

VESSEL SURVEY AND NAVIGATION STUDY

SR 401 Bridge Replacement at Port Canaveral

Project Development & Environment (PD&E) Study

Brevard County, Florida

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1.0. PROJECT SUMMARY

1.1. Project Description

This Project Development and Environment (PD&E) Study involves the evaluation and replacement of the SR 401 bridges (No. 700030, 700031, 700117), north of SR 528 in Brevard County. The SR 401 bridges span over the Canaveral Barge Canal and provide a vital connection to Port Canaveral's operations including major cruise and cargo terminals. The bridges also serve as the primary access to Cape Canaveral Air Force Station, Naval Ordnance Test Unit, facilities for the U.S. Coast Guard, and access to Space Florida operations, as shown in Figure 1. The project begins approximately 500 feet south of the SR 528 bridges over SR 401 and continues approximately 3,500 feet north to account for the various bridge profile touchdown locations expected. Concepts are likely to include the ramps in the northeast and northwest quadrants of the SR 528 at SR 401 interchange. Currently, there are no pedestrian and bicycle accommodations on the bridge.

The existing SR 401 bridges are three parallel double-leaf bascule bridges, that have a vertical clearance of 25 feet at MHW in the closed to navigation position and a horizontal clearance of 90 feet between the fender system. Presently, per 33 CFR 117.273(b), the bridge is closed from 6:30 AM to 8:00 AM and 3:30 PM to 5:15 PM weekdays only, except holidays. Three hours advance notice is required for bridge openings between 10:00 PM and 5:59 AM. Additionally, the bridges are not open to navigation from 11:00 AM to 2:00 PM on Saturdays and Sundays to reduce vehicular traffic congestion and to ensure the safety of roadways while passengers are transiting to and from the cruise ship terminals.

The existing bridges have been classified as functionally obsolete. Bridge improvements will provide additional capacity to address future traffic growth resulting from strategic expansion plans for Port Canaveral and military stakeholders in the immediate area. The PD&E study is commencing with data collection efforts. There will be field reviews, surveys, environmental assessments, soil investigations, and research concerning navigation needs from the surrounding community to determine the appropriate replacement structure for the bridge.

This report focuses on the Vessel Survey and Navigation Study. The study's focus is to assist in the determination of the bridge renovation or replacement option by evaluating the optimal type and height of the bridge based on vessel traffic. The statistics, public involvement engagement, and the overall analysis and forecasting of data will guide the development of the systems, services, and solutions for the SR 401 bridge recommendation.

Figure 1: Project Location Map
 Source: Port Canaveral



Figure 2: Aerial View of the Existing SR 401 Bridges & Canaveral Locks
 Source: Marinas.com



Figure 3: Existing SR 401 Bridges
Source: ReelEstateBrevard.com



1.2. Project Status

SR 401 is within the jurisdiction of the Space Coast Transportation Planning Organization (TPO). This PD&E study is funded in the FDOT's Statewide Transportation Improvement Program (STIP) as a Strategic Intermodal System (SIS) project. The PD&E is listed in the 2019 Amendment of the Regionally Significant Cost Feasible Plan within the 2040 Long Range Transportation Plan (LRTP) and was approved July 9, 2020, in the Space Coast TPO Transportation Improvement Plan (TIP).

1.3. Project Purpose

The purpose of the project is to evaluate improvements to, or the replacement of, the three existing bascule bridges over the Canaveral Barge Canal. The two southbound bridges (7300030 and 700031) were constructed in 1963 and the northbound bridge (700117) was constructed in 1972 and are considered structurally deficient by FDOT.

More specifically, the purpose of this Vessel Survey and Navigation Study is to assist in the determination of the preferred bridge replacement option from a vessel traffic perspective. These include a new fixed-span bridge with a 65-foot clearance, a retrofit to the existing drawbridge keeping the clearance at 25 feet, or a replacement of the existing drawbridge with a drawbridge that has a 40-foot clearance, reducing the frequency of bridge openings to allow boats to pass underneath. A fourth scenario evaluated a 35-foot bridge clearance. The findings of this scenario can be found in the Appendix. Additional modifications to the SR 528 interchange leading to SR 401 may also be required depending on the bridge replacement option.

1.4. Project Need

1.4.1. System Linkage

SR 401 is designated an SIS connector, providing access to the north sector of Port Canaveral, an SIS Seaport. Port Canaveral's operations include major cruise terminals, cargo terminals, and a fuel and energy center for Central Florida. Additionally, SR 401 is classified as a part of the State Strategic Highway Network (the STRAHNET) connector by the Military Surface Deployment and Distribution Command as a connection to an ocean terminal to deploy and sustain U.S. forces on a global basis.

The bridges are the primary access to Cape Canaveral Air Force Station and Space Florida operations, Naval Ordnance Test Unit, facilities for the U.S. Coast Guard, and access to Space Florida operations. The maximum weight limits of the existing bridges restrict heavy loads. The 2011 Spaceport Area Transportation Infrastructure Assessment by the Space Coast TPO identified the weight limit as an impediment to expanding port freight operations and maximizing military uses.

1.4.2. Modal Interrelationships

Port Canaveral handled approximately 4.9 million passengers and approximately 6,400,000 tons of cargo in 2019, in addition to outdoor recreation such as fishing and boating. The Port is bisected by the Canaveral Barge Canal, with a south sector and a north sector. The SR 401 bridges provide access to/from the north sector of Port Canaveral and do not have pedestrian or bicycle facilities. As the second-largest cruise port in the world today, the Port's Vision Plan identified the Port's successful growth rooted in the cruise, cargo, energy, and space industry sectors. The Port also has a role in the fishing industry albeit, most of those facilities are located in the southern sector of the Port. The surface transportation connecting the sectors of the Port is via the SR 401 bridges.

In 2017, FDOT commissioned the SR 401 Bridge Alternatives Analysis Study which indicated traffic of 14,900 AADT with 13% truck traffic. The truck traffic includes fuel transport, which accounts for about 40% of the supply for Central Florida. While the Port Canaveral 30 Year Vision Plan noted that petroleum cargo may level off as the U.S. switches to more renewable energy sources, cargo is expected to grow to more than three times the current tonnage by 2048.

The primary transportation options to distribute cargo are currently via truck or barge. Minimizing delays for road access will better position Port Canaveral to achieve its goal and meet its intended purpose to fuel economic growth. The bridges opening to marine vessels create traffic delays to the port and cruise terminal, space commercial traffic, and military traffic. Similarly, water vessels are delayed based on operation restrictions that are in place. Finally, the Port's Vision Plan considered the sector north of the SR 401 bridges as the area where most of the future growth will occur as it is where the port has land available. This further adds to the importance of the connectivity provided by the bridge.

2.0. DATA COLLECTION

2.1. Overview

This study provides critical information in the determination of the bridge renovation or replacement option by evaluating the optimal type and height of the bridge. This is a function of the air draft of vessels that will utilize the waterway and their frequency of use today and in the future. The analysis is based on data collected from the market to establish drawbridge utilization as well as the timing of the peak months of marine traffic that may coincide with vehicular traffic. The results of the report will help guide the development of the solutions for the SR 401 bridge recommendation.

Unlike the Intracoastal Waterway (ICWW), where marine traffic and bridge height standards are commonplace, this waterway offers the only connection from the inland waterways with the Atlantic Ocean. As a result, the marine traffic characteristics are unique. This is reflected by the different marine traffic categories that were identified as using the Canaveral Barge Canal. This includes the typical recreational boater, but the canal also serves commercial traffic, boat manufacturers located inland along the canal, and traffic associated with the space program.

As a result, a data collection program was devised to gather information including:

- Recreational traffic
- Commercial traffic
- Boat manufacturing traffic
- Space program traffic, both legacy and new commercial providers

The data provided an understanding of the current marine traffic in the region and allowed the creation of a model that establishes future demand for the Canaveral Barge Canal. More specifically, this information focused on answering the following points for today and into the future:

1. The probability of air drafts of vessels traversing under the bridge.
2. The distribution of traffic patterns under the bridge to account for percentages and demands for openings.
3. The resulting number of hours that the bridge would be open based on vessel demand (air drafts).
4. Seasonal traffic variations.

This information was combined to develop an operational model that forecasts annual vessel traffic demands traversing under the SR 401 bridges and evaluates the different bascule span air drafts versus the probability of openings for different bridge heights. The air draft under the bridge evaluated as part of this study were 25 ft, 40 ft, and 65 ft.

2.2. Methodology

2.2.1. Geographic Data Collection Area of Focus

The data was collected based on the Canaveral Barge Canal East Inlet's transportation links and location. The SR 401 bridge provides access to and from the Atlantic Ocean. The Ponce de Leon Inlet sits 50 miles north, just south of Daytona; to the south about 40 miles is the Sebastian Inlet. The yellow circle shown in Figure 4 depicts a 25-mile radius from the SR 401 bridges.

Due to the transportation links and location of the waterways, the Canaveral Barge Canal offers the most direct connection to and from the Atlantic Ocean from the Central Florida area, with the vast majority from Brevard, Orange, and Seminole Counties. Indian River County to the south is most proximate to the Sebastian Inlet, while Volusia County to the north is served by the Ponce de Leon Inlet. See Figure 5. As a result, the data collection focused on data specific to Brevard, Orange, and Seminole Counties.

Figure 4: Data Collection Geographic Area of Focus

Source: Google Earth

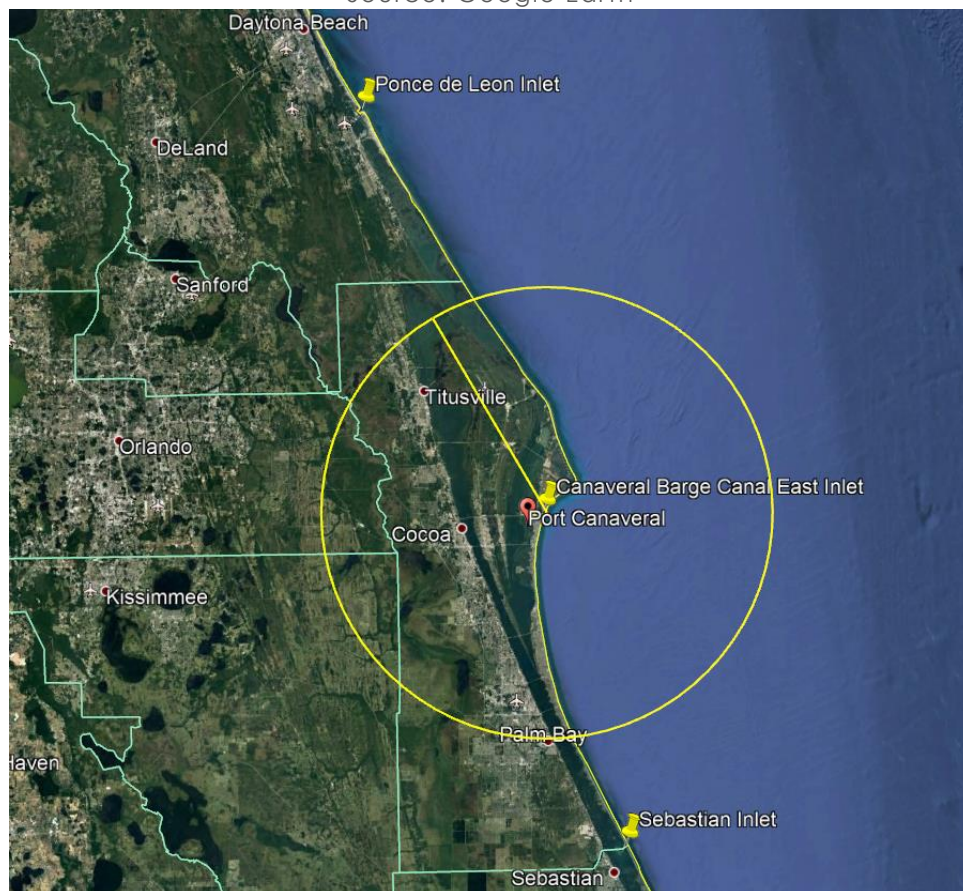


Figure 5: Data Collection Counties of Focus

Source: BA



Specific data collected within these counties focused on the three local markets that utilize the waterway: recreational/commercial boating, boat manufacturing, and Space Florida operations. Data was collected and analyzed from several sources on these markets that impact bridge openings. Additional regional market data was also collected. The data collected for each market is outlined herein.

2.2.2. Regional Data Collection

General data was collected consisting of Brevard, Orange, and Seminole Counties' population data, as well as the historic bascule bridge and the Canaveral lock operations.

Population Data

Historical population data was collected from 2010 to 2019 from the United States Census Bureau. The collected historic population data is shown in Table 1. Anticipated population growth for the same areas from 2020 to 2045 (in five-year increments) was collected from the FDOT's *Projections of Florida Population by County, 2020-2070* report, dated October 2020. The collected population projection data is shown in Table 2. The calculated compound annual growth rates (CAGR) for both datasets are also shown in the tables.

Table 1: Historic Population Data by County, 2010 – 2019

Source: United States Census Bureau

County	2010	2011	2012	2013	2014	2015
Brevard	543,965	544,359	546,966	550,255	555,548	565,746
Orange	1,148,564	1,170,579	1,202,498	1,227,435	1,256,606	1,291,301
Seminole	423,051	426,334	430,537	435,503	441,399	448,318
<i>Total</i>	<i>2,115,580</i>	<i>2,141,272</i>	<i>2,180,001</i>	<i>2,213,193</i>	<i>2,253,553</i>	<i>2,305,365</i>

	2016	2017	2018	2019	CAGR
Brevard	576,874	587,769	595,203	601,942	1.1%
Orange	1,326,516	1,355,921	1,381,540	1,393,452	2.2%
Seminole	455,945	462,801	468,122	471,826	1.2%
<i>Total</i>	<i>2,359,335</i>	<i>2,406,491</i>	<i>2,444,865</i>	<i>2,467,220</i>	<i>1.7%</i>

Table 2: Projected Population Data by County, 2020 – 2045

Source: FDOT, Projections of Florida Population by County, 2020-2070 Report, 10/20/20

County	2020	2025	2030	2035	2040	2045	CAGR
Brevard	602,700	637,200	666,900	694,200	720,000	746,100	0.9%
Orange	1,419,700	1,575,300	1,714,700	1,835,200	1,953,900	2,074,200	1.5%
Seminole	478,800	510,200	536,500	561,600	585,500	607,300	1.0%
<i>Total</i>	<i>2,501,200</i>	<i>2,722,700</i>	<i>2,918,100</i>	<i>3,091,000</i>	<i>3,259,400</i>	<i>3,427,600</i>	<i>1.3%</i>

Bridge Opening Data

The Department of Transportation provided the historical logs of the bascule bridge operations from January 2018 through March 2021. The data included the following level of details:

- Date of Opening
- Time Open
- Time Closed
- Reason for Opening (i.e. Vessel or Maintenance / Training)
- If Vessel, Direction of Vessel
- If Vessel, Type of Vessel

From January 2020 through March 2020, there were no bridge openings due to the Canaveral locks being closed for dewater and repairs as part of an Army Corp of Engineers project. For those months, the 2018 and 2019 average figures were used for analysis purposes. 2021 data was not used as the full-year data was not available. Key metrics are shown in Table 3. A sample of the data provided, inputted, and analyzed is found in Appendix 5.1.

Table 3: Historic Bridge Opening Data Key Metrics, 2018 – 2020

Source: Florida Department of Transportation District 5

Key Metric	2018	2019	2020 ¹
Total Bridge Openings (Vessels & Maintenance)	1,191	1,138	1,329
Total Bridge Openings (Vessels Only)	1,136	1,027	1,220
Number of Vessels Requiring Openings	1,252	1,217	1,415
Ratio of Vessels Requiring Openings to Actual Openings	0.91	0.84	0.86
Average Bridge Opening Time (Vessels Only)	0:06:14	0:06:29	0:06:29
% of Bridge Openings - Maintenance	4.6%	9.8%	8.2%
% of Bridge Openings - Vessels	95.4%	90.2%	91.8%
% of Bridge Openings - Powerboats	36.6%	37.4%	37.0%
% of Bridge Openings - Sailboats	63.4%	62.6%	63.0%
Peak Months	March, April, May, November		
Peak Days	Friday, Saturday, Sunday		
Peak Hours – Weekends	10 am – 11 am, 2 pm – 3 pm		
Peak Hours – Weekdays	8 am – 2 pm		

Lock Opening Data

The U.S. Army Corps of Engineers provided the historical logs of the Canaveral lock operations from January 2018 through June 2021. The data included the following level of details:

- Total Vessels Passing through the Lock by Year – Upbound & Downbound
- Total Lockages by Year – Upbound & Downbound

For January 2020 through March 2020, while the locks were closed, the 2018 and 2019 average openings were used for analysis purposes. Key metrics are shown in Table 4. A sample of the data provided, inputted, and analyzed is found in Appendix 5.2.

¹ 2020 data adds average vessels and openings from 2018 and 2019 to account for bridge closure.

Table 4: Historic Lock Opening Data Key Metrics, 2018 – 2020

Source: U.S. Army Corps of Engineers

Key Metrics	2018	2019	2020 ²
Total Vessels - Upbound	7,760	7,776	9,135
Total Vessels - Downbound	7,661	7,630	9,085
Total Vessels	15,421	15,406	18,220
Total Lockages - Upbound	3,966	3,821	4,374
Total Lockages - Downbound	4,085	3,935	4,399
Total Lockages	8,051	7,756	8,772

Additional information provided by the U.S. Army Corps of Engineers for consideration in the study included information that the posted height of the nearby fixed bridges on the ICWW are all 65 ft above mean high water. The posted height of the power lines crossing the canal adjacent to FL HWY-401 are 85 ft above mean high tide.

2.2.3. Recreational & Commercial Boating

Boating, whether it be recreational powerboats, sailboats, or commercial vessels, is a popular activity and the main reason that causes the SR 401 bridges to open. The data collection for recreational and commercial boating incorporated into this report consisted of three primary activities:

- Surveys with marina operators
- Historical boat registrations
- Inventory of recreational powerboats

Marina Surveys

For the marina surveys, a database of marinas in the vicinity of the bridge was collected. A radius of 25 miles from the SR bridges was used to determine which marinas to include in the outreach. This radius was established as the primary hinterland for traffic from these marinas to use the Canaveral Barge Canal. This distance was determined as the mid-point between the SR 401 bridge and the location of the closest inlets to the Canaveral Barge Canal East Inlet providing access to and from the Atlantic Ocean. See Figure 6 for the location of the marinas surveyed.

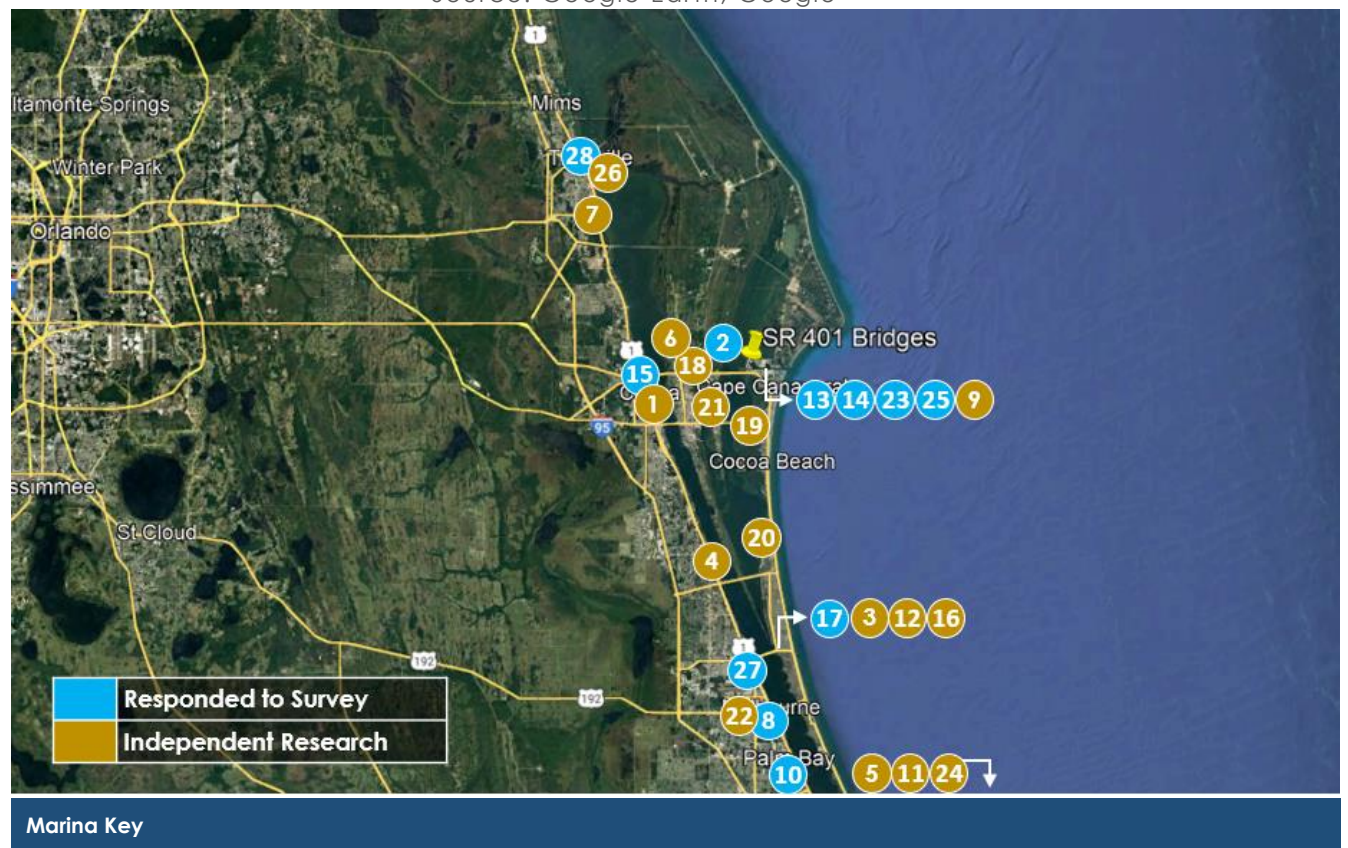
Surveys were sent via email, and marinas had the option to respond to the survey via a link to an online survey, email, phone call, or mail. A total of 28 surveys were sent. 11 marinas responded, with two additional declining to respond. For marinas that did not respond, desktop research was conducted to verify approximate slip inventory to help validate boat registration data.

² 2020 data adds average vessels and openings from 2018 and 2019 to account for bridge closure.

Marinas within the service area of the waterway were surveyed to establish current and future inventory levels, the mix of boats (power versus sail), and the importance of access to the ocean/Banana River under the SR 401 bridges and/or through the Canaveral Locks. Boats on the marinas east of the bridges utilize the waterway under the bridge to navigate towards the ICWW and return. Boats from the marinas down the Barge Canal on Merritt Island navigate towards the ocean and return.

Additionally, these community stakeholders were able to provide specific comments or concerns about the SR 401 bridges over the Canaveral Barge Canal. A copy of the marina database, survey, and responses can be found in Appendix 5.3 through 5.5.

Figure 6: Boat Marinas Surveyed
 Source: Google Earth, Google



Boat Registrations

The historical database review and analysis consisted of collecting and analyzing boat registrations in Brevard, Orange, and Seminole Counties from 2018 to 2020. Registration data was provided from Florida Highway Safety and Motor Vehicles (FLHSMV). The database divided vessels by the following characteristics:

- County
- Vessel length categories
 - Less than 12'
 - 12' to 15'11"
 - 16' to 25'11"
 - 26' to 39'11"
 - 40' to 64'11"
 - 65' to 109'11"
 - More than 110'
- Vessel type
 - Powerboat
 - Sailboat
- Registration type
 - Recreational
 - Commercial
 - Dealer
 - Canoe

High-level metrics are shown in Table 5 for all boat registrations, undifferentiated by vessel type. Table 6 breaks out registrations by sailboat registrations only. Table 7 breaks out registrations by commercial registrations only. Note that dealer boats and canoe registrations were removed from the total figures. Dealership registrations were removed as these boats are not currently utilizing the surrounding waterways; canoes were removed given their size/characteristics.

Table 5: Vessel Registration by County – All Boat Types, 2018 – 2020

Source: FLHSMV

County	2018	2019	2020	CAGR
All Registrations (Powerboat & Sailboat)				
Brevard	32,806	32,857	33,640	1.3%
Orange	28,120	30,044	33,933	9.9%
Seminole	17,684	17,670	17,556	-0.4%
<i>Total</i>	<i>78,610</i>	<i>80,571</i>	<i>85,129</i>	<i>4.1%</i>
All Registrations Greater than 12' in Length (Powerboat & Sailboat)				
Brevard	27,754	27,667	28,199	0.8%
Orange	20,560	21,899	24,433	9.0%
Seminole	14,218	14,224	14,099	-0.4%
<i>Total</i>	<i>62,532</i>	<i>63,790</i>	<i>66,731</i>	<i>3.3%</i>
All Registrations Greater than 15'11" in Length (Powerboat & Sailboat)				
Brevard	20,451	20,537	21,159	1.7%
Orange	16,414	17,750	20,160	10.8%
Seminole	10,607	10,696	10,617	0.0%
<i>Total</i>	<i>47,472</i>	<i>48,983</i>	<i>51,936</i>	<i>4.6%</i>
All Registrations Greater than 25'11" in Length (Powerboat & Sailboat)				
Brevard	2,936	2,992	3,106	2.9%
Orange	1,438	1,859	2,344	27.7%
Seminole	926	949	915	-0.6%
<i>Total</i>	<i>5,300</i>	<i>5,800</i>	<i>6,365</i>	<i>9.6%</i>
All Registrations Greater than 39'11" in Length (Powerboat & Sailboat)				
Brevard	422	441	446	2.8%
Orange	201	208	210	2.2%
Seminole	166	160	165	-0.3%
<i>Total</i>	<i>789</i>	<i>809</i>	<i>821</i>	<i>2.0%</i>
All Registrations Greater than 64'11" in Length (Powerboat & Sailboat)				
Brevard	20	17	21	2.5%
Orange	15	21	19	12.5%
Seminole	11	14	14	12.8%
<i>Total</i>	<i>46</i>	<i>52</i>	<i>54</i>	<i>8.3%</i>
All Registrations Greater than 110' in Length (Powerboat & Sailboat)				
Brevard	2	2	2	0.0%
Orange	1	4	4	100.0%
Seminole	0	0	0	0.0%
<i>Total</i>	<i>3</i>	<i>6</i>	<i>6</i>	<i>41.4%</i>

Table 6: Vessel Registration by County – Sailboats Only, 2018 – 2020

Source: FLHSMV

County	2018	2019	2020	CAGR
All Sailboat Registrations Only				
Brevard	377	381	376	-0.13%
Orange	141	143	136	-1.8%
Seminole	90	94	100	5.4%
<i>Total</i>	<i>608</i>	<i>618</i>	<i>612</i>	<i>0.3%</i>

Table 7: Vessel Registration by County – Commercial Only, 2018 – 2020

Source: FLHSMV

County	2018	2019	2020	CAGR
All Commercial Registrations Only				
Brevard	738	750	745	0.5%
Orange	295	324	354	9.5%
Seminole	190	180	169	-5.7%
<i>Total</i>	<i>1,223</i>	<i>1,254</i>	<i>1,268</i>	<i>1.8%</i>

Inventory of Recreational Boats

The registration dataset provided for vessels only includes vessel length. Given the study's focus on evaluating the optimal type and height of the bridge is a function of the air draft of vessels, data was collected to determine the ratio for length to air draft by vessel type. Bermello Ajamil & Partners (BA) possesses an existing world-class inventory of the majority of recreational powerboats. The inventory database includes boat manufacturer, length, draft, beam, and air draft for over 720 different boat models. A sample of the database is found in Appendix 5.6.

Since the existing database only includes information on powerboats, further desktop research was conducted to understand the length to air draft ratio for sailboats via manufacturer and boat design websites. The necessary information was collected through this research.

2.2.4. Boat Manufacturing

Boat manufacturing in Brevard County is ideal due to its available workforce, access to U.S. and international markets with its easy access to both the Indian and Banana rivers, as well as the inlet into the Atlantic Ocean. The data collection for boat manufacturing consisted of outreach to the boat manufacturers in the vicinity of the bridge. A database was collected. A similar 25-mile radius approach was used as with the recreational and commercial boating segment, where five manufacturers were identified.

Surveys were sent via email, and boat manufacturers had the option to respond to the survey via a link to an online survey or via phone call. Boat manufacturers within the service area of the waterway were surveyed on their current and future inventory concerning current and anticipated new build and repair capacity and demand. Additionally, these community stakeholders were able to provide any specific comments or concerns about the SR 401 bridges over the Canaveral Barge Canal. Surveys were sent to all five manufacturers, with one response received. The manufacturer database can be found in Appendix 5.7, a copy of the survey in Appendix 5.8, and the response in Appendix 5.9.

Given the response rate, further desktop research was conducted to understand boats manufactured locally by each company and the criticality of ocean access for their operations. Subsequently, the necessary information was collected through this research on each of the manufacturers. An overview of the local manufacturers and their local manufacturing needs/capabilities are outlined below.

Brunswick Corporation

Brunswick Corporation is comprised of business segments that include the most notable brand names across all major marine categories: propulsion, parts & accessories, boats, business acceleration. It is the owner of several notable boat brands including Sea Ray and has its Integrated Manufacturing Center on Merritt Island. The Merritt Island facility manufactures the Sea Ray SLX 400 Outboard model, with a length of 39'6" and a beam of 12'1". In the future, Merritt Island may also be used to build other models in the Sea Ray and Boston Whaler lines. The facility produces upholstery, cabinetry, and other boat parts, in addition to the design of hulls and decks. The facility is part of Brunswick's larger plan to integrate manufacturing operations with its Fiberglass Boat Technology Center, which opened in late 2019 in Edgewater, Florida, near Boston Whaler's headquarters. The Edgewater center has the single largest group of engineers in the boating industry.

MasterCraft

MasterCraft is a leading innovator, designer, manufacturer, and marketer of recreational powerboats through its four brands, MasterCraft, NauticStar, Crest, and Aviara. In 2020, MasterCraft purchased a boat manufacturing plant in Merritt Island. The new Merritt Island facility provides more than 140,000 square feet of dedicated manufacturing space. Situated on 38 acres of land, including water access, the new facility provides ample room to grow the Aviara brand and will allow the opportunity for additional vertical integration. Aviara's day boats range from 32 to 40-feet in length. The new Aviara manufacturing facility began production in early 2021. The new plant will support the ramp-up and production of the brand's high-demand models – the AV32, AV36, and AV40.

Merritt Island Boat Works

Merritt Island Boat Works, which builds Ocean Alexander yachts, is a Taiwanese yacht manufacturer with shipyards in Kaohsiung, Taiwan, and the United States, with models

ranging from 45 to 155-feet. Merritt Island Boat Works builds yachts ranging in size from 45 to 70-feet. Due to COVID, the company reduced its total workforce at its Merritt Island factory by 23%. The future of this facility is uncertain.

Falcon USA

Falcon USA is a local company that builds semi-custom fishing boats for each owner based on a boater's style of boating. A symmetrical and asymmetrical hull design like no other catamaran is one of the key factors in Falcon's unique design. Falcon Marine's technology is of the highest standards with vacuum resin infusion on every component throughout the build while eliminating a production backlog. Boats are manufactured in just six to eight weeks. Their largest boat is the Falcon 22, which is 22'6" in length with a beam of 8'6".

Hell's Bay Boatworks

Hell's Bay Boatworks is another local custom manufacturing company, providing all work, tooling, design, repairs, rigging, refurbishing, and remodeling of its skiffs. Hell's Bay Boatworks is led by a team of dedicated fishermen, outdoorsmen, and adventurers. They made sweeping changes in design and construction to revolutionize the shallow water fishing industry with a proven record of creating the finest skiffs available. The skiff builders at Hell's Bay only build to order and put their efforts into quality construction, the finest materials, cutting-edge design, and personal customer service. The largest open water skiff manufactured is the ESTERO model, which has a length of 24'10" and a beam of 8'6".

2.2.5. Space Florida Operations

Florida's Space Coast is the gateway to space, home to NASA and the Kennedy Space Center. Companies like SpaceX, Boeing, United Launch Alliance, and Blue Origin call the Space Coast home and are launching rockets every month. Some companies utilize the Canaveral Barge Canal East Inlet to transfer materials and parts via barge, another reason that causes the SR 401 bridges to open (see Figure 7). Stakeholder outreach was conducted via email to NASA and Space Florida inquiring about their future business needs for access under SR 401.

Figure 7: NASA Space Launch System Towage Under SR 401 – April 27, 2021

Source: Ken Kremer



NASA indicated its essential need for continued usage “a couple of times a year” under the bridge to support its SLS Artemis Program. Vessel characteristics are found in the table below. Space Florida did not respond to inquiries.

Table 8: NASA SLS Artemis Program Vessel Characteristics

Source: NASA

Vessel Characteristics		Pegasus
Type of Vessel		Barge
Length		310 ft
Width		50 ft
Air Draft		55 ft
Annual Trips via Under SR 401		2 roundtrips (4 total trips)

2.3. Data Validation

A review against the marina survey results to the registration was also completed to ensure a general alignment with the overall data set. One comparison included comparing total registrations to the marina survey responses and desktop research about local inventory. Marina responses and desktop research accounted for ~71% of the slip capacity of total 2020 boat registrations for boats greater than 25'11" in length, as seen in Table 9. Additional capacity in the area may come from residential docks or vessels that are stored inland and use ramps to enter the waterways.

Table 9: Data Validation of Boat Registrations vs. Marina Survey Inventory

Source: BA Analysis & Marina Survey

Inventory Type	Marina Responses	Desktop Research	Approximate Total	2020 Registrations
Wet Slips	689	1,822	2,511	n/a
Dry Storage	1,167	842	2,009	n/a
<i>Total</i>	1,856	2,664	4,520	6,365

Additionally, it was important to understand if registration in the three counties identified were sufficient, or if transient customers should be considered in the analysis. Based on marina surveys, transient customers account for, on average, just 9% of the total marina customers in the area. Given the small transient population, the model does not explicitly account for these vessels.

Table 10: Marina Survey Customer Demographic

Source: BA Marina Survey

Customer Segment	% of Customers (Average Across Marina Responses)
Local Residents (Brevard)	59%
Regional Residents (Central Florida)	22%
Transient	9%
Charter / Fishing Boats	3%
Commercial	1%
Other	5%

3.0. DATA ANALYSIS

3.0. Forecast Approach

The data collected was used to analyze existing and future vessel traffic demands traversing under the SR 401 bridges. A model was developed to forecast future uses. The model estimates vessel traffic volume, including the frequency and probability of vessels requiring bridge openings given different bridge heights (25 ft, 40 ft, and 65 ft).

The model and forecast consider historical trends, port area stakeholder input, and other regional growth indicators, such as population growth. The forecasts established the annual distribution of traffic patterns under the bridge to account for percentages and demands for openings. Furthermore, seasonal traffic variations were forecast.

3.1. Division & Concentration of Data

A large amount of data was collected from a variety of sources. The data was evaluated to analyze the characteristics of boat registrations that would be useful to isolate for vessels more likely to use the canal, or that their use may cause bridge openings. For example, many of the boat registrations in Central Florida are small boats typically used in the myriad of lakes and waterways with no interconnection to the Canaveral Canal, or likewise may not be seaworthy for operating in the open seas. The data was sifted to provide a focused registration dataset to ensure the data used in the model is representative of those who will most likely be impacted by the SR 401 bridges compared to analyzing all 85,129 boats registered across Brevard, Orange, and Seminole County in 2020.

3.1.1. Vessel Type

Powerboats & Sailboats

Looking at the boat registration database, which is comprised of both recreational and commercial vessels, it was noted that the boat mix in the counties assessed is heavily weighted towards powerboats. Over the three years of data, sailboat registrations averaged just 0.8% of all boat registrations (Table 11). However, sailboats accounted for 63% of the bridge openings over the same period (Table 3). This is because powerboats have limited air draft. Sailboats, on the other hand, due to their mast height, require higher clearances.

Table 11: % of Sailboat Registrations of Total Registrations by County, 2018 – 2020

Source: FLHSMV, BA Analysis

County	2018	2019	2020	3-Year Average
Brevard	1.1%	1.2%	1.1%	1.1%
Orange	0.5%	0.5%	0.4%	0.5%
Seminole	0.5%	0.5%	0.6%	0.5%
<i>Total</i>	<i>0.8%</i>	<i>0.8%</i>	<i>0.7%</i>	<i>0.8%</i>

Further analysis revealed that of the total registered sailboats, 66.6% of those sailboats required bridge openings, compared to just 0.3% of their powerboat counterparts (Table 12). These figures assume that boats passing under the bridge utilize the waterway to navigate towards the ICWW or ocean and return.

Table 12: % of All Registered Powerboats & Sailboats Requiring Bridge Openings, 2018 – 2020

Source: FLHSMV, BA Analysis

	2018	2019	2020	3-Year Average
Registered Sailboats Requiring Openings	65.3%	61.6%	72.8%	66.6%
Registered Powerboats Requiring Openings	0.3%	0.3%	0.3%	0.3%

Since the goal of the report is to determine bridge openings, which is a function of the air draft of vessels that will utilize the waterway, and the large discrepancy between boat type and bridge openings by boat type, the data was divided accordingly between powerboat registrations and sailboat registrations for the operational model.

Recreational & Commercial Powerboats

Looking at another categorization within the boat registration database, registrations are divided by recreational and commercial. A recreational vessel is used for private pleasure and activities. A commercial vessel is a vessel that carries goods (i.e. passengers or cargo) that pay in one way or another.

It was noted that over the three years of data, commercial registrations averaged 1.6% of all boat registrations (Table 13). The bridge opening data does not specify recreational versus commercial, though the Department of Transportation provided a vessel identification sheet. Upon review, the same vessel type is identified as both recreational and commercial vessels, indicating the vessel's usage type (and not size characteristics) is the only difference. See Table 14.








Table 13: % of Commercial Registrations of Total Registrations by County, 2018 – 2020

Source: FLHSMV, BA Analysis

County	2018	2019	2020	3-Year Average
Brevard	2.3%	2.2%	2.3%	2.3%
Orange	1.1%	1.0%	1.1%	1.1%
Seminole	1.1%	1.1%	1.0%	1.0%
Total	1.6%	1.6%	1.6%	1.6%

Recreational and commercial registrations only indicate a vessel's business and do not vary a vessel's size or air draft. As a result, the data was not divided between recreational and commercial registrations for the operational model. The model assumes all powerboat registrations are aligned with any powerboat assumptions going forward.

Table 14: Recreational & Commercial Identification Sheet
 Source: Florida Department of Transportation District 5

Vessel Image	Vessel Type	Vessel Code (Private)	Vessel Code (Commercial)
	Sportfisherman	P-SF	C-SF
	Motor Yacht	P-MVY	C-MVY
	Catamaran	PS-CAT	CP-CAT
	Trimaran	PS-TRI	CP-TRI
	Motor Cruiser	P-MVS	n/a
	Sloop	PS-S	n/a
	Tug & Barge	T + B	n/a

Space Program Operations

Based on discussions to date, NASA's current transport vessel has an air draft of 55 ft. This vessel is estimated to require two roundtrips a year via the Canaveral Barge Canal. Given that the vessel can traverse under all bridge heights in the study, and the anticipated four bridge openings annually, the model does not explicitly account for the NASA vessel. The one caveat is if NASA or other Space Florida operators (who did not respond for comments to inquiries) determines their business requires a taller vessel to transport parts.

Boat Manufacturing

The boats manufactured on Merritt Island were assessed in terms of air draft requirements based on the largest vessel produced at the local facility. The manufacturers and the

specifications of their largest model produced on Merritt Island are shown in Table 15. The table lists boats from largest to smallest.

Table 15: Boat Manufacturers Vessel Characteristics
 Source: Various Manufactures' Website

Manufacturer	Model	Length	Beam	Air Draft
Merritt Island Boat Works	Ocean Alexander 70e	70'6"	18'2"	28'0"
MasterCraft	Avaria AV40	40'7"	12'3"	9'9"
Brunswick Corporation	Sea Ray SLX 400	39'6"	12'1"	9'8"
Hell's Bay Boatworks	ESTERO	24'10"	8'6"	n/a
Falcon USA	Falcon 22	22'6"	8'6"	n/a

Additionally, of the one response to the survey sent out, Falcon USA indicated that access to the ocean using the Canaveral Locks and the SR401 is "a great amenity but not essential" to business.

The specifications of the locally manufactured boats, along with the feedback from Falcon USA, indicate that the local boat manufacturers do not produce or transport vessels that are impacted by any of the bridge height scenarios, nor do their businesses rely on a particular height of bridge clearance. As such, no particular adjustments to the model were made for this market.

Figure 8: SeaRay SLX 400
 Source: SeaRay



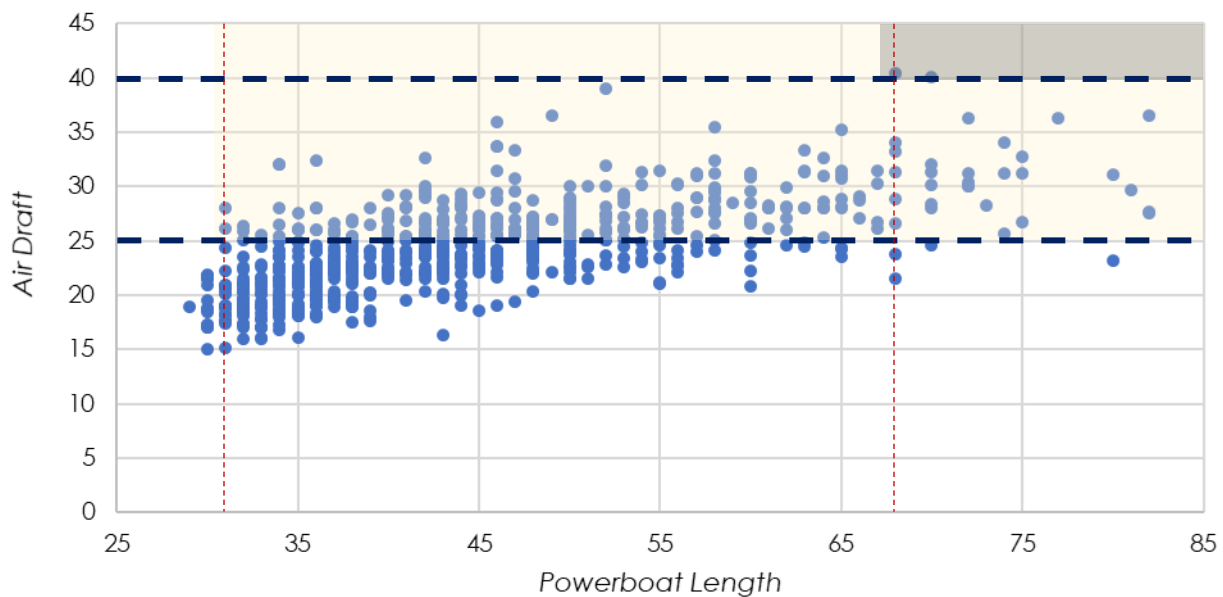
3.1.2. Length to Air Draft Ratio

Powerboats

The registration dataset provided by FLHSMV for vessels only included vessel length. The next step in focusing the dataset involved determining the ratio for length to air draft by vessel type. The existing inventory of BA's recreational boat database was used to determine this ratio of length to air draft for the powerboat segment. Figure 9 depicts the relationship between powerboat air draft and length from the database. The inventory was assessed, and it was determined to add 10 feet to the reported air draft measurements to ensure safe clearance and to account for tidal conditions as well as any additional structures not necessarily reported in air draft measurements (such as towers, antenna, radar, etc.).

Figure 9: Relationship between Powerboat Air Draft & Length (in feet)

Source: BA



The inventory of recreational boats indicates powerboats have limited length to air draft ratios. For the different bridge height scenarios, the inventory database was correlated to the local registration data to determine the distribution by length for powerboats impacted by the different bridge height scenarios (25 ft, 40 ft, and 65 ft).

As shown, air drafts reach above 25 ft with boats greater than 30 ft in length. For the next scenario, air drafts reach above 40 ft in only a few instances with boats greater than 65 ft in length. There are no powerboats in the database that have air drafts above 65 ft.

As a result of this analysis, BA narrowed the focus of all boat registrations to a more specific target market for each bridge scenario. For the 25 ft bridge, powerboat

registrations for both recreational and commercial vessels in Brevard, Orange, and Seminole Counties falling into the "greater than 25'11" in length" category were assessed, as this was the first segment of the overall dataset that began to be impacted by bridge heights of 25 ft or more. This concentration of the data reduces the total 2020 boat registrations (excluding sailboats since those will be assessed independently) from 84,517 to 5,753 for the base scenario. It also increases the three-year average percentage of registered powerboats requiring openings (as previously shown in Table 12) from 0.3% to 4.6%.

For the 40 ft bridge, powerboat registrations in Brevard, Orange, and Seminole Counties falling into the "greater than 65' in length" category were assessed. For the 65 ft bridge, no powerboats will be impacted. This information was further correlated to the local powerboat registration data to establish the distribution of powerboat registrations potentially impacted by the different bridge height scenarios, shown in Table 16.

Table 16: % of Powerboat Registrations Impacted by Bridge Height, 2018 – 2020

Source: BA Analysis

County	2018	2019	2020	3-Year Average
% of Powerboat Registrations Impacted by 25' Bridge (Greater than 25'11" Length)				
Brevard	7.9%	8.0%	8.2%	9.1%
Orange	4.6%	5.7%	6.5%	6.1%
Seminole	4.8%	4.9%	4.7%	5.3%
<i>Total</i>	<i>6.0%</i>	<i>6.5%</i>	<i>6.8%</i>	<i>7.1%</i>
% of Powerboat Registrations Impacted by 40' Bridge (Greater than 65' Length)				
Brevard	0.7%	0.6%	0.7%	0.6%
Orange	1.0%	1.1%	0.8%	1.0%
Seminole	1.2%	1.5%	1.5%	1.4%
<i>Total</i>	<i>0.9%</i>	<i>0.9%</i>	<i>0.8%</i>	<i>0.9%</i>
% of Powerboat Registrations Impacted by 65' Bridge (n/a)				
Brevard	0.0%	0.0%	0.0%	0.0%
Orange	0.0%	0.0%	0.0%	0.0%
Seminole	0.0%	0.0%	0.0%	0.0%
<i>Total</i>	<i>0.0%</i>	<i>0.0%</i>	<i>0.0%</i>	<i>0.0%</i>

Sailboats

Given there is no such database for sailboats, data collected suggested that mast lengths (air draft) for sailboats can vary from 0.7 of the length overall to as much as 1.5 times the sailboat length. The median length to air draft ratio between research findings is 1.1. This was the ratio used to correlate sailboat length to air draft. Again, it was determined to add 10 feet to the calculated air draft measurements to ensure safe

clearance and to account for tidal conditions as well as any additional structures not necessarily reported in air draft measurements. Calculations are shown in Table 17.

Table 17: Relationship between Sailboat Air Draft & Length (in feet)

Source: BA Analysis

<i>Length</i>	<i>Air Draft (1.1 Length)</i>	<i>Air Draft +10 ft Safe Clearance</i>
13 ft	14.3 ft	24.3 ft
27 ft	29.7 ft	39.7 ft
50 ft	55.0 ft	65.0 ft

Given the 13 ft threshold for a 25 ft bridge, and the limited sailboat registrations coupled with the higher air drafts required, all sailboats were included for the initial base model. For the 40 ft bridge height, the length threshold for sailboats was set to greater than 26'11" ft in length. For the 65 ft bridge height, the threshold for sailboats was greater than 49'11" ft in length.

This information was then correlated to the local sailboat registration data to establish the distribution by length for sailboats impacted by the different bridge height scenarios, as shown in Table 18.

Table 18: % of Sailboat Registrations Impacted by Bridge Height, 2018 – 2020

Source: BA Analysis

<i>County</i>	<i>2018</i>	<i>2019</i>	<i>2020</i>	<i>3-Year Average</i>
% of Sailboat Registrations Impacted by 25' Bridge (All)				
Brevard	100%	100%	100%	100%
Orange	100%	100%	100%	100%
Seminole	100%	100%	100%	100%
<i>Total</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>
% of Sailboat Registrations Impacted by 40' Bridge (Greater than 26'11" Length)				
Brevard	47.5%	45.7%	45.2%	46.1%
Orange	29.1%	29.4%	28.7%	29.0%
Seminole	33.3%	36.2%	37.0%	35.5%
<i>Total</i>	<i>41.1%</i>	<i>40.5%</i>	<i>40.2%</i>	<i>40.6%</i>
% of Sailboat Registrations Impacted by 65' Bridge (Greater than 49'11" Length)				
Brevard	0.3%	0.8%	0.8%	0.6%
Orange	2.8%	2.8%	2.9%	2.9%
Seminole	0.0%	0.0%	0.0%	0.0%
<i>Total</i>	<i>0.8%</i>	<i>1.1%</i>	<i>1.1%</i>	<i>1.0%</i>

3.2. Projection Scenarios

3.2.1. Powerboat & Sailboat Registration Forecasts

Once data was concentrated and validated, historical rates of per capita registrations by powerboats and sailboats for Brevard, Orange, and Seminole counties were calculated from the historic population data together with the concentrated registration data for the base scenario. Compound annual growth rates (CAGR) from 2018 to 2020 were established, as well as the three-year average. These figures were used to assess historical trends and were used to project per capita registrations forward throughout the projection period.

Table 19: Per Capita Registration by County, 2018 – 2020

Source: BA Analysis

County	2018	2019	2020	CAGR	3-Year Average
Per Capita Powerboat Registrations Greater than 25'11" in Length					
Brevard	0.4%	0.4%	0.5%	2.6%	0.4%
Orange	0.1%	0.1%	0.2%	28.7%	0.1%
Seminole	0.2%	0.2%	0.2%	-2.4%	0.2%
<i>Total</i>	<i>0.19%</i>	<i>0.21%</i>	<i>0.23%</i>	<i>9.5%</i>	<i>0.2%</i>
Per Capita Sailboat Registrations (All)					
Brevard	12.8%	12.7%	12.1%	-2.9%	12.6%
Orange	9.8%	7.7%	5.8%	-23.1%	7.8%
Seminole	9.7%	9.9%	10.9%	6.0%	10.2%
<i>Total</i>	<i>11.5%</i>	<i>10.7%</i>	<i>9.6%</i>	<i>-8.4%</i>	<i>10.6%</i>

Using the three-year average as a base, total powerboat and sailboat registrations were projected forward utilizing historical figures and FDOT's anticipated population growth by county. A 1% growth rate for powerboat registrations was factored in for Brevard and Orange county given the growth experienced over the historical data period exceeded that of the overall population growth in the counties. The model assumes the general population growth rate for Seminole powerboat boat registrations, as well as all sailboat registrations.

Next, the model estimated the total powerboats and sailboats that may require bridge openings over the forecast period, under each scenario. The model works backward from the existing data based on the boat registration forecasts, coupled with the percentage of registrations potentially impacted by the different bridge heights by county, as outlined in Table 16 and Table 18.

Table 20 shows the baseline for total projected powerboat and sailboat registrations that may be limited by the three bridge height scenarios.

Table 20: Projected Registrations Potentially Limited by Bridge Height, 2020 – 2045

Source: BA Analysis

County	2020	2025	2030	2035	2040	2045	CAGR
25 ft Bridge							
Powerboat Registrations							
Brevard	2,730	3,034	3,337	3,651	3,979	4,334	1.8%
Orange	2,208	2,575	2,946	3,314	3,708	4,137	2.4%
Seminole	815	868	913	956	997	1,034	0.9%
<i>Total</i>	<i>5,753</i>	<i>6,477</i>	<i>7,196</i>	<i>7,920</i>	<i>8,684</i>	<i>9,505</i>	<i>1.9%</i>
Sailboat Registrations							
Brevard	356	381	419	459	500	544	1.8%
Orange	145	200	229	257	288	321	2.4%
Seminole	95	88	93	97	102	105	0.9%
<i>Total</i>	<i>612</i>	<i>669</i>	<i>741</i>	<i>813</i>	<i>889</i>	<i>971</i>	<i>1.9%</i>
40 ft Bridge							
Powerboat Registrations							
Brevard	n/a	19	21	23	26	28	1.8%
Orange	n/a	26	29	33	37	41	2.4%
Seminole	n/a	12	13	13	14	14	0.9%
<i>Total</i>	<i>n/a</i>	<i>57</i>	<i>63</i>	<i>70</i>	<i>76</i>	<i>83</i>	<i>1.9%</i>
Sailboat Registrations							
Brevard	n/a	176	193	211	231	251	1.8%
Orange	n/a	58	66	75	84	93	2.4%
Seminole	n/a	31	33	35	36	37	0.9%
<i>Total</i>	<i>n/a</i>	<i>265</i>	<i>293</i>	<i>321</i>	<i>350</i>	<i>382</i>	<i>1.8%</i>
65 ft Bridge							
Powerboat Registrations							
Brevard	n/a	0	0	0	0	0	0.0%
Orange	n/a	0	0	0	0	0	0.0%
Seminole	n/a	0	0	0	0	0	0.0%
<i>Total</i>	<i>n/a</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>0.0%</i>
Sailboat Registrations							
Brevard	n/a	2	3	3	3	3	1.8%
Orange	n/a	6	7	7	8	9	2.4%
Seminole	n/a	0	0	0	0	0	0.0%
<i>Total</i>	<i>n/a</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>	<i>13</i>	<i>2.2%</i>

3.2.2. Bridge Opening Forecasts

Table 20 provided the total potential boats in the area that may require bridge openings. However, not all boats in the area traverse under the bridge and require openings – as outlined previously in Table 12. From the total potential boat registrations forecast under each scenario, the percentage of registered power and sailboats requiring openings were calculated based on historic percentages – 4.6% of total powerboat registrations and 66.6% of total sailboat registrations. These percentages assume double passage under the bridge.

Additionally, as historic data indicates, not all vessels that require openings will trigger a unique opening, as multiple vessels can traverse under the bridge in a given opening. Thus annual bridge openings were determined based on the historic ratio of openings to boats. This ratio was 0.87 (Table 3).

Lastly, the average bridge opening time was used to calculate the total time open. The average time open for vessels was six minutes and 24 seconds. These annual figures do not include the number of openings and time open for maintenance and training.

The forecasted vessels traversing, annual bridge openings, and annual bridge opening time for each bridge height are shown in Table 21.

Table 21: 25', 40', & 65' Annual Bridge Opening Forecast Summary, 2020 – 2045

Source: BA

Month	2020	2025	2030	2035	2040	2045
25 ft Bridge						
Vessels Traversing	1,415	1,488	1,650	1,813	1,984	2,169
Bridge Openings	1,220	1,296	1,437	1,579	1,729	1,889
Bridge Opening Time	130:09:24	138:18:24	153:18:23	168:27:36	184:24:48	201:32:43
40 ft Bridge						
Vessels Traversing	1,415	358	396	434	473	516
Bridge Openings	1,220	312	345	378	412	450
Bridge Opening Time	130:09:24	33:18:41	36:46:31	40:17:47	43:59:35	47:57:34
65 ft Bridge						
Vessels Traversing	1,415	11	12	14	15	17
Bridge Openings	1,220	9	11	12	13	15
Bridge Opening Time	130:09:24	0:59:54	1:07:45	1:15:38	1:24:01	1:33:08

3.2.3. Seasonality Forecasts

The final analysis included a review of seasonality under each scenario. Seasonality was calculated based on a review of the historic bridge opening data. The forecasted

monthly and daily seasonality utilized the three-year average from the historical data set. This breakdown by proposed bridge height is shown in Table 22 (monthly) and Table 23 (daily). Historical monthly and daily distribution can be found in Appendix 5.10 and 5.11.

Table 22: Annual Bridge Openings by Month, 2020 – 2045

Source: BA

Month	2020	2025	2030	2035	2040	2045
25 ft Bridge Height						
January	87	100	111	121	133	145
February	82	94	105	115	126	138
March	106	122	136	149	163	178
April	56	117	130	143	157	171
May	131	139	154	170	186	203
June	121	110	121	133	146	160
July	122	101	112	123	135	148
August	112	101	111	123	134	147
September	55	78	86	95	104	113
October	93	93	103	113	123	135
November	135	135	149	164	180	196
December	121	107	119	130	143	156
<i>Total</i>	<i>1,220</i>	<i>1,296</i>	<i>1,437</i>	<i>1,579</i>	<i>1,729</i>	<i>1,889</i>
40 ft Bridge Height						
January	87	24	27	29	32	35
February	82	23	25	27	30	33
March	106	29	33	36	39	42
April	56	28	31	34	37	41
May	131	34	37	41	44	48
June	121	26	29	32	35	38
July	122	24	27	30	32	35
August	112	24	27	29	32	35
September	55	19	21	23	25	27
October	93	22	25	27	29	32
November	135	32	36	39	43	47
December	121	26	28	31	34	37
<i>Total</i>	<i>1,220</i>	<i>312</i>	<i>345</i>	<i>378</i>	<i>412</i>	<i>450</i>
65 ft Bridge Height						
January	87	1	1	1	1	1
February	82	1	1	1	1	1
March	106	1	1	1	1	1
April	56	1	1	1	1	1
May	131	1	1	1	1	2
June	121	1	1	1	1	1
July	122	1	1	1	1	1
August	112	1	1	1	1	1
September	55	1	1	1	1	1
October	93	1	1	1	1	1
November	135	1	1	1	1	2
December	121	1	1	1	1	1
<i>Total</i>	<i>1,220</i>	<i>9</i>	<i>11</i>	<i>12</i>	<i>13</i>	<i>15</i>

Table 23: Annual Bridge Openings by Day, 2020 – 2045

Source: BA

Month	2020	2025	2030	2035	2040	2045
25 ft Bridge Height						
Sunday	185	197	219	240	263	288
Monday	158	168	186	204	224	245
Tuesday	147	151	167	184	201	220
Wednesday	184	177	196	215	236	258
Thursday	147	167	185	203	222	243
Friday	152	193	214	235	258	282
Saturday	249	244	270	297	325	355
<i>Total</i>	<i>1,220</i>	<i>1,297</i>	<i>1,437</i>	<i>1,579</i>	<i>1,729</i>	<i>1,889</i>
40 ft Bridge Height						
Sunday	185	48	52	57	63	68
Monday	158	40	45	49	53	58
Tuesday	147	36	40	44	48	52
Wednesday	184	43	47	52	56	61
Thursday	147	40	44	49	53	58
Friday	152	47	51	56	61	67
Saturday	249	59	65	71	78	85
<i>Total</i>	<i>1,220</i>	<i>312</i>	<i>345</i>	<i>378</i>	<i>412</i>	<i>450</i>
65 ft Bridge Height						
Sunday	185	1	2	2	2	2
Monday	158	1	1	2	2	2
Tuesday	147	1	1	1	2	2
Wednesday	184	1	1	2	2	2
Thursday	147	1	1	2	2	2
Friday	152	1	2	2	2	2
Saturday	249	2	2	2	2	3
<i>Total</i>	<i>1,220</i>	<i>9</i>	<i>11</i>	<i>12</i>	<i>13</i>	<i>15</i>

4.0. FINDINGS & RECOMMENDATIONS

The data analysis established drawbridge utilization as well as the timing of the peak months and days of marine traffic from 2020 through 2045. The utilization was based on forecasts of annual vessel traffic demands traversing under the SR 401 bridges based on 25 ft, 40 ft, and 65 ft bascule span air drafts. These findings are based on an understanding of the current marine traffic in the region and future demand for the Canaveral Barge Canal.

As summarized below, as the bridge increases in height, significantly fewer openings are required. Therefore to decrease both vessel and vehicular traffic interference, increasing the bridge height will have significant positive impacts. However, it is noted that even at the 65 ft bridge height, a few openings are anticipated for some sailboats that have masts beyond 65 ft.

The 65 ft bridge option is a fixed bridge option. However, as per the information provided by the U.S. Army Corps of Engineers, the posted height of all nearby fixed bridges on the ICWW is 65 ft above mean high water. These few sailboats could traverse to the ICWW or ocean by another inlet that does not have a bridge limitation. Conversely, there remains enough marina capacity outside of the Canaveral Barge Canal where transiting under the bridge would not be a requirement for these few sailboats.

A complete summary of the Vessel Survey and Navigation Study is shown in Table 24.

Table 24: Vessel Survey & Navigation Study Summary, 2020 – 2045

Source: BA

Month	2020	2025	2030	2035	2040	2045
Vessels Traversing						
25 ft Clearance	1,415	1,488	1,650	1,813	1,984	2,169
40 ft Clearance	1,415	358	396	434	473	516
65 ft Clearance	1,415	11	12	14	15	17
Bridge Openings						
25 ft Clearance	1,220	1,296	1,437	1,579	1,729	1,889
40 ft Clearance	1,220	312	345	378	412	450
65 ft Clearance	1,220	9	11	12	13	15
Bridge Opening Time						
25 ft Clearance	130:09:24	138:18:24	153:18:23	168:27:36	184:24:48	201:32:43
40 ft Clearance	130:09:24	33:18:41	36:46:31	40:17:47	43:59:35	47:57:34
65 ft Clearance	130:09:24	0:59:54	1:07:45	1:15:38	1:24:01	1:33:08
Bridge Openings (Peak Season)						
25 ft Clearance	670	730	809	889	974	1,064
40 ft Clearance	670	176	194	213	232	253
65 ft Clearance	670	5	6	7	7	8
Bridge Openings (Off Peak Season)						
25 ft Clearance	551	566	628	690	755	825
40 ft Clearance	551	136	151	165	180	196
65 ft Clearance	551	4	5	5	6	6
Bridge Openings (Weekends)						
25 ft Clearance	434	441	489	537	588	643
40 ft Clearance	434	106	117	129	140	153
65 ft Clearance	434	3	4	4	4	5
Bridge Openings (Weekdays)						
25 ft Clearance	786	856	948	1,042	1,141	1,247
40 ft Clearance	786	206	227	249	272	297
65 ft Clearance	786	6	7	8	9	10

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION
VESSEL SURVEY AND NAVIGATION STUDY

Project Development & Environment (PD&E) Study

APPENDIX

S.R. 401 Bridge Replacement PD&E Study
 FM 444787-1-22-01

5.0. APPENDIX

5.1. SR 401 Bridge Opening Log Data - Sample

Source: Florida Department of Transportation District 5

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION
REPORT OF DRAWBRIDGE OPENINGS

ES-010.04
 MAINTENANCE
 0195

0-34 B-38 T-1 Pg. 3
 19 18 1

BRIDGE NUMBER 700117 SECTION NUMBER 70080
 REPORT FOR THE MONTH OF JAN 2018
 NAME OF BRIDGE NEWBARGE CANAL
 LOCATION SR 401

DAY OF WEEK	DATE	DRAW OPENING NUMBER	TIME GATES DROPPEN AM OR PM	TIME GATES OPEN AM OR PM	DIRECTION	CONDITION OF WEATHER & RIVER	TYPE OF VESSEL PASSING THROUGH	NAME OR NUMBER OF VESSEL	NAME OF TENDER IN CHARGE OF DRAW
TUE	16	35	8:27 AM	8:33 AM	<input checked="" type="checkbox"/> NORTH <input type="checkbox"/> SOUTH	PS-C	PS-S	RENEGADE	SMITH
TUE	16	36	10:00 AM	10:00 AM	<input checked="" type="checkbox"/> NORTH <input type="checkbox"/> SOUTH	PS-C	PMV-05	DETERMINATION	SMITH
TUE	16	37	10:31 AM	10:31 AM	<input checked="" type="checkbox"/> NORTH <input type="checkbox"/> SOUTH	PS-C	PS-Y	MILLYSRA MORE	SMITH
TUE	16	38	8:16 AM	8:24 AM	<input checked="" type="checkbox"/> NORTH <input type="checkbox"/> SOUTH	PS-W	A-SF	MISTY BLUE	A. WEAVER
TUE	16	39	8:09 AM	8:15 AM	<input checked="" type="checkbox"/> NORTH <input type="checkbox"/> SOUTH	PS-W	PS-S	THE FAIR SWAN	A. WEAVER
TUE	16	40	8:06 PM	8:22 AM	<input checked="" type="checkbox"/> NORTH <input type="checkbox"/> SOUTH	PS-W	T	BOONE AVE	A. WEAVER
WED	17	41	8:15 AM	8:20 AM	<input checked="" type="checkbox"/> NORTH <input type="checkbox"/> SOUTH	PS-C	PMV-Y	NO VASANCY	SMITH
WED	17	42	9:03 AM	9 AM	<input checked="" type="checkbox"/> NORTH <input type="checkbox"/> SOUTH	PS-C	T	BOBBIE ANN	SMITH
WED	17	43	10:07 AM	10:08 AM	<input checked="" type="checkbox"/> NORTH <input type="checkbox"/> SOUTH	PS-C	PS-S	ANTWERP REALTY	SMITH
WED	17	44	11:05 AM	11:13 AM	<input checked="" type="checkbox"/> NORTH <input type="checkbox"/> SOUTH	PS-C	PS-S	BLUE ROSE	SMITH
WED	17	45	12:25 PM	1 PM	<input checked="" type="checkbox"/> NORTH <input type="checkbox"/> SOUTH	PS-C	T/B	CATHERINE	SMITH
WED	17	46	2:41 PM	2:47 PM	<input checked="" type="checkbox"/> NORTH <input type="checkbox"/> SOUTH	PS-C	PS-S	ANTWERP REALTY	RONSTRON
WED	17	47	5:27 AM	5:28 PM	<input checked="" type="checkbox"/> NORTH <input type="checkbox"/> SOUTH	PS-C	T	BOBBIE ANN	RONSTRON
THU	18	48	6:05 AM	6:20 AM	<input checked="" type="checkbox"/> NORTH <input type="checkbox"/> SOUTH	NS-W	PMV-Y	OATO	SMITH
THU	18	49	3:12 PM	3:18 PM	<input checked="" type="checkbox"/> NORTH <input type="checkbox"/> SOUTH	T EST	T EST	BOBBIE ANN	RONSTRON
FRI	19	50	8:44 AM	8:30 AM	<input checked="" type="checkbox"/> NORTH <input type="checkbox"/> SOUTH	PS-C	T	BOBBIE ANN	P. Speck
FRI	19	51	9:00 AM	9:06 AM	<input checked="" type="checkbox"/> NORTH <input type="checkbox"/> SOUTH	S-C	P-MVC	Misty Blue	P. Speck
FRI	19	52	5:57 PM	5:57 PM	<input checked="" type="checkbox"/> NORTH <input type="checkbox"/> SOUTH	PS-C	T	BOBBIE ANN	RONSTRON
FRI	19	53	7:46 PM	7:50 PM	<input checked="" type="checkbox"/> NORTH <input type="checkbox"/> SOUTH	NS C	T	UNICORN	RONSTRON

5.2. Canaveral Lock Log Data – Sample

Source: U.S. Army Corps of Engineers

EROC K3	VESSEL SUMMARY REPORT	Report: LPMS 5		
LOCK 21	CANAVERAL HARBOR	Run Date: 06/25/2021 12:11		
CHMB 1	CANAVERAL LOCK	01/01/2018 thru 12/31/2018		
Type of Vessel		Upbound	Downbound	Total
Passenger Boat or Ferry (commercial)		0	1	1
Crewboat Vessel (does not include boat crew)		1	1	2
Commercial Non-cargo Vessel (i.e. private yacht & pilot)		0	1	1
Other		441	433	874
Non-federal Government Vessel (i.e. state or local govt)		24	32	56
Fishing Vessel (commercial)		60	69	129
Federal Government Vessel wo/Barges		159	145	304
Recreation Vessel		6989	6885	13874
Cmrcl Towboats w/Barges		22	26	48
Towboats wo/Barges		64	68	132
Total Vessels		7760	7661	15421
Only Vessel Types With Counts Greater Than 0 Appear Above				
Total Non-Vessel Lockages		N/A	N/A	0
Total Assists		4	6	10
Total Lockages		3966	4085	8051

S.R. 401 Bridge Replacement PD&E Study
FM 444787-1-22-01

5.3. Marina Survey Database

Source: GoogleMaps, BA

Name	Address	Location (of Bridge)	Phone
1. Whitley Bay Yacht Club	90 Delannoy Ave, Cocoa, FL 32922	West	(321) 632-5445
2. KARS Park	Audobon Rd, Merritt Island, FL 32953	West	(321) 867-7967
3. Telemar Bay Marina	1399 Banana River Dr, Indian Harbour Beach, FL 32937	West	(321) 773-2468
4. Pineda Point Marina	6175 N US Hwy 1, Melbourne, FL 32940	West	(321) 254-4199
5. Treasure Coast Marina	5185 US-1, Grant-Valkaria, FL 32949	West	(321) 733-3390
6. Cape Crossing Marina	290 Marine Harbor Dr suite a, Merritt Island, FL 32953	West	(321) 576-4967
7. Kennedy Point Yacht Club & Marina	4749 S Washington Ave, Titusville, FL 32780	West	(321) 383-0280
8. Melbourne Yacht Club	1202 E River Dr, Melbourne, FL 32901	West	(321) 768-9921
9. Ocean Club	930 Mullet Rd, Cape Canaveral, FL 32920	East	(321) 783-9001
10. Palm Bay Marina	4350 Dixie Hwy NE, Palm Bay, FL 32905	West	(321) 723-0851
11. Sebastian River Marina & Boat Yard	8525 US-1, Sebastian, FL 32976	West	(772) 664-3029
12. Anchorage Yacht Basin	96 East Eau Gallie Causeway, Melbourne, FL 32937	West	(321) 773-3620
13. Blue Points Marina	726 Scallop Dr, Cape Canaveral, FL 32920	East	(321) 799-2860
14. Cape Marina	800 Scallop Dr, Cape Canaveral, FL 32920	East	(321) 783-8410
15. Cocoa Village Marina	90 Delannoy Ave, Cocoa, FL 32922	West	(321) 632-5445
16. Eau Gallie Yacht Basin	587 Young St, Melbourne, FL 32935	West	(321) 242-6577
17. Eau Gallie Yacht Club	100 Datura Dr, Indian Harbour Beach, FL 32937	West	(321) 773-2600
18. Harbortown Marina	2700 Harbortown Dr, Merritt Island, FL 32952	West	(321) 453-0160
19. Island Time Marina	400 W Cocoa Beach Causeway, Cocoa Beach, FL 32941	West	(321) 613-4852
20. Manatee Cove Marina	Patrick Air Force Base, FL 32925	West	(321) 494-7455
21. Marker 24 Marina	1360 S Banana River Dr, Merritt Island, FL 32952	West	(321) 453-7888
22. Melbourne Harbor Marina	2210 Front St # 101, Melbourne, FL 32901	West	(321) 725-9054
23. Port Canaveral Yacht Club	910 Mullet Rd, Cape Canaveral, FL 32920	East	(321) 784-2292
24. Sebastian Inlet Marina	8685 US-1, Micco, FL 32976	West	(772) 664-8500
25. Sunrise Marina	505 Glen Cheek Dr, Cape Canaveral, FL 32920	East	(321) 783-9535
26. Titusville Marina	451 Marina Rd, Titusville, FL 32796	West	(321) 383-5600
27. Waterline Marina	905 FL-5, Melbourne, FL 32935	West	(321) 254-0452
28. Westland Boatyard & Marina	419 N Washington Ave, Titusville, FL 32796	West	(321) 267-1667

5.4. SR 401 Bridge Replacement Marina Survey Questions

Marina Name & Address

Facility Characteristics - Capacity

Please complete the table below

	Currently	Future Demand (5-10 years)
How many wet slips?		
How many dry boat storage capacity on racks?		
How many dry boat storage capacity on the yard?		

Facility Characteristics - Services

Please complete the table below

	Currently	Future Demand (5-10 years)
Do you offer fuel?		
Do you offer repairs?		
Do you offer in and out ramps?		
Do you offer in and out lift capacity?		

Vessel Characteristics - Capacity

Fill in the approximate percentage of ships you have falling within each category below, if known.

	Current Percentage
% Sailboats	
% Powerboats	

Vessel Size - % of Vessels by Length

Fill in the approximate percentage of ships you have falling within each category below, if known.

	% Powerboats	% Sailboats
Under 21 ft		
22 – 30 ft		
31 – 45 ft		
46 – 55 ft		
56 – 65 ft		
Over 65 ft		

Vessel Size - % of Vessels by Mast Height

Fill in the approximate percentage of ships you have falling within each category below, if known.

	% Sailboats
Under 35 ft	
36 – 45 ft	
46 – 55 ft	
56 – 65 ft	
Over 65 ft	

Customer Base

On average, what percentage of your customers come from each segment below?

% of Local Residents (Brevard)	
% of Regional Residents (Central FL)	
% Transient	
% Charter / Fishing Boats	
% Commercial	
% Other	

Occupancy & Seasonality

1. Is your business constant year-round? Please explain.
2. If your marina is seasonal, what are the peak months?
3. What is your average occupancy during the peak season?
4. What is your average occupancy during the non-peak season?

Access Under SR 401 Bridges

1. Is access to the ocean / Banana River important to your customers?
2. % of business that regularly uses the Canaveral locks to access the ocean / Banana River.

Do you have any specific comments/concerns from your own experience or from what your customers have told you about the SR 401 bridges over the Canaveral Barge Canal?

Please leave any additional comments here that you would like us to take into consideration for the bridge assessment, including if you would like to discuss anything in more detail over the phone.

Do you want to be contacted as the project continues? If yes, please provide the best way to contact you moving forward.

5.5. SR 401 Bridge Replacement Marina Survey Responses

Wednesday, June 23, 2021



SR 401 Bridge Marina Questionnaire - East

Would you prefer to fill the survey out online, or do you prefer that someone from BA contacts you via phone? Online Survey

Contact Information

Your Name
 Keith Smith

Marina Name
 Bluepoints Marina

Email (for future communications)
 keith@bluepointsmarina.com

Do you want to be contacted as the project progresses?
 Yes

Contact Information 1

Your Name
 Keith Smith

Marina Name
 Bluepoints Marina

Email (for future communications)
 keith@bluepointsmarina.com

Do you want to be contacted as the project progresses?
 Yes

Marina Address

726 Scallop Drive
 Cape Canaveral, FL, 32920

Facility Characteristics - Capacity

	Currently	Future Demand (5-10 years)
How many wet slips?	26	uncertain
How many dry boat storage capacity on racks?	566	(Permitted for 924 dry storage
How many dry boat storage capacity on the yard?	N/A	will expand into this in the future

Facility Characteristics - Services

	Currently	Future Demand (5-10 years)
Do you offer fuel?	Yes	Yes
Do you offer repairs?	Yes	Yes
Do you offer in and out ramps?	No	No
Do you offer in and out lift capacity?	Yes	Yes

Vessel Characteristics

	Current Percentage
% of Sailboats	0
% of Powerboats	100

Vessel Size - % of Vessels by Length (6 Categories)

	% Powerboats (Length)	% Sailboats (Length)
Under 21 ft	0	0
22 - 30 ft	25	0
31 - 45 ft	70	
46 - 55 ft	5	0
56 - 65 ft	0	0
Over 65 ft	0	0

Vessel Size - % of Vessels by Mast Height (6 Categories)

	% Sailboats (Mast Height)
Under 21 ft	0
22 - 35 ft	0
36 - 45 ft	0
46 - 55 ft	0
56 - 65 ft	0
Over 65 ft	

Customer Base (6 Categories)

	%
% of Local Residents (Brevard)	49
% of Regional Residents (Central Florida)	49
% Transient	2
% Charter / Fishing Boats	5
% Commercial	0
% Other	0

Occupancy & Seasonality

Is your business constant year round? Please explain.

yes

If your marina is seasonal, what are the peak months?

peak months are March - August

What is your average occupancy during the peak season?

confidential

What is your average occupancy during the non peak season?

confidential

Access Under SR 401 Bridges

Is access to the ocean (east of SR 401) / Banana River (west of SR 401) important to your customers?

yes

% of business that regularly uses the Canaveral locks to access the ocean / Banana River.

25

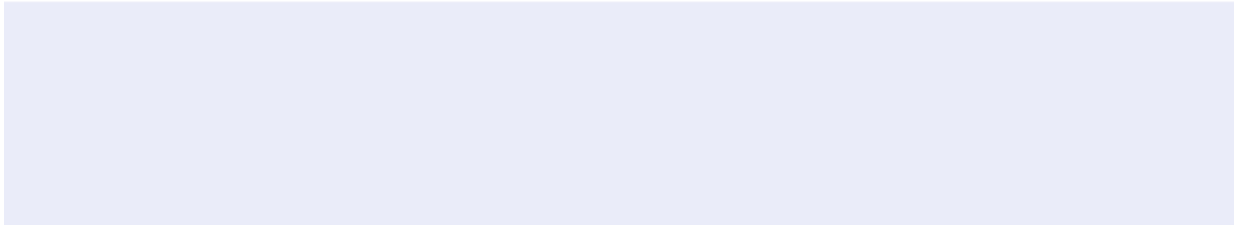
Do you have any specific comments / concerns from your own experience or from what your customers have told you about the SR 401 bridges over the Canaveral Barge Canal?

No

Thursday, June 24, 2021



SR 401 Bridge Marina Questionnaire - East



Would you prefer to fill the survey out online, or do you prefer that someone from BA contacts you via phone?

Online Survey

Contact Information

Your Name

Colonel Richard Roten

Marina Name

Port Canaveral Yacht Club

Email (for future communications)

dickroten@gmail.com

Do you want to be contacted as the project progresses?

Yes

Contact Information 1

Your Name

Colonel Richard Roten

Marina Name

Port Canaveral Yacht Club

Email (for future communications)

dickroten@gmail.com

Do you want to be contacted as the project progresses?

Yes

Marina Address

910 Mullet Drive
 Cape Canaveral , Fl

Facility Characteristics - Capacity

	Currently	Future Demand (5-10 years)
How many wet slips?	5050	30

	Currently	Future Demand (5-10 years)
How many dry boat storage capacity on racks?	0	0
How many dry boat storage capacity on the yard?	0	0

Facility Characteristics - Services

	Currently	Future Demand (5-10 years)
Do you offer fuel?	No	
Do you offer repairs?	No	No
Do you offer in and out ramps?	No	No
Do you offer in and out lift capacity?		

Vessel Characteristics

	Current Percentage
% of Sailboats	75
% of Powerboats	

Vessel Size - % of Vessels by Length (6 Categories)

	% Powerboats (Length)	% Sailboats (Length)
Under 21 ft	0	0
22 - 30 ft	0	0
31 - 45 ft	70	70
46 - 55 ft	25	25
56 - 65 ft	0	0
Over 65 ft		

Vessel Size - % of Vessels by Mast Height (6 Categories)

	% Sailboats (Mast Height)
Under 21 ft	0
22 - 35 ft	0
36 - 45 ft	0
46 - 55 ft	30
56 - 65 ft	40
Over 65 ft	30

Customer Base (6 Categories)

	%
% of Local Residents (Brevard)	80
% of Regional Residents (Central Florida)	
% Transient	
% Charter / Fishing Boats	
% Commercial	
% Other	

Occupancy & Seasonality

Is your business constant year round? Please explain.

Yes

If your marina is seasonal, what are the peak months?

Yes

Access Under SR 401 Bridges

Is access to the ocean (east of SR 401) / Banana River (west of SR 401) important to your customers?

Yes

% of business that regularly uses the Canaveral locks to access the ocean / Banana River.

90

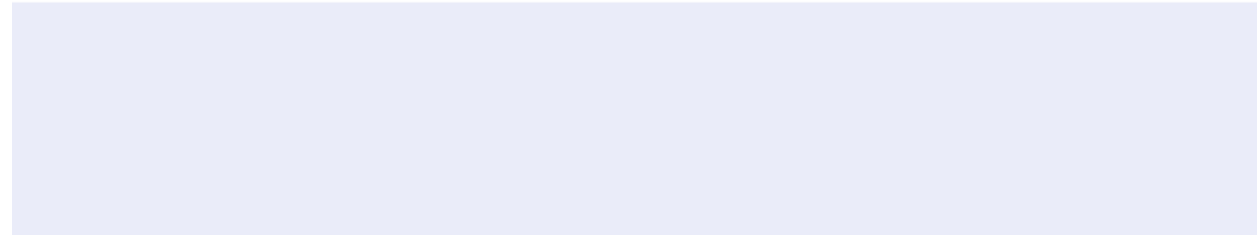
Do you have any specific comments / concerns from your own experience or from what your customers have told you about the SR 401 bridges over the Canaveral Barge Canal?

Hurricane evacuation requires all vessels to leave via SR 401 to ICW

Tuesday, June 29, 2021



SR 401 Bridge Marina Questionnaire - East



Would you prefer to fill the survey out online, or do you prefer that someone from BA contacts you via phone?

Online Survey

Contact Information

Your Name

Dylan Houck

Marina Name

Cape Marina

Email (for future communications)

dylan@capemarina.com

Do you want to be contacted as the project progresses?

Yes

Marina Address

800 Scallop Dr
 Cape Canaveral, FL, 32920

Facility Characteristics - Capacity

	Currently	Future Demand (5-10 years)
How many wet slips?	115	125
How many dry boat storage capacity on racks?	80	150
How many dry boat storage capacity on the yard?	100	150

Facility Characteristics - Services

	Currently	Future Demand (5-10 years)
Do you offer fuel?	Yes	Yes
Do you offer repairs?	No	No

	Currently	Future Demand (5-10 years)
Do you offer in and out ramps?	No	No
Do you offer in and out lift capacity?	Yes	Yes

Vessel Characteristics

	Current Percentage
% of Sailboats	25
% of Powerboats	75

Customer Base (6 Categories)

	%
% of Local Residents (Brevard)	60
% of Regional Residents (Central Florida)	25
% Transient	5
% Charter / Fishing Boats	5
% Commercial	5
% Other	

Occupancy & Seasonality

Is your business constant year round? Please explain.

There is no Off Season.

If your marina is seasonal, what are the peak months?

N?A

What is your average occupancy during the peak season?

95%

What is your average occupancy during the non peak season?

92%

Access Under SR 401 Bridges

Is access to the ocean (east of SR 401) / Banana River (west of SR 401) important to your customers?

Absolutely, it 100% essential.

% of business that regularly uses the Canaveral locks to access the ocean / Banana River.

70

Do you have any specific comments / concerns from your own experience or from what your customers have told you about the SR 401 bridges

The largest concern is that any project regarding the 401 Bridge must keep the status quo. A huge percentage of sailboats require the drawbridge capabilities of the 401 to

enter and exit Port Canaveral. There is not to my knowledge any improvements to be made to the bridge as the bridge opening satisfy the traffic demands. If the bridge was taller it would decrease the openings required for some sailboats but it still must be a drawbridge as some masts go beyond 75'-100'. The best bet is to increase the height of the bridge and still have the drawbridge thus decreasing the number of openings interfering with traffic while still allowing vessels of almost any size thru.

Tuesday, July 6, 2021



SR 401 Bridge Marina Questionnaire - East



Would you prefer to fill the survey out online, or do you prefer that someone from BA contacts you via phone?

Online Survey

Contact Information

Your Name

Thomas Maliszko

Marina Name

Eau Gallie Yacht Club

Email (for future communications)

tmaliszko@egyachtclub.com

Do you want to be contacted as the project progresses?

No

Marina Address

100 Datura
 Indian Harbour Beach, FL, 32937

Facility Characteristics - Capacity

	Currently	Future Demand (5-10 years)
How many wet slips?	64	64
How many dry boat storage capacity on racks?	0	0
How many dry boat storage capacity on the yard?	0	0

Facility Characteristics - Services

	Currently	Future Demand (5-10 years)
Do you offer fuel?	No	No
Do you offer repairs?	No	No

	Currently	Future Demand (5-10 years)
Do you offer in and out ramps?	Yes	Yes
Do you offer in and out lift capacity?	No	No

Vessel Characteristics

	Current Percentage
% of Sailboats	15
% of Powerboats	85

Vessel Size - % of Vessels by Length (6 Categories)

	% Powerboats (Length)	% Sailboats (Length)
Under 21 ft	4	0
22 - 30 ft		
31 - 45 ft		
46 - 55 ft		
56 - 65 ft		
Over 65 ft		

Vessel Size - % of Vessels by Mast Height (6 Categories)

	% Sailboats (Mast Height)
Under 21 ft	0
22 - 35 ft	10
36 - 45 ft	5
46 - 55 ft	0
56 - 65 ft	0
Over 65 ft	0

Customer Base (6 Categories)

	%
% of Local Residents (Brevard)	85
% of Regional Residents (Central Florida)	15
% Transient	0
% Charter / Fishing Boats	0
% Commercial	0

	%
% Other	100

Occupancy & Seasonality

Is your business constant year round? Please explain.

Yes, our boats are in the water all year

Access Under SR 401 Bridges

Is access to the ocean (east of SR 401) / Banana River (west of SR 401) important to your customers?

Yes

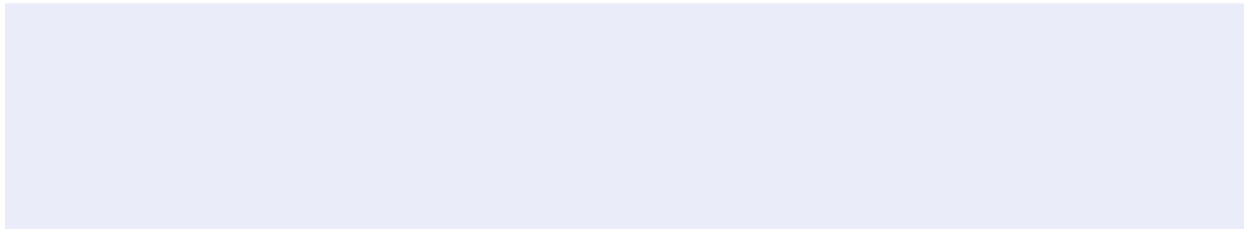
% of business that regularly uses the Canaveral locks to access the ocean / Banana River.

50

Tuesday, July 6, 2021



SR 401 Bridge Marina Questionnaire - East



Would you prefer to fill the survey out online, or do you prefer that someone from BA contacts you via phone?

Online Survey

Contact Information

Your Name

Robin Roark

Marina Name

Sunrise Marina

Email (for future communications)

robinroark@sunrisemarina.com

Do you want to be contacted as the project progresses?

Yes

Marina Address

505 Glen Cheek Drive
 Cape Canaveral, Florida, 32920

Facility Characteristics - Capacity

	Currently	Future Demand (5-10 years)
How many wet slips?	18	
How many dry boat storage capacity on racks?	110	
How many dry boat storage capacity on the yard?	4	

Facility Characteristics - Services

	Currently	Future Demand (5-10 years)
Do you offer fuel?	Yes	
Do you offer repairs?	No	

	Currently	Future Demand (5-10 years)
Do you offer in and out ramps?	No	
Do you offer in and out lift capacity?	Yes	

Vessel Characteristics

	Current Percentage
% of Sailboats	0
% of Powerboats	112

Vessel Size - % of Vessels by Length (6 Categories)

	% Powerboats (Length)	% Sailboats (Length)
Under 21 ft	10	
22 - 30 ft	50	
31 - 45 ft	52	
46 - 55 ft		
56 - 65 ft		
Over 65 ft		

Customer Base (6 Categories)

	%
% of Local Residents (Brevard)	30
% of Regional Residents (Central Florida)	50
% Transient	0
% Charter / Fishing Boats	20
% Commercial	
% Other	

Occupancy & Seasonality

Is your business constant year round? Please explain.

Yes

What is your average occupancy during the peak season?

90%

What is your average occupancy during the non peak season?

90%

Access Under SR 401 Bridges

Is access to the ocean (east of SR 401) / Banana River (west of SR 401) important to your customers?

Some

% of business that regularly uses the Canaveral locks to access the ocean / Banana River.

10

Wednesday, June 23, 2021



SR 401 Bridge Marina Questionnaire - West

Would you prefer to fill the survey out online, or do you prefer that someone from BA contacts you via phone?

Online Survey

Contact Information

Your Name

Bradley W Keyon

Marina Name

Palm Bay Marina

Email (for future communications)

Bradk@Boatandmotorsuperstores.com

Do you want to be contacted as the project progresses?

Yes

Marina Address

4350 DIXIE HWY NE
 PALM BAY, FL, 32905-4332

Facility Characteristics - Capacity

	Currently	Future Demand (5-10 years)
How many wet slips?	80	400
How many dry boat storage capacity on racks?	100	400
How many dry boat storage capacity on the yard?	20	100

Facility Characteristics - Services

	Currently	Future Demand (5-10 years)
Do you offer fuel?	No	Yes
Do you offer repairs?	Yes	Yes
Do you offer in and out ramps?	No	Yes
Do you offer in and out lift capacity?	No	Yes

Vessel Characteristics

	Current Percentage
% of Sailboats	0
% of Powerboats	100

Vessel Size - % of Vessels by Length (6 Categories)

	% Powerboats (Length)	% Sailboats (Length)
Under 21 ft	70	0
22 - 30 ft	25	0
31 - 45 ft	5	0
46 - 55 ft	0	0
56 - 65 ft	0	0
Over 65 ft	0	0

Vessel Size - % of Vessels by Mast Height (6 Categories)

	% Sailboats (Mast Height)
Under 21 ft	0
22 - 35 ft	0
36 - 45 ft	0
46 - 55 ft	0
56 - 65 ft	0
Over 65 ft	0

Customer Base (6 Categories)

	%
% of Local Residents (Brevard)	80
% of Regional Residents (Central Florida)	15
% Transient	5
% Charter / Fishing Boats	0
% Commercial	0
% Other	0

Occupancy & Seasonality

Is your business constant year round? Please explain.

Yes. Mostly Locak

Ocean Access Under SR 401 Bridges

Is access to the ocean important to your customers?

yes

% of business that regularly uses the Canaveral locks to access the ocean.

10

Do you have any specific comments / concerns from your own experience or from what your customers have told you about the SR 401 bridges over the Canaveral Barge Canal?

We have a bridge of 16' so we have no sail boats

Please leave any additional comments here that you would like us to take into consideration for the bridge assessment, including if you would like to discuss anything in more detail over the phone.

No

Wednesday, June 23, 2021



SR 401 Bridge Marina Questionnaire - West



Would you prefer to fill the survey out online, or do you prefer that someone from BA contacts you via phone?

Online Survey

Contact Information

Your Name

Chase Falonk

Marina Name

Westland Boatyard & Marina

Email (for future communications)

info@westlandmarina.com

Do you want to be contacted as the project progresses?

Yes

Marina Address

419 N Washington Ave
 Titusville, FL, 32796

Facility Characteristics - Capacity

	Currently	Future Demand (5-10 years)
How many wet slips?	65	100
How many dry boat storage capacity on racks?	40	100
How many dry boat storage capacity on the yard?	135	200

Facility Characteristics - Services

	Currently	Future Demand (5-10 years)
Do you offer fuel?	No	
Do you offer repairs?	Yes	

	Currently	Future Demand (5-10 years)
Do you offer in and out ramps?	No	
Do you offer in and out lift capacity?	Yes	

Vessel Characteristics

	Current Percentage
% of Sailboats	85
% of Powerboats	15

Vessel Size - % of Vessels by Length (6 Categories)

	% Powerboats (Length)	% Sailboats (Length)
Under 21 ft	5	1
22 - 30 ft	5	15
31 - 45 ft	73	70
46 - 55 ft	10	8
56 - 65 ft	5	4
Over 65 ft	2	2

Vessel Size - % of Vessels by Mast Height (6 Categories)

	% Sailboats (Mast Height)
Under 21 ft	0
22 - 35 ft	5
36 - 45 ft	20
46 - 55 ft	30
56 - 65 ft	40
Over 65 ft	5

Customer Base (6 Categories)

	%
% of Local Residents (Brevard)	10
% of Regional Residents (Central Florida)	15
% Transient	60
% Charter / Fishing Boats	1
% Commercial	2

	%
% Other	12

Occupancy & Seasonality

Is your business constant year round? Please explain.

Wet slip & dry rack business is constant. Dry yard fluctuates, primarily storage during the summer months, 50/50 storage/service hauls in the winter season

If your marina is seasonal, what are the peak months?

Peak months are November through May

What is your average occupancy during the peak season?

95%

What is your average occupancy during the non peak season?

95%

Ocean Access Under SR 401 Bridges

Is access to the ocean important to your customers?

Yes

% of business that regularly uses the Canaveral locks to access the ocean.

80%

Do you have any specific comments / concerns from your own experience or from what your customers have told you about the SR 401 bridges over the Canaveral Barge Canal?

Given our location vessels transiting the ICW to come to our facility are limited to the fixed heights of the bridges we are between as there is no direct ocean access from our location. If a fixed bridge is to be built it would be great if it is at least as tall as the other fixed bridges in the county crossing the ICW.

Thursday, June 24, 2021



SR 401 Bridge Marina Questionnaire - West



Would you prefer to fill the survey out online, or do you prefer that someone from BA contacts you via phone?

Online Survey

Contact Information

Your Name

Steve Cordell II

Marina Name

Waterline Marina

Email (for future communications)

Steve@WaterlineMarina.com

Do you want to be contacted as the project progresses?

Yes

Marina Address

905 N Harbor City Blvd
 Melbourne, Florida, 32935

Facility Characteristics - Capacity

	Currently	Future Demand (5-10 years)
How many wet slips?	102	102
How many dry boat storage capacity on racks?	0	0
How many dry boat storage capacity on the yard?	0	0

Facility Characteristics - Services

	Currently	Future Demand (5-10 years)
Do you offer fuel?	No	No
Do you offer repairs?	No	No

	Currently	Future Demand (5-10 years)
Do you offer in and out ramps?	No	No
Do you offer in and out lift capacity?	No	No

Vessel Characteristics

	Current Percentage
% of Sailboats	80
% of Powerboats	20

Vessel Size - % of Vessels by Length (6 Categories)

	% Powerboats (Length)	% Sailboats (Length)
Under 21 ft	0	0
22 - 30 ft	5	5
31 - 45 ft	90	75
46 - 55 ft	5	20
56 - 65 ft		
Over 65 ft		

Vessel Size - % of Vessels by Mast Height (6 Categories)

	% Sailboats (Mast Height)
Under 21 ft	
22 - 35 ft	5
36 - 45 ft	75
46 - 55 ft	20
56 - 65 ft	
Over 65 ft	

Customer Base (6 Categories)

	%
% of Local Residents (Brevard)	50
% of Regional Residents (Central Florida)	20
% Transient	
% Charter / Fishing Boats	
% Commercial	

	%
% Other	30

Occupancy & Seasonality

Is your business constant year round? Please explain.

Yes our boating season is year round

What is your average occupancy during the peak season?

95%

What is your average occupancy during the non peak season?

95%

Ocean Access Under SR 401 Bridges

Is access to the ocean important to your customers?

Yes

% of business that regularly uses the Canaveral locks to access the ocean.

30%

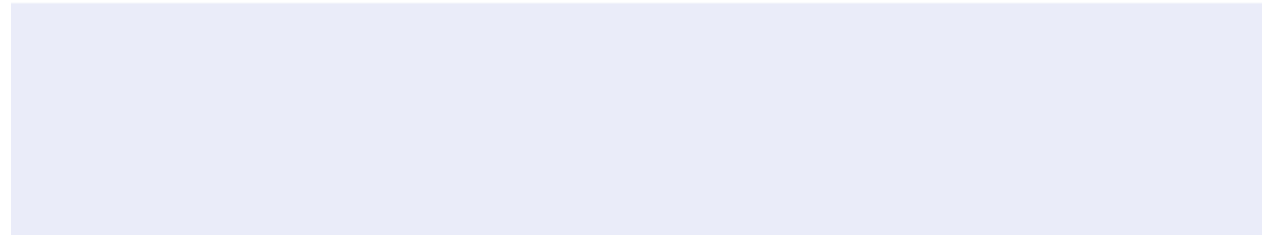
Do you have any specific comments / concerns from your own experience or from what your customers have told you about the SR 401 bridges over the Canaveral Barge Canal?

No concerns at this time

Monday, June 28, 2021



SR 401 Bridge Marina Questionnaire - West



Would you prefer to fill the survey out online, or do you prefer that someone from BA contacts you via phone?

Online Survey

Contact Information

Your Name

Ken Lunden

Marina Name

Cocoa Village Marina

Email (for future communications)

cvmarina@cfl.rr.com

Do you want to be contacted as the project progresses?

No

Marina Address

Cocoa Village Marina, 90 Delannoy Ave
 Cocoa, FL, 32922

Facility Characteristics - Capacity

	Currently	Future Demand (5-10 years)
How many wet slips?	107	0
How many dry boat storage capacity on racks?	0	0
How many dry boat storage capacity on the yard?	0	0

Vessel Characteristics

	Current Percentage
% of Sailboats	40
% of Powerboats	60

**Vessel Size - % of Vessels by Length
 (6 Categories)**

	% Powerboats (Length)	% Sailboats (Length)
Under 21 ft	0	
22 - 30 ft		
31 - 45 ft		
46 - 55 ft		
56 - 65 ft		
Over 65 ft		

**Vessel Size - % of Vessels by Mast
 Height (6 Categories)**

	% Sailboats (Mast Height)
Under 21 ft	0
22 - 35 ft	2
36 - 45 ft	5
46 - 55 ft	2
56 - 65 ft	12
Over 65 ft	

Customer Base (6 Categories)

	%
% of Local Residents (Brevard)	50
% of Regional Residents (Central Florida)	30
% Transient	15
% Charter / Fishing Boats	0
% Commercial	1
% Other	4

Occupancy & Seasonality

Is your business constant year round? Please explain.

No

If your marina is seasonal, what are the peak months?

November through May

What is your average occupancy during the peak season?

90%

What is your average occupancy during the non peak season?

55%

Ocean Access Under SR 401 Bridges

Is access to the ocean important to your customers?

Yes

% of business that regularly uses the Canaveral locks to access the ocean.

12%

Tuesday, July 6, 2021

 **SR 401 Bridge Marina Questionnaire - East**

Would you prefer to fill the survey out online, or do you prefer that someone from BA contacts you via phone?

Online Survey

Contact Information

Your Name

DAvid Noble

Marina Name

Melbourne Yacht Club

Email (for future communications)

dave@sailawards.com

Do you want to be contacted as the project progresses?

Yes

Marina Address

1202 River Drive
 Melbourne , FL, 32901

Facility Characteristics - Capacity

	Currently	Future Demand (5-10 years)
How many wet slips?	42	
How many dry boat storage capacity on racks?	7	
How many dry boat storage capacity on the yard?	n/a	

Facility Characteristics - Services

	Currently	Future Demand (5-10 years)
Do you offer fuel?	No	
Do you offer repairs?	No	

	Currently	Future Demand (5-10 years)
Do you offer in and out ramps?	Yes	
Do you offer in and out lift capacity?	No	

Vessel Characteristics

	Current Percentage
% of Sailboats	95
% of Powerboats	5

Vessel Size - % of Vessels by Length (6 Categories)

	% Powerboats (Length)	% Sailboats (Length)
Under 21 ft		4
22 - 30 ft		36
31 - 45 ft		60
46 - 55 ft		
56 - 65 ft		
Over 65 ft		

Vessel Size - % of Vessels by Mast Height (6 Categories)

	% Sailboats (Mast Height)
Under 21 ft	5
22 - 35 ft	25
36 - 45 ft	60
46 - 55 ft	10
56 - 65 ft	
Over 65 ft	

Customer Base (6 Categories)

	%
% of Local Residents (Brevard)	100
% of Regional Residents (Central Florida)	
% Transient	
% Charter / Fishing Boats	
% Commercial	
% Other	

Occupancy & Seasonality

Is your business constant year round? Please explain.

Yacht club for Brevard residents

If your marina is seasonal, what are the peak months?

year round

What is your average occupancy during the peak season?

100%

What is your average occupancy during the non peak season?

100%

Ocean Access Under SR 401 Bridges

Is access to the ocean important to your customers?

Very much so

% of business that regularly uses the Canaveral locks to access the ocean.

50

Do you have any specific comments / concerns from your own experience or from what your customers have told you about the SR 401 bridges over the Canaveral Barge Canal?

Not a bother, always been timely for me other than at rush hour. so I plan accordingly

Tuesday, July 6, 2021

FDOT BA SR 401 Bridge Marina Questionnaire - East

Would you prefer to fill the survey out online, or do you prefer that someone from BA contacts you via phone?

Online Survey

Contact Information

Your Name

Robert Scott

Marina Name

Melbourne Yacht Club

Email (for future communications)

scottrljr@gmail.com

Do you want to be contacted as the project progresses?

No

Marina Address

1202 E River Dr
 Melbourne , Fl, 32937

Facility Characteristics - Capacity

	Currently	Future Demand (5-10 years)
How many wet slips?	42	10
How many dry boat storage capacity on racks?	0	12
How many dry boat storage capacity on the yard?	12	5

Facility Characteristics - Services

	Currently	Future Demand (5-10 years)
Do you offer fuel?	No	No
Do you offer repairs?	No	No

	Currently	Future Demand (5-10 years)
Do you offer in and out ramps?	Yes	No
Do you offer in and out lift capacity?	No	

Vessel Characteristics

	Current Percentage
% of Sailboats	95
% of Powerboats	5

Vessel Size - % of Vessels by Length (6 Categories)

	% Powerboats (Length)	% Sailboats (Length)
Under 21 ft	5	30
22 - 30 ft	2	50
31 - 45 ft	0	18
46 - 55 ft	0	0
56 - 65 ft	0	0
Over 65 ft	0	0

Customer Base (6 Categories)

	%
% of Local Residents (Brevard)	100
% of Regional Residents (Central Florida)	
% Transient	
% Charter / Fishing Boats	
% Commercial	
% Other	

Occupancy & Seasonality

Is your business constant year round? Please explain.

Yes, local residents belonging to the club only. Dry storage is small dinky and sunfish/laser type sailboats.

If your marina is seasonal, what are the peak months?

No

What is your average occupancy during the peak season?

NA

What is your average occupancy during the non peak season?

NA

Ocean Access Under SR 401 Bridges

Is access to the ocean important to your customers?

No

% of business that regularly uses the Canaveral locks to access the ocean.

0%

Do you have any specific comments / concerns from your own experience or from what your customers have told you about the SR 401 bridges over the Canaveral Barge Canal?

We are a private club with mostly sailing boats. Mostly staying in Indian River. Occasionally one or two will venture north.

5.6. Inventory of Recreational Powerboats – Sample

Source: BA

Length (ft)	Draft (ft)	Beam (ft)	air draft (ft)
29	1.1	9.8	8.9
30	3	8	5.1
30	2.1	11.3	7
30	2.1	10.1	7.0
30	2.6	10.6	7.3
30	3.1	11.3	7.3
30	3.0	11.4	8.5
30	3.1	10.6	8.7
30	2.8	10.6	8.8
30	2.2	11.1	9.5
30	2.9	10.3	11.0
30	2.6	10.9	11.6
30	2.6	12.3	11.6
30	2.6	11.9	11.8
30	2.7	11.6	11.8
30	2.1	11.0	11.9
31	2.1	9.8	5.2
31	2.1	10.6	7.4
31	2.9	12.0	7.6
31	2.8	11.1	7.6
31	2.1	11.6	8.1
31	2.6	12.0	8.4
31	3.1	9.6	8.8
31	3.0	10.0	8.9
31	2.9	11.0	9.1
31	2.6	11.6	9.1
31	2.8	10.1	10.1
31	2.2	11.6	10.5
31	3.0	11.8	10.8
31	2.1	11.1	10.8
31	2.1	11.6	11.0
31	3.1	11.2	11.0
31	2.1	12.0	12.2
31	2.1	11.1	14.4
31	2.6	11.1	16.2
31	3.4	11.4	18.0
32	3.2	9.8	6.0

5.7. Boat Manufacturer Survey Database

Source: GoogleMaps, BA

Name	Address	Phone
Sea Ray Boats Inc	350 Sea Ray Dr, Merritt Island, FL 32953	(865) 522-4181
Falcon Boats USA	5225 S Washington Ave, Titusville, FL 32780	(772) 236-8289
Hells Bay Boatworks	1520 Chaffee Dr, Titusville, FL 32780	(321) 383-8223
Aviara Boats Manufacturing	1210 Nautical Way, Merritt Island, FL 32952	
Merritt Island Boat Works	1210 Nautical Way, Merritt Island, FL 32952	(321) 735-7111

5.8. SR 401 Bridge Replacement Boat Manufacturer Survey Questions

Company Name & Address:

Ocean Access Under SR 401 Bridges

1. How important is access to the ocean using the Canaveral Locks and the SR 401 crossing to your business?
 - A. Essential
 - B. A great amenity but not essential
 - C. Not needed

2. % of your boats that regularly use the Canaveral Locks to access the ocean.

3. How often do you use the Canaveral Locks in a year?

Facility Characteristics - Brevard Plant Capacity

Please complete the table below.

	Currently	Future (5-10 years)
On average, how many boats do you manufacture annually in your Brevard Plant?		
On average, how many boats do you repair or overhaul annually in your Brevard Plant?		

Vessel Characteristics - Type of Boat

Fill in the approximate percentage of ships you have falling within each category below.

	Current Percentage	Future (5-10 years)
% Sailboats Manufactured Annually		
% Powerboats Manufactured Annually		

Vessel Size - % of Vessels by Length

Fill in the approximate percentage of ships you have falling within each category below.

	% Powerboats (length)	% Sailboats (length)
Under 21 ft		
22 – 30 ft		
31 – 45 ft		
46 – 55 ft		

56 – 65 ft		
Over 65 ft		

Vessel Size - % of Vessels Air Draft (from the water line to the highest point)

Fill in the approximate percentage of ships you have falling within each category below.

	% Powerboats (air draft)	% Sailboats (air draft)
Under 21 ft		
22 – 35 ft		
36 – 45 ft		
46 – 55 ft		
56 – 65 ft		
Over 65 ft		

Do you have any specific comments about the SR 401 bridges over the Canaveral Barge Canal?

Please leave any additional comments here that you would like us to take into consideration for the bridge assessment, including if you would like to discuss anything in more detail over the phone.

Do you want to be contacted as the project continues? If yes, please provide the best way to contact you moving forward.

5.9. SR 401 Bridge Replacement Boat Manufacturer Survey Responses

Wednesday, July 7, 2021



SR 401 Boat Manufacturer Questionnaire

Would you prefer to fill the survey out online, or do you prefer that someone from BA contacts you via phone?

Online Survey

Contact Information

Your Name

MIKE WERNER

Company Name

FALCON MARINE LLC

Email (for future communications)

MWERNER@FALCONMARINEUSA.COM

Do you want to be contacted as the project progresses?

Yes

Company Address

5225 S WASHINGTON
 TITUSVILLE, FL, 32780

Ocean Access Under SR 401 Bridges

A great amenity but not essential

Ocean Access Under SR 401 Bridges

% of your boats that regularly uses the Canaveral Locks to access the ocean

20

How often do you use the Canaveral Locks in a year?

12

Facility Characteristics - Brevard Plant Capacity

	Currently	Future Demand (5-10 years)
On average, how many boats do you manufacture annually in your Brevard plant?	15	52
On average, how many boats do you repair or overhaul annually in your Brevard plant?	0	

Vessel Characteristics - Type of Boat

	Current Percentage	Future Demand (5-10 years)
% of Sailboats Manufactured Annually	0	
% of Powerboats Manufactured Annually	100	100

Vessel Size - % of Vessels by Length (6 Categories)

	% Powerboats (Length)	% Sailboats (Length)
Under 21 ft		
22 - 30 ft	100	
31 - 45 ft		
46 - 55 ft		
56 - 65 ft		
Over 65 ft		

Vessel Size - % of Vessels by Air Draft (6 Categories)

	% Powerboats (Air Draft)	% Sailboats (Air Draft)
Under 21 ft	100	
22 - 35 ft		
36 - 45 ft		
46 - 55 ft		
56 - 65 ft		
Over 65 ft		

Do you have any specific comments about the SR 401 bridges over the Canaveral Barge Canal?

NO

5.10. Bridge Openings, Monthly Seasonality, 2018 – 2020

Source: Florida Department of Transportation District 5, Analysis by BA

Month	2018	2019	2020	3-Year Average
January	92	81	87	7.7%
February	91	73	82	7.3%
March	95	116	106	9.4%
April	127	117	56	9.1%
May	117	115	131	10.7%
June	89	78	121	8.4%
July	93	54	122	7.8%
August	65	86	112	7.8%
September	67	78	55	6.0%
October	88	62	93	7.1%
November	111	106	135	10.4%
December	101	61	121	8.2%
<i>Total</i>	<i>1,136</i>	<i>1,027</i>	<i>1,220</i>	<i>100%</i>
Peak Months				
Mar, Apr, May, Jun, Nov, Dec	640	593	670	56.3%
Jan, Feb, Jul, Aug, Sep, Oct	496	434	551	43.7%
<i>Total</i>	<i>1,136</i>	<i>1,027</i>	<i>1,220</i>	<i>100%</i>

5.11. Bridge Openings, Daily Seasonality, 2018 – 2020

Source: Florida Department of Transportation District 5, Analysis by BA

Month	2018	2019	2020	3-Year Average
Sunday	181	150	185	15.2%
Monday	153	128	158	12.9%
Tuesday	131	117	147	11.6%
Wednesday	149	131	184	13.6%
Thursday	152	135	147	12.9%
Friday	170	178	152	14.9%
Saturday	201	188	249	18.8%
<i>Total</i>	<i>1,137</i>	<i>1,027</i>	<i>1,220</i>	<i>100%</i>
Peak Days				
Weekends (Sat & Sun)	382	338	434	34.0%
Weekdays (Mon – Fri)	755	689	786	66.0%
<i>Total</i>	<i>1,137</i>	<i>1,027</i>	<i>1,220</i>	<i>100%</i>

5.12. 35” Bridge Height Scenario – Annual Bridge Opening Summary, 2020 – 2045

Source: BA

Month	2020	2025	2030	2035	2040	2045
35 ft Bridge						
Vessels Traversing	1,415	639	706	774	845	921
Bridge Openings	1,220	557	615	674	736	803
Bridge Opening Time	130:09:24	59:22:18	65:35:32	71:53:53	78:31:13	85:37:18