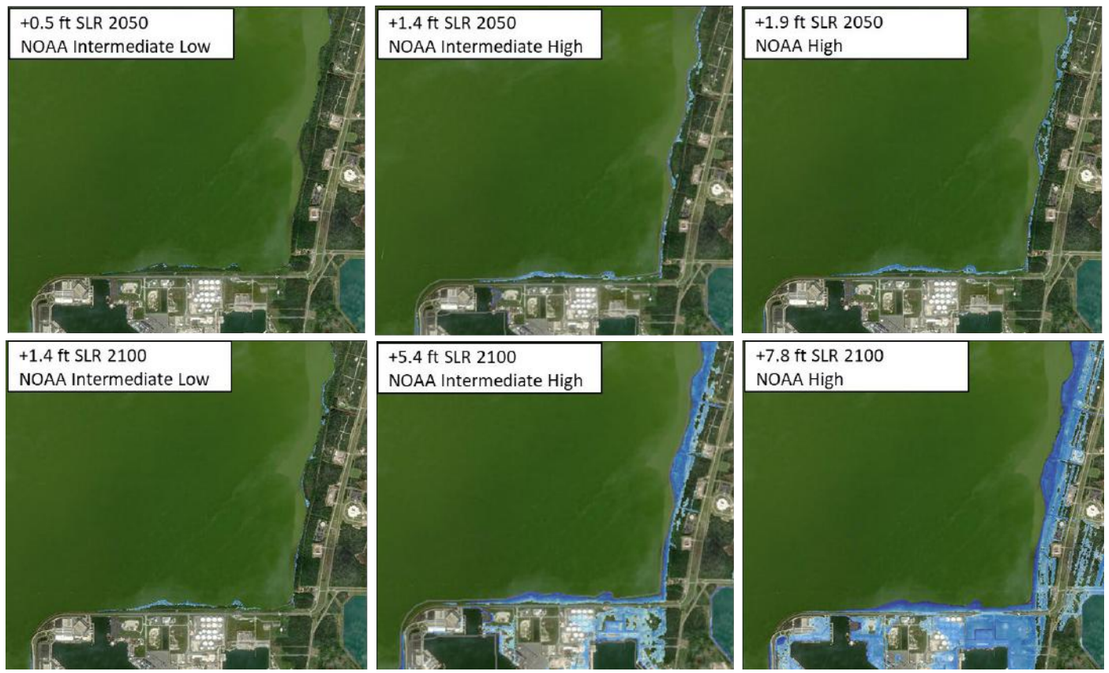
The North Port of Port Canaveral, adjacent to the proposed site options, is projected to experience tidal inundation once sea level rise reaches 4 to 5 feet. However, shoreline overtopping during high tide conditions originates from the southern shoreline near the Middle Turning Basin. By 7.8 feet of sea level rise, the north shoreline of Port Canaveral's North Port is also overtopped along several low-lying stretches, causing potential inundation of State Road 401, which is a primary access road for the port and to the south gate of the Cape Canaveral Space Force Station.

[14] Sea level rise projections are relative to the year 2020 for the Trident Pier tide station (#8721607) based on NOAA 2017 modeled projections. The reported sea level rise amounts reflect the projected range between NOAA Intermediate Low and NOAA High curves.

[15] Hall, CR, PA Schmalzer, DR Breininger, JH Drese, DA Scheidt et al., Ecological Impacts of the Space Shuttle Program at John F. Kennedy Space Center, Florida. 2014: Kennedy Space Center, FL. NASA Technical Memorandum 2014-216639.

[16] Federal Emergency Management Agency (FEMA), 2021. Flood Insurance Study, Brevard County, Florida and Unincorporated Areas.

FIGURE 36 – HIGH TIDE INUNDATION EXPOSURE FOR POTENTIAL PROJECT SITE LOCATIONS



(Source: Florida Sea Level Sketch Planning Tool)

Infrastructure along the western shoreline of the Cape Canaveral Space Force Station that is potentially exposed to high tide inundation by end of the century includes a Florida Power and Light electrical substation, the former Delta Launch Control Center, and the CCAFS Fire & Emergency Services Building.

COASTAL STORM SURGE FLOODING

To understand the potential for hurricane or tropical storm flooding, an exposure assessment was also performed considering extreme water levels (1-percent annual chance) (Figure 37). Similar to the high tide inundation mapping results, initial coastal storm surge flood impacts are limited to the undeveloped shoreline area. By 5.4 feet of sea level rise, the 1-percent annual chance water level overtops the shoreline of the North Port area of Port Canaveral, exposing backland areas of the terminal.

Infrastructure along the western shoreline of the Cape Canaveral Space Force Station that is potentially exposed to 1-percent annual chance water levels by end of the century includes a Florida Power and Light electrical substation, the former Delta Launch Control Center, CCAFS Fire & Emergency Services Building, and other Space Force Facilities located west of the Samuel C. Phillips Parkway.

FIGURE 37 – 1-PERCENT ANNUAL CHANCE WATER LEVEL FLOOD EXPOSURE FOR POTENTIAL PROJECT SITE LOCATIONS[17]

(Source: Florida Sea Level Sketch Planning Tool)

POTENTIAL IMPLICATIONS FOR SITE SELECTION

Increased sea levels may result in changes that affect local water levels, wave action, and currents, potentially impacting the existing shoreline configuration through flooding and increased erosion. Selection of the proposed wharf location may provide long-term flood hazard protection benefits to the North Port of Port Canaveral or the western shoreline of the Space Force campus, particularly for facilities located west of Samuel C. Phillips Parkway. In order to provide flood protection for existing adjacent properties, design elevations of the terminal bulkhead for the wharf should consider water level design criteria that includes future sea level rise projections to provide long-term flood protection during initial construction or be designed for phased elevating with sea level rise.

Regardless of the placement of the proposed terminal, there are several design considerations that may increase the flood resilience of the new wharf. In additional to the terminal bulkhead, future water level conditions should be incorporated into the design of other port facilities, such as transportation networks required for port accessibility, the stormwater drainage network, and electrical components of ancillary facilities located throughout the terminal. Rising sea levels may also elevate groundwater levels, particularly for areas constructed on artificial fill, such as a port terminal. High groundwater levels may affect roadway pavement subgrades, building foundations, and cause settlement at the port. Considering sea level rise effects in the geotechnical analysis can be used to inform site design to offset potential structural impacts to terminal facilities.

[17] Mapped water levels were calculated using the local FEMA 1-percent annual chance water level plus sea level rise and represented by the closest mapping layers available on the Florida Sea Level Sketch Planning Tool.

APPENDIX Q – ESTIMATED CONSTRUCTION COSTS

TABLE 36 – ESTIMATED CONSTRUCTION COSTS FOR PHASES 1-7

Description	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Total
Channel Dredging	-	$43,333,333	$21,233,333	$86,996,000	$74,152,000	$73,736,000	$82,316,000	$381,766,667
Wharf	$12,900,000	$30,000,000	$14,700,000	$50,190,000	$42,780,000	$42,540,000	$47,490,000	$240,600,000
Net Fill Required	$(7,102,080)	-	$88,433,463	$23,040,042	$6,792,021	$6,386,690	-	$117,550,135
Road	-	-	$26,749,232	$10,500,480	-	-	-	$37,249,712
Terminal Paving & Utilities	$14,012,117	-	$140,039,019	$57,381,235	$55,920,000	$53,400,000	$57,840,000	$378,592,371
Environmental Mitigation	-	-	-	-	-	-	-	-
Surcharge	-	-	-	-	-	-	$23,275,808	$23,275,808
Buildings	$8,300,000	$45,780,000	$157,000,000	-	-	-	-	$211,080,000
Raw Cost Subtotal	**$28,110,037**	**$119,113,333**	**$448,155,048**	**$228,107,756**	**$179,644,021**	**$176,062,690**	**$210,921,808**	**$1,390,114,693**
Design, Permitting, & CM (10%)	$2,811,004	$11,911,333	$44,815,505	$22,810,776	$17,964,402	$17,606,269	$21,092,181	$139,011,469
Contingency (40%)	$11,244,015	$47,645,333	$179,262,019	$91,243,102	$71,857,609	$70,425,076	$84,368,723	$556,045,877
Total Cost	**$42,165,055**	**$178,670,000**	**$672,232,572**	**$342,161,634**	**$269,466,032**	**$264,094,035**	**$316,382,712**	**$2,085,172,039**
Annual Cost Per Berth	$3,063,245	$12,980,181	$48,836,965	$24,857,670	$19,576,414	$19,186,144	$22,984,860	$151,485,479

COST ESTIMATE ASSUMPTIONS

Channel

1. The proposed new channel dredge depth is assumed to be 30 feet.
2. The width of the channel needs to be about 720 feet if barges need a place to park while not working at the wharf.
3. If barge parking is not needed, the channel width can be 600 feet.

Terminal

1. Wharf length total is about 6,100 feet in support of space-related new terminals. The other wharf created is about 1,490 feet in length, which can be returned to support AF/Army needs.
2. This will create about 12 terminals with a wharf length of about 500 feet each.
3. The terminal varies in size based on the rotation of the wharf.
4. Backland of each terminal is approximately 60% paved/impervious, with 40% unpaved/pervious for water and stormwater retention.
5. The proposed site elevation is assumed to be 10 feet above water level.

Dredging/Surcharge

1. Dredging and fill needs will be tracked on a per-phase basis for each of the seven project phases.
2. Dredge material will be recycled to use for terminal/road fill.
3. Surcharge will be taken into consideration in the final phase of the terminal buildout.

Road

1. The proposed road elevation is assumed to be 10 feet above water level.
2. The road width is assumed to be 72 feet.
3. The slope of the road outside shoulders is assumed to be a 4:1 on each side.