



PORT EVERGLADES MASTER/VISION PLAN

2018 UPDATE

Element 2: Market Assessment

Prepared by



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2.0 Glossary of Terms

Air Draft

The maximum height of a structure or vessel.

Apron

Area immediately adjacent to the vessel berth where lines, provisioning, gangway and other operations occur.

Anchorage

Location where a vessel may anchor. For cruise, in destinations where docks are not present to accommodate vessel operations, anchorages are used and passengers are shuttled to/from the cruise vessel to a landside location using a small boat (tender). Anchorages are generally only used in ports-of-call.

Available Passenger Cruise Days (APCD)

The formula cruise lines typically use to assess and compare cruise itineraries from a financial perspective.

Beam

The width of a vessel at its widest part.

Bed (Berth) Nights

A typical cruise industry form of capacity measurement representing the number of lower berths (a bed on a cruise vessel, with the aggregate total generally determining the vessel's nominal passenger capacity) multiplied by nights of operation in a region.

Berth

- (1) An anchorage or dock space for a vessel in port.
- (2) A bed, generally attached to the deck and/or bulkhead onboard a cruise vessel.

Break-Bulk

General cargo or goods such as steel rebar or pipes that must be loaded/unloaded and handled individually or in pre-determined modular quantities (i.e. pallettes). Break-bulk cargo is not handled in intermodal shipping containers or in bulk quantities as would be the case with petroleum, grain and cement, for example.

Bunker/Bunkering

Marine fuel used for propulsion. The act of delivering marine fuel to a vessel.

Cabotage Laws

Legislation and/or regulation relating to the ability of foreign-flagged vessels to transport goods and passengers between domestic ports. Cabotage Laws are often put into place to protect domestic maritime industries.

Capacity

The number of units (passengers, berths, containers, gallons, tons, etc.) that a given area or space can handle at a given time.

Cruise Brand

Term referring to individual cruise vessel operating companies (i.e. Carnival Cruise Line) to distinguish them from their corporate holding companies (i.e. Carnival Corporation).

Cruise Line

For purposes of this report, cruise line is used to describe a corporate holding company with one or more cruise brand(s) operating under its corporate umbrella (i.e. Carnival Corporation).

Cruise Terminal

Building where cruise passengers embark and/or debark in a homeport destination.

Daily Cruises

Term applied to vessel service transporting passengers and/or vehicles and/or cargo from point to point. The key difference between daily cruises and multiday cruises is that daily cruises offer transportation services as their primary business focus, not a travel and leisure experience.

Dockage

Fees levied by a port or destination for the right to dock a vessel.

Draft

The depth of water required by a vessel to float; the measurement in feet (or meters) of the extent to which the vessel projects below the surface of the water.

Dry Bulk

Commodity cargo that is transported in unpackaged, non-standardized, non-liquid granular form, usually in large quantities (i.e. cement, bauxite, coal, etc.).

Emission Control Area (ECA)

Geographic boundaries established through treaties to provide for decreased NO_x and SO_x emissions in select zones such as North America and Europe.

Gross Tonnage (GT)

A measure of a vessel's enclosed volume. This term has emerged as the standard measure of communicating a vessel's size. A *mega-vessel* generally refers to a vessel of 70,000 GT or larger.

Ground Transportation Area (GTA)

Zone in which vehicles, including buses, taxis and private cars are organized and accessed as part of cruise terminal/destination embarkation and disembarkation activities.

Homeport

A marine facility and destination city that serves as the base of operations from which a multiday or daily cruise begins and/or terminates.

Itinerary

Sailing routes and ports visited on a given cruise. Two itinerary types are generally observed. *Open-jaw (OJ) itineraries* refer to those deployments where the cruise begins at one homeport and ends at another. *Roundtrip (RT) or Closed-jaw itineraries*—the more common type observed—begin and end from the same homeport.

In Bond

Cargo or baggage that transits directly to and from the port/airport and has a customs approval allowing for a single inspection.

Length Overall (LOA)

Total length of a cruise vessel in feet (or meters), including any incidental structure that may extend this dimension.

Liquid Bulk

Free-flowing liquid cargos, such as gasoline, jet fuel, crude oil, liquefied natural gas, industrial chemicals, etc. that are typically transported in large quantities via tanker vessel and stored in tanks at or near ports for distribution/consumption.

Liquefied Natural Gas (LNG)

Liquefied Natural Gas is a fuel that is seeing increased use in the maritime industry. Cruise lines and U.S. Flag cargo shipping lines already have vessels deployed that use this fuel source with more planned. Carnival Corporation is the leader in this technology among global cruise lines but others are following suit.

Marine Terminal

Facility, including storage yards as well as associated buildings, where cargo handling activity occurs, usually within a physically defined and secure (i.e. gated) area.

Mixed-Use Facility

Refers to a facility or complex with more than one type of real estate or operational use. Mixed-use facilities generally:

- (1) are contiguous in nature
- (2) are developed within a broader master plan constructed at one time or in phases
- (3) provide for a symbiotic relationship to occur among all uses such that the sum of the mixed-use facility from a real estate or operational perspective is greater than its parts. Mixed-use maritime facilities often include cruise, ferry, marina, commercial, residential, recreational and other upland transportation facilities.

Multiday Cruises (Cruises)

Leisure-oriented voyages on deep-water, oceangoing cruise vessels of two or more nights often to a variety of destinations, or port-of-calls. Multiday cruises are offered either by regional or international operators marketing to a variety of consumer sectors and nationalities.

Neo-Panamax

Vessels classified as Neo-Panamax are of the maximum dimensions that will fit through the newest set of locks in operation by the Panama Canal (427 m/1,401 feet long by 55 m/180 feet wide by 18.3 m/60 feet in depth).

Panamax

Vessels classified as Panamax are of the maximum dimensions that will fit through the original locks of the Panama Canal (304 m long by 33.5 m wide by 25.9 m deep). Thus, a Panamax vessel will usually have dimension of close to 294 m/965 feet long by 32.3 m/106 feet wide by 12.04 m/39.5 feet in depth.

Passenger Fee (Head Tax)

Port charges assessed against each passenger aboard a cruise vessel. Generally the principal income stream to ports and destinations for accommodating cruise activities.

Peak (or Peaking)

Period of greatest intensity of use or volume. Port Everglades' peak days for cruise activity, for example, are Saturday and Sunday since those are the days that, on average, see the greatest number of cruise ship calls and/or passenger debarkations during the course of a given cruise season.

Penetration Rate

Percentage of the total potential market that is currently accessible. For example, in 2016, North America had a penetration rate for cruise of 2.3 percent (13.34 million cruisers/579 million total population).

Port Authority

Governmental or quasi-governmental public authority for a special-purpose district usually formed by a legislative body (or bodies) to oversee and/or operate ports and other maritime, aviation, road and/or rail transportation infrastructure.

Port-of-call (POC)

One of several destinations visited as part of a cruise itinerary. The focus of the port-of-call is on tourism activities adjacent to the cruise arrival area and the transportation of passengers to regional points of interest.

Post-Panamax

Size standard that exceeds the largest vessel dimension capable of transiting the original Panama Canal locks (304 m long by 33.5 m wide by 25.9 m in depth). Generally based on the beam and LOA of the vessel.

Private Island

Island destinations primarily located in the Caribbean and Central America that are owned and/or developed for exclusive or semi-exclusive use by a single cruise company (cruise line) and its proprietary brands.

Revenue Passenger

This generally refers to homeport passengers or in some very limited cases port-of-call passengers (e.g. Vancouver, where all passengers are charged on/off the vessel), whereby passenger counts reflect the port's passenger wharfage or tariff rate charging policy. For homeport calls the actual number of passengers is doubled to show that the cruise operator is charged by the port for the passenger embarking debarking the vessel at a set fee.

Ro-Ro

Maritime term for roll-on/roll-off cargo such as passenger vehicles, tractor/trailers, buses, railcars, etc. that are driven on and off a ship under their own power or using a platform vehicle, such as a truck and trailer or self-propelled modular transporter.

Super Post-Panamax

Generally refers to the largest vessels in existence today. These vessels are defined not only by their dimensions, but also their carrying capacity (i.e. 3,000+ passengers for cruise and 12,000-14,000 TEUs for container ships).

Tariff

A schedule of fees charged to port users, especially marine terminal and vessel operators to cover some or all costs associated with port operations and other fiduciary obligations (i.e. infrastructure development and maintenance).

Terminal Operator (TO)

Entity with primary responsibility for managing marine terminal/cruise terminal and related operations on a daily basis, usually under contract to a public port authority or other public or quasi-public ownership interest.

Transit Passenger

By literal definition, the status of cruise passengers during a port-of-call.

Twenty-Foot Equivalent Unit (TEU)

Unit of cargo used to describe the capacity of modular container ships and container terminals. It is based on the volume of a 20-foot-long (6.1 m) intermodal container, which is the historical standard metal container used in container shipping. The majority of containers in use today are Forty-Foot Equivalent Units (FEU); however, TEU remains the standard unit of measurement.

Use Ratio (Utilization Percentage)

The ratio of days that a berth is actually occupied to available berth days (total calls/total available berth days). For example, in a year-round market, a single berth is theoretically available for a total of 365 days. If that berth receives 52 calls (one vessel sailing weekly roundtrip itineraries year-round) then its use ratio is .142, or 14.2 percent (52/365).

All other terms and acronyms are defined within the text below.

2.1 Introduction

Element 2 of the 2018 Update of the Port Everglades Master/Vision Plan presents an assessment of future market conditions for each of Port Everglades' core lines of business through the year 2038. Specifically, 20-year business forecasts were developed by members of the B&A team as follows:

- | | |
|---------------------------|-------------------|
| • Cruise/ICTF | B&A |
| • Liquid Bulk/LNG | Hatch |
| • Containerized Cargo | Martin Associates |
| • Non-Containerized Cargo | Martin Associates |

Information presented in this element reflects B&A's review of historical Port Everglades statistics, broader industry information pertaining to each individual line of business, one-on-one interviews held with Port Everglades tenants and other stakeholders, and input from Port Everglades senior staff and coordination with Broward County, including Fort Lauderdale-Hollywood International Airport (FLL) and the Convention and Visitors Bureau (CVB). All years specific to Port Everglades are fiscal (October-September), and all projections are unconstrained, unless otherwise noted.

2.2 Historical Cruise, Liquid Bulk and Cargo Activity

2.2.1 Cruise

Port Everglades welcomed 10 cruise brands, 846 cruise ship calls, and 3.9 million multiday and daily cruise passengers in FY2017, making Port Everglades the world's third busiest cruise homeport.¹ This statistics represented an increase of approximately 1 percent, despite the fact that one of Port Everglades' eight multiday cruise terminals –Terminal 4 (T4) – was out of service during much of the 2016-2017 cruise season.

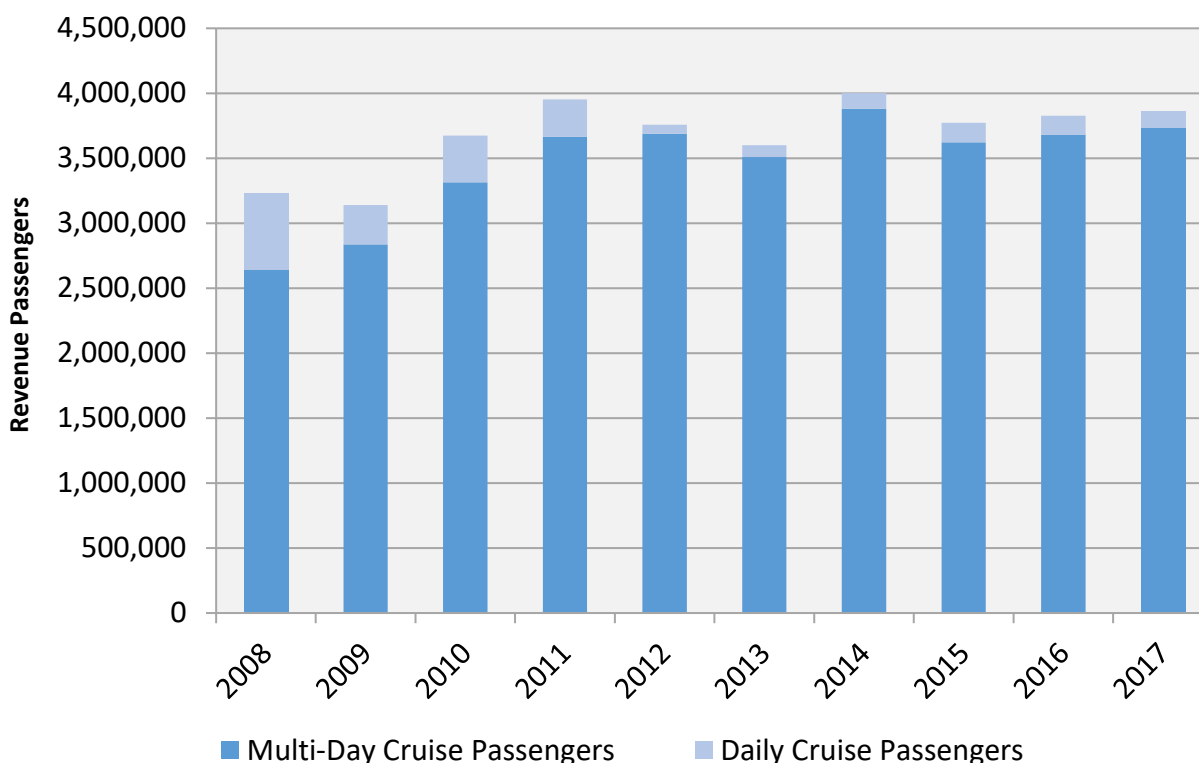
Port Everglades' overall cruise activity since FY2008 is shown in Figure 2.2.1. While the trend during the past 10 years has been generally positive, multiday cruise-passenger volumes have essentially stabilized since FY2011, with some year-to-

¹ Passenger counts are revenue passengers.

year variation, but no overall growth. In fact, FY2017 combined multiday and daily cruise passenger activity was below the level achieved in both FY2014 and FY2011. As a point of comparison, multiday cruise activity in North America as a whole increased by 25.3 percent, or 2.3 percent per year, between 2008 and 2017.²

Figure 2.2.1: Historical Port Everglades Cruise Revenue Passengers, 2008-2017

Source: Port Everglades



Port Everglades achieved several cruise milestones in FY2017, including:

- Welcoming Royal Caribbean International's newest and largest cruise ship, *Harmony of Seas*, sailing year-round on Saturday's from cruise Terminal 18
- Welcoming Holland America Line's first ship Pinnacle class vessel, *MS Koningsdam*
- Homeport to Pearl Seas Cruises' *Pearl Mist* for first cruise to Cuba from Port Everglades since the 1950s

² Source: Cruise Industry News Annual Report 2018

- Became first U.S. port to launch Mobile Passport Control, a smartphone app approved by U.S. Customs and Border Protection (CBP) that expedites customs clearance for cruise passengers

2.2.2 Liquid Bulk, Containerized and Non-Containerized Cargo

Port Everglades has a long history of helping to meet the energy needs of South Florida. In FY2017, 36 percent of statewide light product demand, including 20 percent of Florida's demand for gasoline, jet fuel, and other liquid fuels, was met by petroleum products that are stored and distributed by companies located at the port.³ In all, 12 petroleum terminals and pipeline companies operate on private property within the port's jurisdictional area, and more than 13.4 million gallons of petroleum products arrive at Port Everglades on tanker vessels and barges each day. Table 2.2.1 presents the mix of petroleum-related liquid-bulk products handled at Port Everglades in FY2017.

³ Sources: 2017 Port Everglades Commerce Report, p.17; Port Everglades light product data for FY2017as analyzed by Hatch

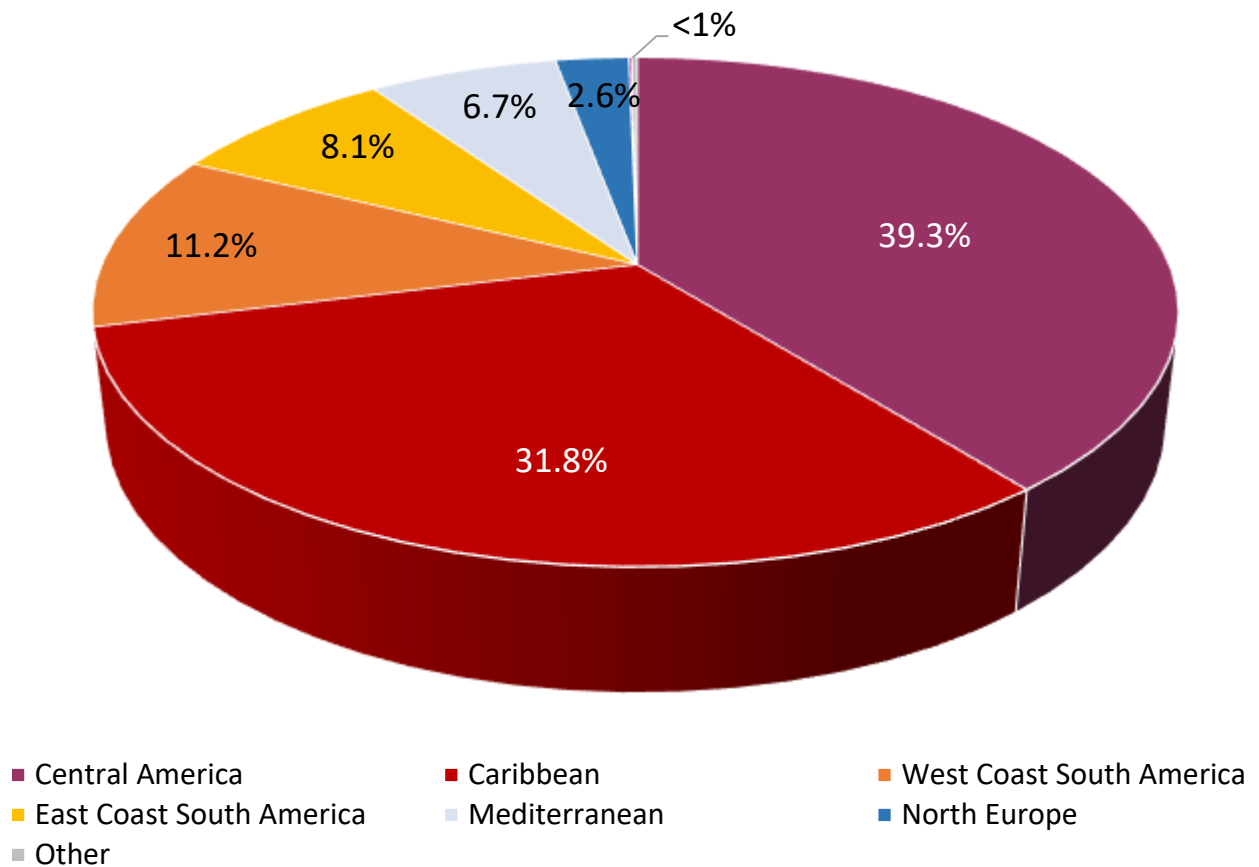
Table 2.2.1: Port Everglades Liquid Bulk Product Mix (Barrels), FY2017*Source: Port Everglades*

Product	FY2017
Asphalt	371,259
Aviation Gasoline	213,752
Bio Diesel (truck/rail)	141,406
Crude Oil Loaded	470,568
Diesel Fuel	15,741,886
Ethanol (vessel)	1,633,434
Ethanol (truck/rail)	5,415,909
Fuel Oil	2,683,242
Gasoline	63,268,372
Jet Fuel	31,982,450
Propane	385,375
Total	122,307,652

These products are distributed across 12 Florida counties, and are critical to the operation of all four international airports in the region, namely:

- Fort Lauderdale-Hollywood International Airport (FLL)
- Miami International Airport (MIA)
- Palm Beach International Airport (PBI)
- Southwest Florida International Airport (RSW)

In addition to the products listed in Table 2.2.1, Port Everglades handled about 8,500 tons of nonpetroleum liquid bulk products in FY2017.

Figure 2.2.2: Top 10 Port Everglades Trade Partner Regions (Loaded TEUs), 2017*Source: Port Everglades*

Port Everglades is also a major contributor to South Florida's trade economy. The port ranked 10th among mainland U.S. container ports in FY2017, handling a record 1,076,893 TEUs.

Table 2.2.2: Top 10 Port Everglades Containerized Import Commodities, 2017*Source: PIERS*

Commodity	TEUs	\$ Value
Apparel	35,998	3,836,894,759
Beverages	23,629	296,213,219
Lumber	15,304	153,954,603
Glass/Ceramic	15,176	204,408,379
Aggregates	13,736	137,155,447
Machinery	11,948	1,154,777,828
Manufactured Plastic Products	9,747	246,557,383
Aluminum & Non-Ferrous Metals	9,363	407,441,799
Paper	9,183	144,766,290
All Others	123,856	1,969,087,671

In addition to being Florida's busiest container port by volume (TEUs), Port Everglades also leads the state in north-south trade, and is the busiest port in Florida for refrigerated cargo and the fifth busiest nationwide. Figure 2.2.2 shows Port Everglades' top trade partners in FY2017. Tables 2.2.2 and 2.2.3 present Port Everglades' top containerized import and export commodities.

Since 2006, Port Everglades' total tonnage has fluctuated between approximately 20.5 million short tons on the low end, up to approximately 26 million short tons on the high end. Liquid bulk cargo, which consists mainly of refined petroleum products (see Table 2.2.1), is the dominant cargo handled at Port Everglades by tonnage. Liquid-bulk volumes, as measured in barrels hit a 10-year high in FY2017, were up 1.7 percent from the next highest year, FY2016. Containerized cargo, the

second largest cargo market handled at the port in terms of tonnage, peaked in FY2008, then declined to a low in FY2009, reflecting the global recession (see Figure 2.2.3). Since 2009, container volumes have shown steady growth, reaching a tonnage level in FY2017 that is about 10 percent higher than the previous peak year (2008). Total container volume as measured in TEUs was up 3.8 percent in FY2017, compared to FY2016. Loaded TEUs were up 7.3 percent. Dry bulk cargos have declined from nearly 3.0 million tons in 2006, to 1.2 million tons in 2017 – a 41 percent decline. Break-bulk cargo, which represents less than 1 percent of total cargo tonnage handled at Port Everglades, has shown no growth over the past 11 years. Since the 2014 Update, Port Everglades has expanded its ro-ro business considerably, handling some 15,000 automobiles in FY2017, with plans to handle as many as 40,000 within the 20-year planning horizon.

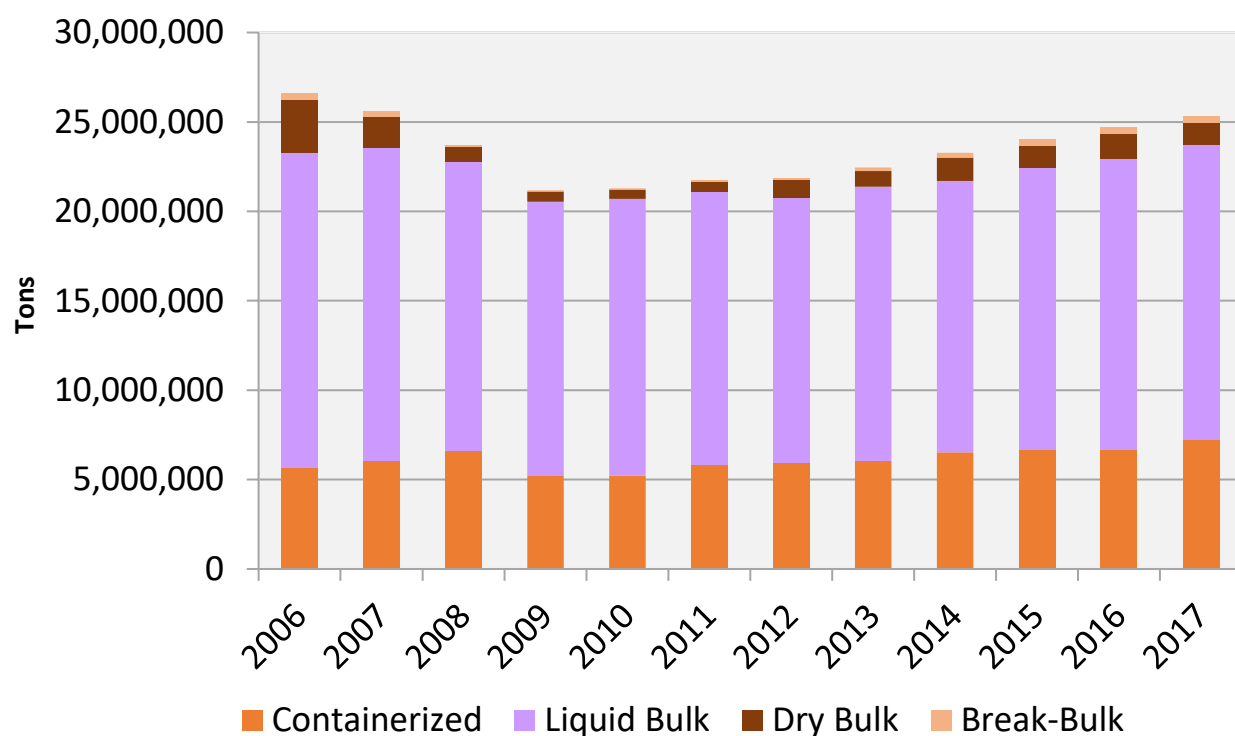
Table 2.2.3 Top 10 Port Everglades Containerized Export Commodities, 2017
Source: PIERS

Commodity	TEUs	\$ Value
Food Products	46,537	926,520,701
Machinery	45,442	2,495,474,273
Motor Vehicles	42,376	744,336,505
Apparel	21,682	2,391,659,903
Steel Products	20,335	541,240,574
Paper	16,748	219,408,120
Textiles	15,755	888,581,671
Vehicle Parts	14,894	252,219,253
Industrial Chemicals	12,278	250,552,264
All Others	98,915	4,271,226,765

Port Everglades Foreign-Trade Zone (FTZ) No. 25 is an additional economic asset to Port Everglades, its customers, and the broader Broward County business community. An FTZ is a designated location within or near a U.S. Customs Port of Entry, where foreign and domestic merchandise are considered to be in international commerce and outside of U.S. Customs jurisdiction. Ranked as the 4th most active FTZ in the United States (2016) for export activity, FTZ-25 provides numerous Customs Duty and cash-flow benefits to Broward County businesses, while facilitating both import and export activity at Port Everglades.

Figure 2.2.3: Historical Tonnage Handled at Port Everglades, 2006-2017

Source: Florida Ports Council

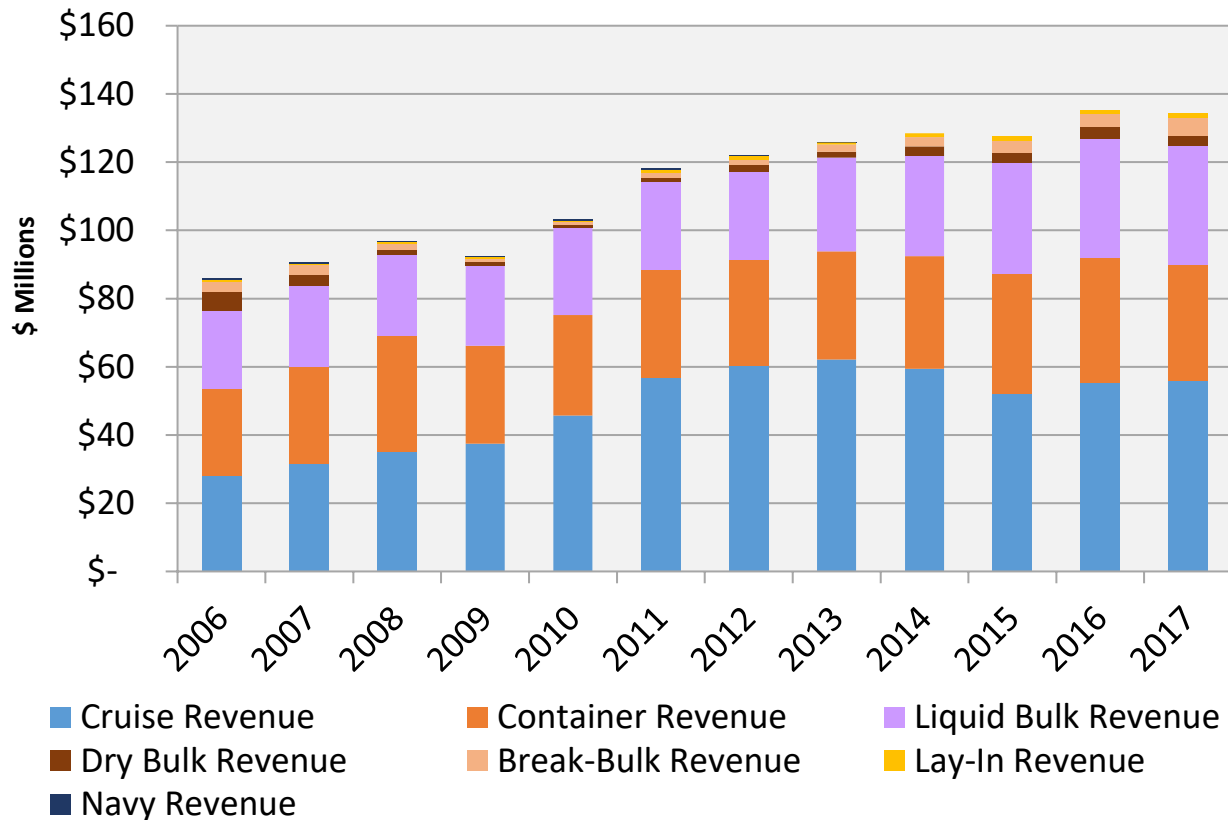


2.2.3 Port Revenue

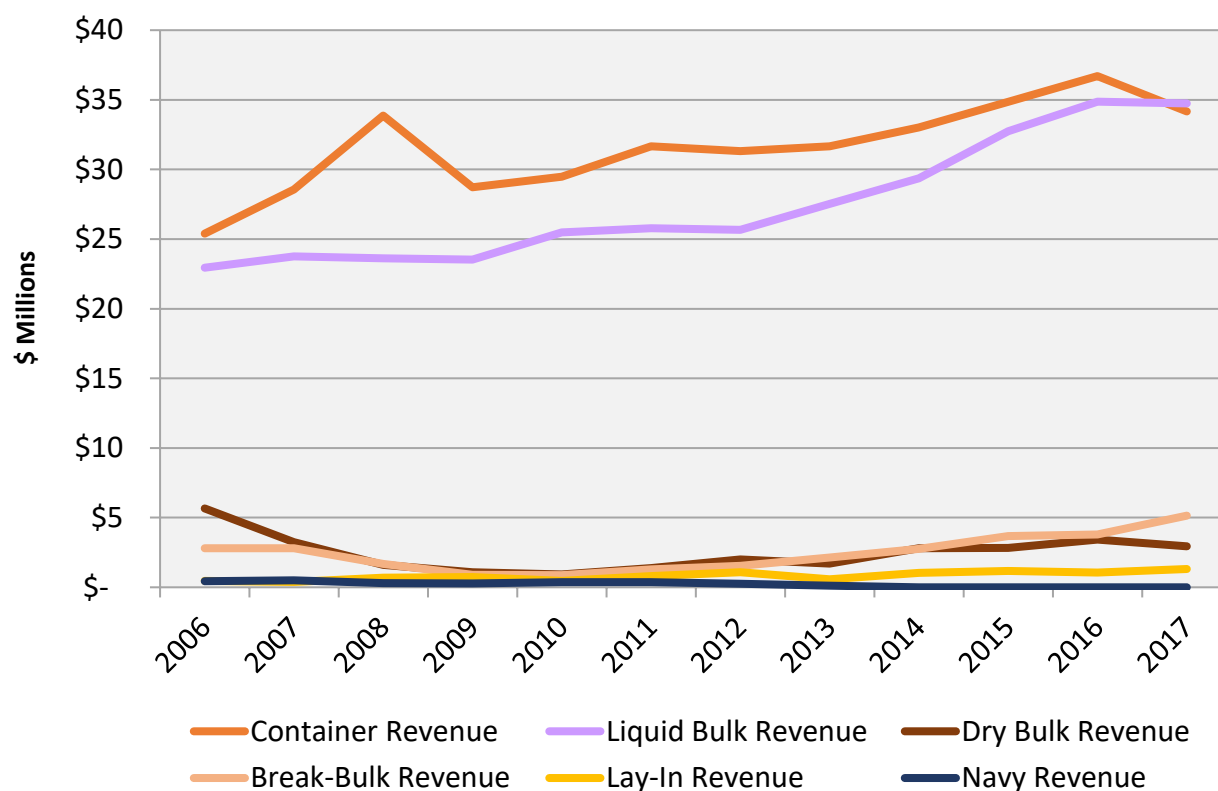
Total revenue at Port Everglades has generally grown since 2009, reaching a high of \$162.6 million in FY2016. However, total revenue declined by nearly \$1 million in FY2017, due primarily to a 7 percent decrease in containerized cargo revenue associated with changes to Crowley's lease agreement, which scaled back excess box charges for the year and reduced the total amount of leased area in Southport by 21 acres. Revenue from cruise operations accounted for 34.5 percent of total

Port Everglades revenue in FY2017. Liquid bulk (21.5 percent) and containerized cargo (21.1 percent) accounted for nearly all revenue generated by Port Everglades cargo activity in FY2017, with combined non-containerized cargo (dry bulk, break-bulk, autos, etc.) accounting for 5 percent. Like cruise passenger activity (see Figure 2.2.1), cruise revenue has fluctuated during the past decade, peaking in FY2013 at \$62.2 million, declining nearly \$10 million to \$52.3 million in FY2015, then rebounding somewhat to \$55.9 million in FY2017. The decline in cruise revenue is due mainly to the payoff of RCCL's cruise terminal 18 (T18) capital cost recovery charge (CCRC).

Total cargo revenue for Port Everglades increased from 2006 through 2008, then declined in 2009, reflecting the global recession. Cargo revenue rebounded to some extent in 2010, then remained stable through 2013. Since 2013, cargo volumes have fluctuated, but have generally followed an upward growth pattern. Unsurprisingly, cargo revenues have followed a similar and roughly proportional trajectory, though FY2017 revenue generated by cargo declined from FY2016 levels. Specifically, revenue from container operations was down \$2.5 million, and dry bulk revenue was down approximately \$500,000. Break-bulk revenue increased about \$1.3 million. Liquid bulk revenue remained flat. See Figures 2.2.4 and 2.2.5.

Figure 2.2.4: Historical Port Everglades Revenue by Source, 2006-2017*Source: Port Everglades*

In summary, since 2006, cruise revenue has been strong but inconsistent, particularly since FY2013. Containerized cargo revenue has been generally stable, with notable declines occurring in FY2009 as a result of the global recession, then again in FY2017. Non-containerized cargo revenue has fluctuated from year to year since 2006, but has generally increased over time, following a sharp four-year decline leading into 2009. Growth in liquid-bulk revenue has been the key driver in overall cargo-related revenue growth at Port Everglades, particularly during the past five years (see Figure 2.2.6).

Figure 2.2.5: Historical Port Everglades Cargo Revenue by Source, 2006-2017*Source: Port Everglades*

2.3 Cruise Market Assessment

2.3.1 Summary of Key Conclusions

The top cruise homeports serving the Caribbean/Bahamas market, led by Port Everglades, PortMiami, and Port Canaveral, must provide cruise facilities and related infrastructures (i.e. berths/terminals/ground transportation areas) that facilitate continued growth of the world's largest cruise region. Within South Florida, PortMiami has made unprecedented commitments to the four major global cruise operators – Royal Caribbean Cruises, Ltd (RCCL), Carnival Corporation, Norwegian Cruise Line Holdings (NCLH), and MSC Cruises – in the past two years. These commitments will expand PortMiami's cruise berth capacity from seven berths to as many as 11 berths, most of which will be capable of accommodating the largest cruise vessels in the market today, as well as those planned for the long

term. Port Everglades has eight multiday cruise berths, seven of which have been renovated/expanded in the past decade, including the newest cruise terminal at Port Everglades, cruise Terminal 25 (T25), which will open in October 2018 and will serve the new *Celebrity Edge*, as well as other ships from the RCCL fleet. Despite these efforts, given the aggressive growth currently being experienced by the global cruise industry, including the launching of several new cruise brands, more cruise facilities are needed at the major Florida ports in the mid- to long-term, to keep up with projected demand.

The mix of itinerary offerings at Port Everglades is changing with the deployment of vessels, on 5/5/4-day patterns. These shorter sailings allow for more passenger throughput on smaller cruise vessels, and create an opportunity to more evenly distribute cruise activity during a given week. This change increases the utilization of Port Everglades' cruise assets and helps to mitigate cruise-related traffic congestion by shifting activity from peak periods to non-peak periods; it also creates an opportunity for Port Everglades to increase overall annual cruise passenger throughput and associated revenue.

Over the long term, larger vessels are still the clear trend, due to lower per-passenger costs, higher returns on investment and passenger preferences for new onboard experiences. The majority of cruise berths at Port Everglades will need to be 1,200 feet in length, with a working apron of 60-70 feet, to accommodate future vessel operations. The daily berth capacity of Port Everglades will need to increase to accommodate industry growth.

New cruise facilities/berths will be needed in the near-term (2-5 years) to support additional vessels deployed to the South Florida ports. B&A's medium projection expects sufficient demand to necessitate up to 12 berths at Port Everglades within the 20-year forecast period.

Vessels capable of carrying more than 7,000 passengers will require new infrastructures that are designed and developed to both accommodate larger vessels and more passengers, and specifically provide a platform for technological applications and operations focused on passenger satisfaction, lower operational costs, and reduced terminal size. This design will incorporate:

- New automated CBP processes
- Enhanced baggage sorting and movement
- Expedited passenger check-in processes
- Multimodal facilities capable of separating transportation modes, parking, and other embark/debark functions for single or multiple brands

Future expansion must be strategic and planned in close partnership with cruise lines, service providers, CBP, FLL, the Broward County Convention and Visitors Bureau (CVB), and other entities, in order to meet the needs and expectations of the industry and maximize the socioeconomic benefits provided by cruise activity at Port Everglades. Partnering with a key cruise operator(s) to develop a new multi-berth cruise/multimodal facility in Midport to provide for additional capacity and a long-term platform for cruise operations is a recommended strategy for future development.

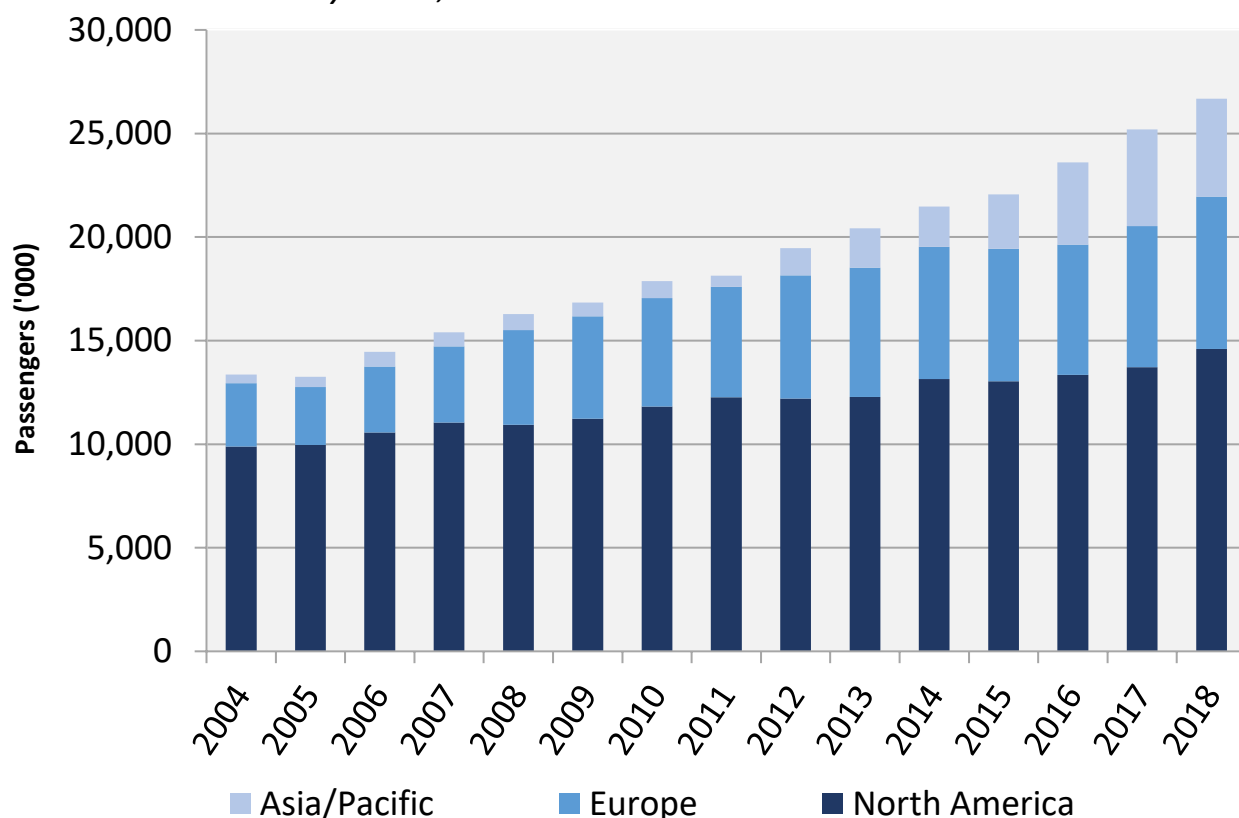
Port Everglades' future cruise capture rate and growth are interdependent on which Florida port expands, how rapidly, and to what degree, in terms of providing additional cruise berths. Port *Miami* and Port Canaveral have aggressively pursued expansion of their cruise business during the past two years, while overall cruise traffic at Port Everglades has remained relatively flat. Today, the cruise industry has more than 100 cruise vessels on order; Cuba and the Bahamas are experiencing massive cruise developments in light of policy changes related to Cuba, new/expanded private island destinations in the Bahamas, and the expansion of downstream ports of call, such as Grand Cayman, Nassau, and others, providing for more itinerary and destination options than ever before. Port Everglades can still take advantage of this continued growth through strategic planning and partnership opportunities, but it must act decisively in the near term to put mid- to long-term efforts in motion.

It is essential for Port Everglades to better manage existing berths and terminals to create greater facility efficiencies. In particular, the port must work with cruise

operators to increase utilization on off-peak days (i.e. Tuesdays-Thursdays), in order to “create” additional capacity on weekends during the peak season (November-April). The introduction of additional 5/5/4-day sailings, and/or at some point 3/4-day sailings, will provide some level of relief, but growth in overall vessel traffic and passenger activity also requires better Portwide coordination with the cruise lines on a daily basis.

2.3.2 Global Cruise Industry

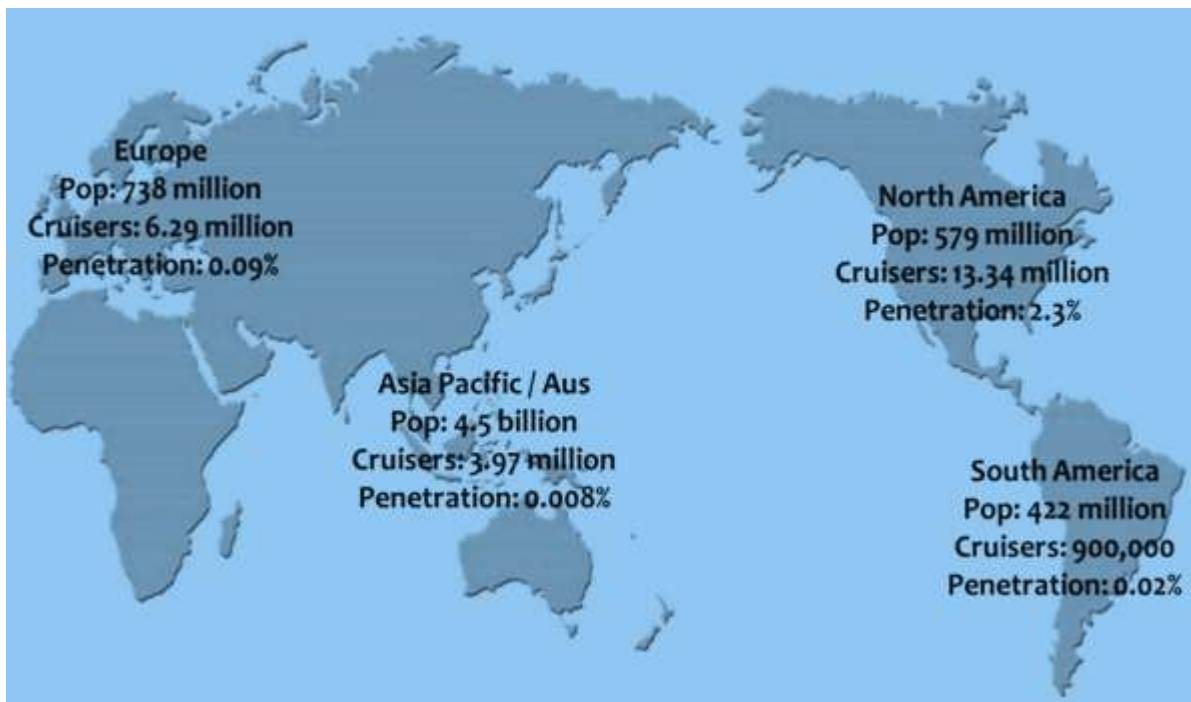
While small in terms of overall world tourism, the cruise industry has been one of the most successful hospitality sectors over the past three decades, and is continuing to expand with more than 100 cruise vessels currently on order for delivery over the next five years. Figure 2.3.1 shows the growth of the cruise tourism industry since 2004 by the major consumer regions of the world. According to the 2018 Cruise Industry News (CIN) Annual Report, overall passenger berth capacity for 2018 is 563,305 berths on 386 ships worldwide. A 5.9 percent growth factor is expected for 2018, based on current vessel deliveries. As shown, the North American market continues to be the main consumer-generating market, with Europe and Asia growing rapidly as the industry looks to take increased market share in these regions.

Figure 2.3.1: Global Cruise Passengers, 1995-2018*Source: Cruise Industry News; B&A*

The industry overall has seen steady growth, year after year, irrespective of recession, political turmoil, or other factors that have influenced the broader visitor and travel industry.

Each of the major cruise lines is focusing on the development of key consumer markets around the world. In Asia, the lines are beginning to develop consumer awareness of the product, and in Europe, the lines are continuing to focus their products on each country and population base by creating individual brands.

The Caribbean market has always seen a steady flow of cruise consumers, and has provided strong yields to the industry through onboard and shoreside spending. The North American consumer demographic is turning to new products and experiences in the Caribbean with the opening of Cuba and new private-island destinations (islands owned and/or developed for exclusive or semi-exclusive use by a single cruise operator and its proprietary brands) where a family Summer market continues to expand.

Figure 2.3.2: Cruise Consumer Market Penetration, 2016*Source: B&A*

Since its inception, the cruise industry has been constrained by the availability of capacity and ships (supply), not by the availability of passengers (demand). As a result, ships of all the major lines sail at or above 100 percent of lower berth capacity year-round on a global level. Some regions, such as the Caribbean and Alaska, may see average actual passenger volume that exceeds lower berth capacity, due to strong demand and passenger demographics (i.e. families vs. single and retired couples). The Caribbean region and homeports such as Port Everglades, frequently experience actual passenger volume that is 102-115 percent of lower berth capacity onboard cruise vessels. Globally, cruise lines have been successful in increasing overall market penetration – with the introduction of new ships with larger capacities into the fleet, and the subsequent deployment of these newer, larger vessels to markets where they have a high degree of confidence that demand will meet, if not exceed, new capacity. This same strategy has allowed cruise lines to manage and increase yields effectively, even as total supply increases, by moving capacity dynamically from year to year and season to season, to meet or even drive demand in certain markets while constraining capacity (if and when necessary) in

other markets. There remains a large upside market opportunity for the cruise industry, however, given that it is still very small, in comparison to worldwide land-based tourism with a penetration rate of less than 3 percent. The supply model is likely to continue well into the next 20-year period. See Figure 2.3.2.

Repeat clientele are a major strength of the industry. According to CLIA, in 2014, 62 percent of 1,600 U.S. and Canadian residents reported taking multiple cruises, with 38 percent self-reporting as first-time cruisers.⁴ This high level of repeat business requires that the industry provide new products and destinations to sustain interest and continue to attract repeat customers, in addition to new customers. Cruise lines are expanding in several cruise regions, or providing new destination products to provide a variety of merchandising to their repeat clientele and establish new market bases. In line with this pattern, there is a saturation of traditional cruise areas, which has motivated the industry to branch out into new regions, as well as add new ports, berths, and products in existing marquee regions, such as the Caribbean, Alaska, and the Baltic.

U.S. consumers have represented the industry's base since inception, and continue to be a stabilizing factor. Today, non-U.S. passengers are taking more cruises, with Europe (particularly the UK and Germany) continuing to grow, as well as the Asia consumer markets.

The cruise industry has consolidated into a handful of profitable operators that require ports to market to a limited number of companies/decision-makers. However, each brand makes its own itinerary and deployment decisions, based on their target consumer demographics and demand cycles. Therefore, there are still multiple decision-makers for each port. Industry concentration is an overall positive issue for marquee homeports, such as Port Everglades.

Cruise lines try to limit their commitments to regions or ports to preserve their ability to move ships and modify their operations quickly (i.e. within 6-12 months) to reflect changes to demand, economic, and global geopolitical issues, to absorb costs and/or to increase profitability. Two major factors that weigh heavily in the determination of cruise vessel deployment are:

⁴ Source: https://www.cruising.org/docs/default-source/research/clia_naconsumerprofile_2014.pdf

- **Passenger Satisfaction and Demand**

Cruise lines use survey tools, travel agents, and passenger feedback as key indicators for future deployments.

- **Yields**

Cruise lines place vessels into itinerary patterns with high demand, high revenues, and lower operating costs to maximize passenger spending per day, as well as net margins (i.e. onboard and shoreside spending, such as shopping, bar, casino, spa and shore excursion revenues)

Weather patterns, consumer demand, and cruise line operations have influenced deployments in many regions, extending seasonality into nontraditional time slots. The industry has shown itself to be generally recession-resistant by actively controlling and reducing costs, shifting capacity between longer and shorter cruises, developing vessels with more outside cabins and onboard amenities, refitting vessels for year-round cruising in specific regions, and allowing for discounting of cabin fares to increase potential for onboard revenue spending (in order to stay profitable). The industry has also done an excellent job of shifting land-based vacationers to cruises, due to the all-inclusive value perception of the cruise product. According to CLIA, in 2014, 28 percent of 1,600 U.S. and Canadian residents rated cruising as a “very high value” vacation experience, with an additional 41 percent rating cruising as “somewhat high value.”

In the Caribbean, where the logistics of air & land-based travel to multiple island destinations within the region are difficult for most travelers, the value of cruising vs. land-based vacation options within the same market is amplified dramatically, since a cruise ship and the various shore-excursion options offered as part of the cruise experience may offer the average consumer the only feasible opportunity to experience the region. There are long distances between island countries, so for young and middle-aged adults and families traveling with young children, older travelers, and travelers with disabilities or other mobility limitations – all of which collectively constitute a sizable percentage of the overall cruise consumer base – cruising is a more manageable and compelling option.

Other major factors that impact growth and ship deployments include regulatory matters that affect the cost structure of the cruise industry, such as the North

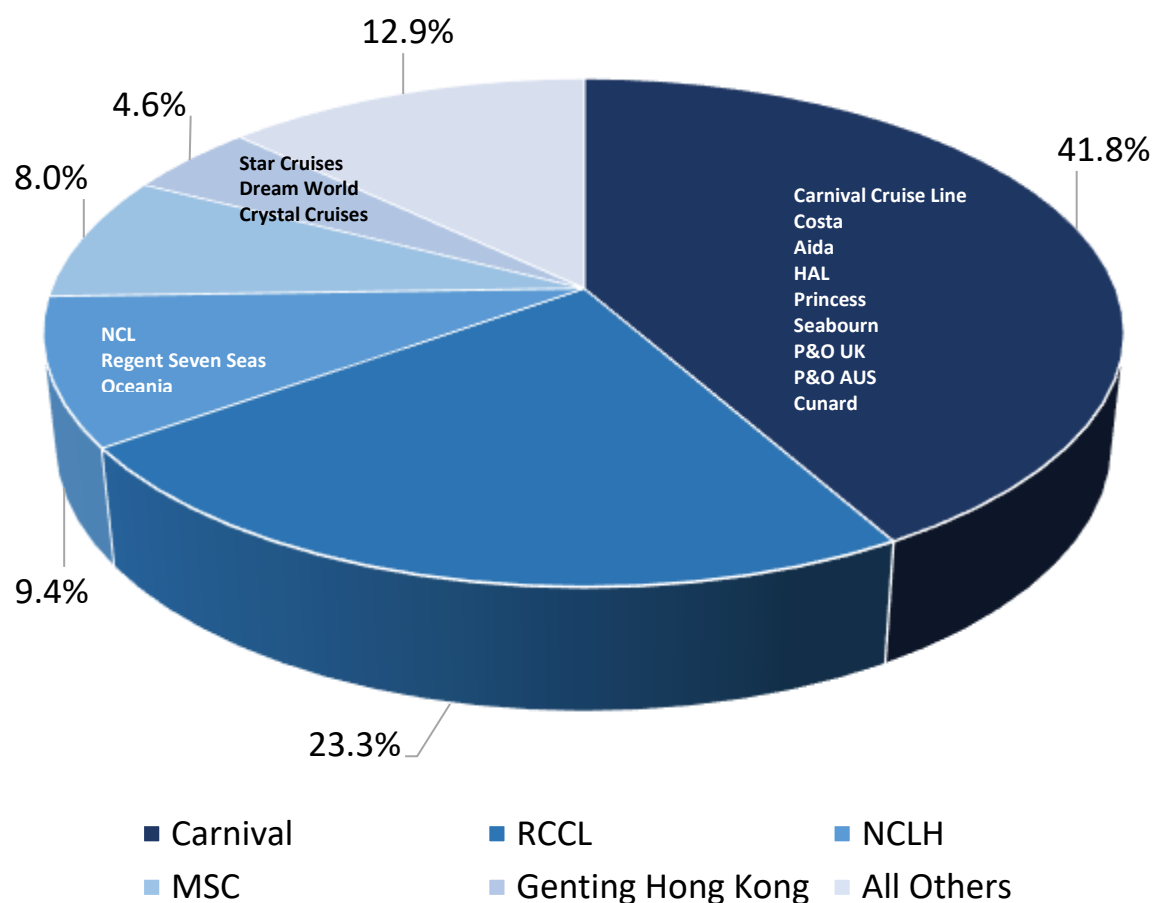
American Emission Control Area (ECA), MARPOL wastewater regulations in the Baltic, California emissions legislation, and monitoring policies in Alaskan waters.

2.3.3 Major Cruise Brands

Five major cruise corporations (cruise lines) control most worldwide cruise capacity (87.1 percent) and ~78 percent of revenues. See Figure 2.3.3.

Figure 2.3.3: Major Worldwide Cruise Line Passenger Capacity, 2018

Source: Cruise Industry News; B&A



Carnival is the world's largest cruise operator, with nine cruise brands (105 vessels), ranging from luxury (Cunard and Seabourn) to contemporary mass market (Carnival Cruise Line). RCCL is roughly half the size of Carnival, in terms of passenger capacity, with seven brands and 61 ships – followed by the fleets of NCLH (three brands/26 ships), MSC (single brand/15 ships) and Genting Hong Kong (three brands/nine ships).

The remaining fleet encompasses some 272 vessels controlled by brands that operate between one and six oceangoing vessels each. Table 2.3.1 provides an illustration of the major global cruise brands, and their influence on deployments worldwide.

Table 2.3.1: Major Worldwide Cruise Line Passenger Capacity, 2018

Source: Cruise Industry News; B&A

Cruise Operator	Ships	Newbuild s	Consumer Market	Berths	Bed Day Capacity	Market Share
Carnival	105	17		240,442	11,110,718	41.8%
Carnival Cruise Line (NA)	26	3	Contemporary	69,890	4,356,531	16.3%
Princess Cruises (NA)	17	4	Contemporary	45,180	1,806,400	6.8%
Costa Crociere (IT)	14	4	Contemporary	34,847	1,833,376	6.9%
AIDA Cruises (G)	13	2	Contemporary	30,212	1,002,882	3.8%
Holland America Line (NA)	15	2	Premium	26,022	837,234	3.1%
P&O Cruises (UK)	7	1	Contemporary	17,311	548,832	2.1%
P&O Cruises Australia (AUS)	5	0	Contemporary	7,710	443,088	1.7%
Cunard Line (UK)	3	1	Luxury	6,712	212,110	0.8%
Seabourn Cruise Line	5	0	Luxury	2,558	70,262	0.3%
RCCL⁵	61	11		135,596	6,213,174	23.3%
Royal Caribbean Intl. (NA)	25	5	Contemporary	80,690	4,302,750	16.1%
Celebrity Cruises (NA)	13	2	Premium	25,330	820,436	3.1%
Pullmantur (SP)	4	0	Budget	7,358	389,894	1.5%
TUI Partnership (G)	6	3	Contemporary	14,784	511,854	1.9%
SkySea (C)	1	0	Contemporary	1,800	131,400	0.5%
Azamara Club Cruises (NA)	3	0	Premium	2,122	56,840	0.2%

⁵ In June, 2018 RCCL acquired a 66.7 percent stake in Silversea Cruise Line for \$1 billion, assuming ~\$500 million in debt, based on an enterprise value of approximately \$2 billion. This increased the RCCL fleet by nine ships and 2,848 lower berths.

Silversea	9	1	Luxury	3,512	87,664	0.3%
NCLH	26	7		54,846	2,519,718	9.4%
NCL (NA)	16	6	Contemporary	46,930	2,299,720	8.6%
Oceania Cruises (NA)	6	0	Premium	5,256	144,828	0.5%
RSSC (NA)	4	1	Luxury	2,660	75,170	0.3%
MSC	15	11	Contemporary	44,460	2,136,760	8.0%
Genting	9	6		15,409	1,221,383	4.6%
Star Cruises (Asia)	4	2	Contemporary	6,505	685,743	2.8%
Dream Cruises (Asia)	2		Premium	6,800	476,000	1.0%
Crystal Cruises (NA)	3	4	Luxury	2,104	59,640	0.3%

Additional business strategy and brand differentiation for each of the major cruise lines is discussed below, including a deployment overview for each brand.

Carnival Corporation and Plc (Carnival)

Carnival is composed of two companies, Carnival Corporation and Carnival Plc, which are combined and function as one entity, so they are effectively a general partnership between two component public corporations, listed on the New York Stock Exchange and London Stock Exchange, respectively. As such, Carnival is the only company in the world to be listed on both the S&P 500 and FTSE 100 indices. The company operates cruise vessels in North America (including Alaska), Italy, France, the United Kingdom, South America, Germany, Southern Europe, Bahamas, the Mediterranean, Hawaii, the Caribbean Islands, Spain, Asia/Pacific, and Australia. Carnival, as currently structured, was founded in 2002, and is headquartered in Miami, FL. There are also other operating units and joint ventures of Carnival, such as Carnival Maritime, headquartered in Hamburg, Germany, which is responsible for the oversight of global logistics and operations for the company. The following 10 cruise brands fall under the Carnival corporate umbrella:

Carnival Cruise Line (CCL)

This is the primary brand for Carnival. Most of CCL's deployment patterns and vessels are targeted at the first-time cruiser in the contemporary market, which also positions the overall group to capture repeat passengers who climb the ladder

to experience other brands within the Carnival family. The value proposition of the CCL brand has grown over the past five years to compete with the RCI brand in the world's largest market, the Caribbean. The Caribbean is the base of the CCL brand, and their focus will continue to be on this region (~82 percent of fleet deployment). Deployment of single CCL vessels (in most cases) to Alaska, the U.S. West Coast/Mexican Riviera, Canada & New England, and Europe provides sufficient capacity to meet passenger demand specific to this brand, as an alternative to the Caribbean. The CCL brand typically does not offer sailings of more than seven days, and prefers the shorter 5/5/4-day patterns.

CCL's cabin-ticket price point is lower, in most cases, than its competitors in key markets, but they have assembled an excellent upsell onboard their vessels for services, food & beverages, and shoreside activities, to take advantage of captive consumers. They do not hide the fact that their primary effort is to get persons onboard the ships at whatever cost, then make money from onboard spending. This formula has worked out very well for them. CCL is establishing operations in a China partnership with sister company Costa, which has been in the market nine years. Besides leveraging that relationship, CCL will have its own dedicated marketing team in Shanghai.

Princess Cruises

Traditionally known for Alaska and more exotic sailings on a global basis, the Princess brand is more diversified in their deployments, with activities in the Caribbean, Alaska, the U.S. West Coast/Mexican Riviera, Asia/Pacific, and Europe. The primary consumer demographic for Princess is the U.S. West Coast. In Asia, they have concentrated efforts on expanding the locally based consumer markets, with an emphasis on Japan and Korea. The brand offers sailings of more than seven days in all its deployments. Princess and sister brands Holland America Line (HAL) and Seabourn recently joined forces to form the Holland America Group (HA Group) as a way to reduce costs in the back office, as well as onboard and shoreside. As part of the HA Group, Princess has spearheaded a shore-excursion data program to thoroughly evaluate all cost components of activities, including transportation, guides, insurance, venue price, etc. to help control the cost of tours. Princess is viewed as an upscale contemporary brand that focuses on the shoreside elements of the product proposition.

Holland America Line (HAL)

HAL is a premium brand with deep roots in Alaska. HAL's market is primarily North American. HAL has not historically been perceived as a family-oriented brand, but it has seen somewhat younger cruisers in the past 3-5 years in some of the major markets, such as Alaska and the Caribbean. The brand is known for exceptional onboard service, and for offering a wide variety of itinerary patterns and "collector" ports worldwide. The core business for HAL is Alaska and the Caribbean. They deploy to Europe, Canada, and New England, with two ships apiece sailing in the summer and fall from Boston/Quebec, Asia/Pacific, and the U.S. West Coast/Panama Canal.

Figure 2.3.4: Holland America Line's *MS Koningsdam*

Source: *i.ytimg.com*



Seabourn Cruise Line

Carnival Corporations' luxury brand primarily serves the North American consumer market. This all-inclusive cruise experience occurs on small ships, and provides unique destinations and opportunities to sail to ports, which many other vessels cannot go to, due to a combination of marine issues, time, and distance limitations

associated with larger ships and shorter, more traditional roundtrip itineraries. Seabourn offers sailings of 7-21 days and many segments to provide its guests with an option of longer stays onboard. These small ships do not provide large passenger throughput, but they do offer solid economic impacts to the communities they visit, due to strong passenger spending.

The remaining brands under Carnival – Costa Crociere, AIDA Cruises, P&O Cruises, P&O Cruises Australia, and Cunard Line – are primarily deployed away from North American regional markets, due to differing target demographic models and core itinerary patterns. Looking to the future, while Costa, AIDA, Cunard and P&O Cruises will continue to have a limited – but perhaps expanded – presence in North America, it is highly unlikely that these or other Carnival brands (which are not currently active in North America) will develop a North American presence to rival that of sister brands CCL, Princess, HAL, and Seabourn. The reason is that the CCL and HA Group brands have been developed specifically with a core North American consumer market in mind, while the other Carnival brands have been developed to cater to other markets. Carnival would effectively be competing with itself by introducing significant new capacity from additional sister brands.

Royal Caribbean Cruises, Ltd (RCCL)

RCCL owns six distinct cruise brands, and as of June 2018, has a controlling stake in a seventh brand – Silversea Cruise Line. RCCL has made efforts to tap into the major consumer demographics outside of the U.S., through its onboard services and the designation of specific brands for key demographics in Europe. RCCL is pursuing interests in Asia presently – with a partnership to form a new cruise line for the Chinese market. In 2015, the first vessel began sailing from Shanghai in this endeavor. Synergies within the group include operations, food and beverages, and shore excursions. Marketing and marine departments for all brands maintain independent stances within the organization. SkySea Cruises (SkySea) is a joint venture targeting the Chinese consumer market. This brand will be discontinued at the end of 2018. The following cruise brands all fall under the RCCL corporate umbrella:

Royal Caribbean International (RCI)

RCI is the flagship brand for RCCL, offering cruise itineraries that range from 2-18 nights, with options for onboard dining, entertainment, and other activities. This contemporary brand has pushed the limits of cruise vessel size (Oasis class),

onboard entertainment, and technology (i.e. *Quantum of the Seas*). While it is primarily a North American brand the deployment patterns and marketing efforts have been geared toward expansion to serve a much larger international passenger base, enticing them to many different destinations. Deployment for 2017 shows this diversity, as they are in six different international markets; the Caribbean is at the core, followed by Asia/Pacific, Europe, Bermuda, Alaska, and, Australia. Thus, the commitment of the brand is to the Caribbean, serving a wide variety of demographics, as part of the overall growth strategy; it is also committed to Asia.

Celebrity Cruises (Celebrity)

Celebrity offers cruise itineraries ranging from 3-18 nights to various destinations, and operates upscale ships that offer higher-end accommodations, fine dining, personalized services, and spa facilities. Celebrity is one of RCCL's premium brands, with North Americans as the core demographic. Known for its Solstice class ships, where RCI has moved out of deployments to fulfil their goals, Celebrity has moved in to fill the void. Celebrity's deployment ranges from the Caribbean, Europe, and Alaska to Australia, Asia/Pacific, and Bermuda.

Figure 2.3.5: RCI's *Harmony of the Seas* Departing Port Everglades, 2017

Source: orlandosentinel.com

***Azamara Club Cruises***

This small-ship brand offers cruise itineraries ranging from 4-18 nights, and serves the up-market segment of the North American, United Kingdom, and Australian markets. Due to its small fleet and demographic target, Azamara keeps a broad range of deployments each year.

Pullmantur

This European brand provides cruise itineraries, ranging from 4-12 nights, with various cruising options and onboard activities for couples and families traveling with children.

TUI Cruises

European brand providing onboard activities, services, shore excursions, and menu offerings for the German consumer.

SkySea

A single vessel joint venture poised at capturing the mainland China market, which is being discontinued in 2018.

Silversea Cruise Line

A 66.7 percent stake was purchased by RCCL in June 2018, providing for an ultra-luxury brand option in the RCCL fleet.

Norwegian Cruise Line Holdings (NCLH)

Norwegian Cruise Line merged with Prestige Cruise Holdings, Ltd, in 2014 to form NCLH. This diversified holding company and operator of leading global cruise brands, spanning market segments from contemporary to luxury, under the Norwegian Cruise Line, Oceania Cruises and Regent Seven Seas Cruises brands.

Norwegian Cruise Line (NCL)

NCL, also referred to as Norwegian, is a proven innovator in cruise travel, with a history of breaking the boundaries of traditional cruising – most notably with the introduction of Freestyle Cruising, which opened up numerous additional dining and entertainment options for guests and facilitated a more guest-centric onboard experience by increasing flexibility and choice. NCL operates some of the most contemporary ships at sea. Some 47.1 percent of NCL capacity is based in the Caribbean market, catering primarily to the North American consumer. NCL also has deployments in Europe, Bermuda, Alaska, and Hawaii, as well as seasonal sailings in Canada and New England. They offer itinerary patterns from 5-12 nights. NCL is continuing a high growth trajectory, with the introduction of several newbuilds in the recent past, and several more in the coming years. This fleet is one of the youngest in the industry. Their aim is to compete directly for the core North American market and expand accordingly. NCL entered the China/Japan marketplace with their 2017 newbuild (*Norwegian Joy*) and the opening of three sales offices in China. They have formed substantial entertainment partnerships to diversify their onboard cruise products.

Oceania Cruises

Oceania is a market leader in the upper-premium cruise segment, featuring fine cuisine, gourmet culinary experiences, elegant accommodations, impeccable service, and destination-driven itineraries. Oceania offers itinerary patterns ranging from 7-21 nights, depending on the destination. They deploy ships on a seasonal basis, and tap into the North American market base.

Regent Seven Seas Cruises (RSSC)

RSSC is a leader in the luxury cruise segment with all-suite accommodations, highly personalized service, and an inclusive luxury experience – featuring round-trip air, fine wines and spirits, and unlimited shore excursions among its numerous included amenities. RSSC is primarily based in North America, offering cruises from 7-21 nights.

MSC Cruises (MSC)

MSC is a single brand with many newer cruise vessels, and plans to introduce some of the industry's largest ships in the coming years. MSC is a privately held company based in Geneva, Switzerland, and owned by the Aponte family, the same organization that owns Mediterranean Shipping Company S.A. – currently the world's second-largest container shipping company. MSC has a very young cruise ship fleet, and continues to expand aggressively, with 11 newbuilds currently in the orderbook. The core market for MSC is Southern Europe, but they have expanded outside of the continent, with offices in Asia (Hong Kong and Shanghai), the U.S. (Fort Lauderdale, FL), the Middle East, and South Africa.

MSC's U.S. office has tried to expand the North American market to the point of a deployment, specifically along the East Coast, to meet demand. However, the company does much better financially with European-based deployments. MSC offers cruises throughout Europe, allowing for passengers to embark/debark in several different ports along the main itinerary pattern. The standard cruise duration is 7-12 nights. The North American office is encouraging more deployments to the region, and has built a larger sales team in North America as well. MSC now deploys vessels from Port *Miami*, concentrating on the Bahamas and Western Caribbean, and is in the process of developing a private island destination to enhance and differentiate its itinerary offerings. Other North America deployments, such as Alaska, are only a matter of time for the brand, given its rapid expansion.

Genting Hong Kong Limited

As a higher level of interest and investment takes place regarding the Asia cruise market by the major cruise lines, there has also been an internal expansion of cruise brand operations aimed at the key Asian demographic markets, especially China. For many years, Star Cruises was the dominant brand in the market focusing on short sailings and gaming. They have evolved into Genting Hong Kong, a leading

global leisure, entertainment, and hospitality enterprise, with ventures in resorts, gaming, and cruise. Genting currently operates three separate cruise brands: Dream Cruises, Star Cruises, and Crystal Cruises.

Dream Cruises

This is the first-ever Asia-based premium cruise brand. Dream Cruises delivered its first newbuild, *Genting Dream*, in 2016, catering specifically to Asia's premium sector. Its sister ship, *World Dream*, was delivered in November 2017.

Star Cruises

Star Cruises will maintain its role in the contemporary gaming and short cruise market segment. Star Cruises has been the dominant cruise brand in the Asia region, and the new brands will help diversify and expand their market options.

Crystal Cruises

Crystal is a high-end luxury cruise brand, offering cruises in markets around the world. Currently, Crystal is in the process of executing newbuild agreements for additional oceangoing vessels, and is extending its model into river cruising as well. Crystal caters to an international consumer market, with an emphasis on North America.

2.3.4 Cruise Line Consolidation and Segmentation

Cruise industry consolidation propelled industry growth from 1990-2010, with the merger of several key cruise operators (i.e. Royal Caribbean Cruise Line & Celebrity Cruises) and the acquisition of major brands by Carnival (Princess, HAL, Cunard, etc.). In 2014, Norwegian Cruise Line came together with Prestige Cruise Holdings to form NCLH. Genting Hong Kong purchased Crystal from parent-company Nippon Yusen Kabushiki Kaisha (NYK) in 2015 for \$550 million. This acquisition has allowed Genting Hong Kong to jump into the luxury cruise segment, as well as river cruising.

It is likely that there will continue to be new joint partnerships related to the Chinese market, in order to integrate cruise vessels with the travel agent supply chain required to fill them, such as those that have already been established by RCCL (SkySea), Carnival, and MSC. While these brands are not currently in the Caribbean market, it is likely in the long-term that there will be some level of Asian cruise brands sailing in the region to provide their consumer base with new cruise

products. There are already numerous Asian consumers sailing on the Princess, Holland America, and RCI brands through Port Everglades each year.

With the recent acquisition of Silversea by RCCL, major consolidation and acquisition activities have most likely been completed, since five major corporations already have ~88 percent of worldwide cruise berth capacity. The principal activity taking place now revolves around diversification of brands into complementary markets, to allow for upscaling core cruise consumers, from contemporary to premium and luxury brands, within the same corporate stream. New cruise lines/brands, such as Virgin Voyages, are also preparing to enter the cruise business, with new approaches to their targeted cruise demographic segments.

Table 2.3.2 provides an overview of the cruise brand consumer demographics for the major cruise brands. As shown, each brand targets a demographic, or range of consumers. With the deployment of larger cruise vessels with more outside cabins, balconies, and suites that derive higher ticket pricing, there is now not such a clear-cut demographic for each of the cruise brands. They are now differentiating themselves to a greater degree, via onboard products and services.

Individual cruise brands compete for consumers in many different market sectors. They must differentiate themselves and provide a value proposition to the consumer that ranges from budget to super luxury. Different cruise lines in a given region target different demographics. Table 2.3.2 shows the primary consumer demographic for each brand. However, individual vessels carry varying demographics based upon cabin type (suite vs. inside cabin), destination (Caribbean vs. Southeast Asia), and other factors. Even individual sailings may consist of highly mixed and very different demographic profiles. The Caribbean market is popular with a wide variety of demographics, which is why it appeals to so many different brands. This broad appeal is unlikely to change, which is a strength of the region and a positive indicator for future growth.

Table 2.3.2: Major North American and European Cruise Brand Demographic Profiles*Source: Cruise Industry News; B&A*

Cruise Brand	Core Nationality Source market	Age Range	Income Range	Market Sector	Core geography (ranked by capacity)	Notes
Carnival Cruise Line	Primarily U.S.	25 and up	Avg.	Contemporary 3, 4, 5, 7-day sailings	Caribbean West Coast Aus, Alaska	Younger middle class, couples and families
Celebrity Cruises	Primarily U.S. and Canadian	35 and up	USD \$100,000	Premium 7-day plus sailings	Caribbean, Alaska Med, NEW, Aus Asia/Pacific	Couples and families
Holland America Line	Primarily U.S.	45 and up	USD \$75,000	Premium 7-day plus sailings	Alaska, Caribbean NEW, CNE, Med Transcanal	Couples and retired singles
Norwegian Cruise Line	Primarily U.S.	35 and up	Avg.	Contemporary 7-day plus sailings	Caribbean Med, Asia/Pacific Alaska	Younger couples, singles and families
Royal Caribbean International	U.S. and Intl. (50% goal)	30 and up	Avg. to high	Contemporary/Premium	Caribbean Asia/Pacific Med, Aus NWE, Alaska	Couples, families and singles
Disney Cruise Line	U.S. and Intl. mix	35 and up	Avg. to high	Contemporary/Premium	Caribbean, Alaska West Coast, NEW Med, CNE	Families and couples
Princess Cruises	Primarily U.S.	35 and up	Avg. to high	Contemporary/Premium	Asia/Pacific Alaska Caribbean Aus, West Coast	Predominantly couples and singles
Crystal Cruises	U.S. and Intl. mix	55 and up	High	Luxury 7-day plus sailings	NEW, Alaska SA, Caribbean, CNE Med, Asia/Pacific	Couples and retired singles
Silversea Cruises	U.S. and Intl. mix	55 and up	High	Luxury 7-day plus sailings	Med, NEW, Asia/Pacific, SA, Caribbean, Alaska	Small ship experience Couples and retired singles
Seabourn Cruise Line	U.S. and Intl. mix	55 and up	High	Luxury 7-day plus sailings	Med, Caribbean, Asia/Pacific, Alaska Aus, NWE	Small ship experience Couples and retired singles
Regent Seven Seas	U.S. and Intl. mix	45 and up	Mid to high	Affordable Luxury 7-day plus sailings	Med, Alaska, Caribbean, NEW, SA Asia/Pacific, CNE	Small ship experience Couples and retired singles

Oceania Cruises	U.S. and Intl. mix	45 and up	Mid to high	Affordable Luxury 7-day plus sailings	Med, Caribbean NEW, SA, Alaska Transatlantic, Bermuda, CNE	Small ship experience Couples and retired singles
MSC Cruises	Primarily European mix	30 and up	Avg.	Contemporary 7-day plus sailings	Med, Caribbean NEW, SA Asia/Pacific	Couples, singles and families
Costa Cruises	Primarily European mix	35 and up	Avg.	Contemporary 7-day plus sailings	Asia/Pacific Med, NEW SA	Couples, singles and families
Cunard Line	UK and Intl. mix	50 and up	Mid to high	Premium/ Luxury 7-day plus	Transatlantic, NEW Med, Canaries, CNE Caribbean	Couples and retired singles
Hapag-Lloyd Cruises	Primarily German	50 and up	Mid to high	Premium/ Luxury 7-day plus	NEW, Asia/Pacific Med, Aus, Caribbean	Couples and retired singles
AIDA Cruises	Primarily German	25 and up	Avg.	Contemporary 3, 4, 5, 7-day plus sailings	NEW, Med Canaries Red Sea	Couples, singles and families

2.3.5 Cruise Vessel Supply

Cruise lines have been highly successful at introducing new vessel inventory and developing onboard products that generate sustained interest in cruising. Cruise brands continually work to improve the quality and quantity of onboard experiences with diverse food and beverage venues, entertainment activities, meeting and conference facilities, and recreation areas.

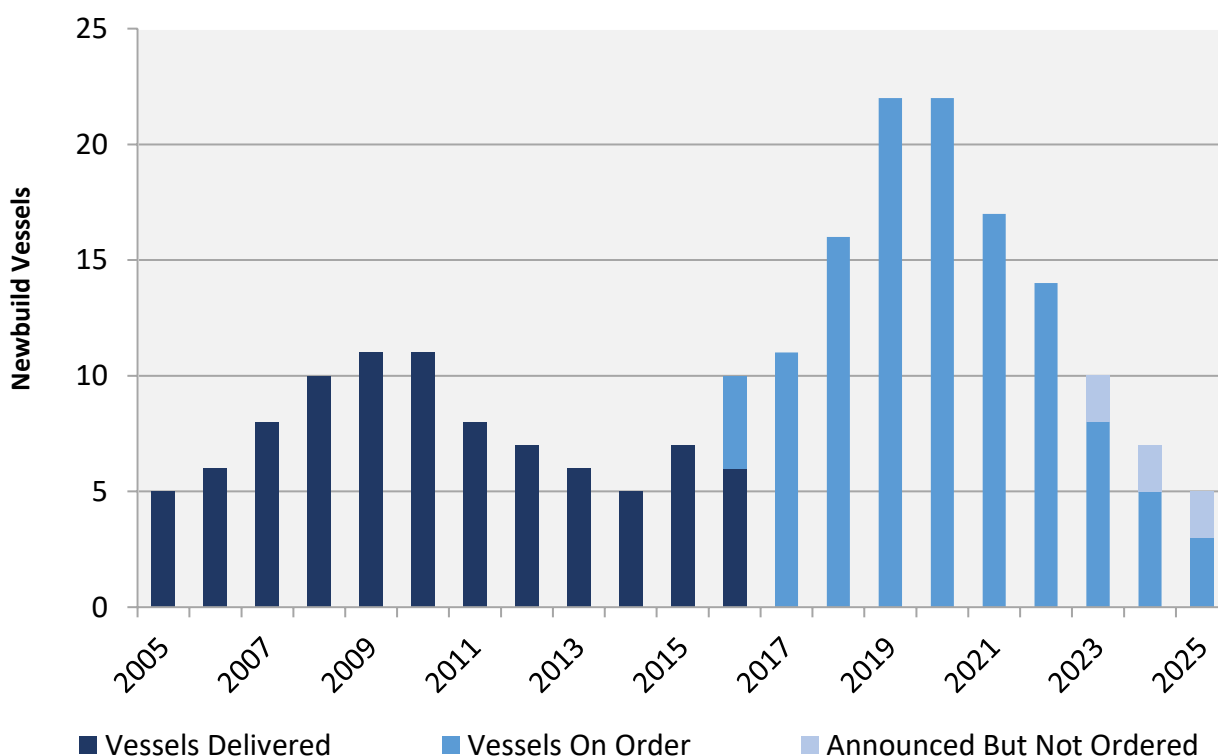
Among the largest of their efforts is the creation of larger and more lavish vessels furnished with veranda-style outside cabins, grand central atriums, health spas and other amenities similar to what is found in the best land-based resorts. These amenities are more attractive to consumers and help to increase the average ticket price that a cruise line can charge as well as onboard spending. In the Caribbean, onboard amenities may impact shore excursion spending more than a destination such as Alaska where the ship is less of an attraction than the ports of call themselves due to the unique natural and cultural aspects inherent to Alaska as a destination and the inability of most cruise passengers to interact with those aspects outside of their cruise experience. To forecast future facility requirements and passenger throughput, it is important to consider the trends in ship construction and newbuild deployment.

RCI delivered the first newbuild of the next generation of cruise vessels – Oasis of the Seas – in 2009 followed by Allure of the Seas in 2010, both with passenger loads exceeding 5,400. Additional larger capacity cruise vessels have followed. NCL, Costa, RCI and others have ordered several more ships with capacities exceeding 5,000 passengers and more than 150,000 gross tons (GT). RCI’s Quantum class and Oasis class vessels, NCL’s Breakaway class vessels and MSC’s Meraviglia class vessels are all examples. Carnival announced the development of up to eight 5,000 passenger LNG-powered cruise vessels (dual fuel) for its fleet, specifying two for its Costa brand and two for its AIDA brand. They have nine ships in this class on order. LNG technology will reduce the emissions of these vessels as required in ECA zones.

As of June 2018, there are 101 new cruise vessels on order with a total berth capacity of 230,953 lower berths scheduled for delivery (2018 through 2027). For comparison purposes, in Spring 2006, the forward cruise vessel orderbook contained 29 vessels with a berth capacity of approximately 85,000. Figure 2.3.6 shows the cruise vessel newbuild deliveries from 2005 through 2025.

Figure 2.3.6: Cruise Vessel Deliveries, On Order and Announced, 2005-2025

Source: Seatrade Cruise (June 2018); B&A

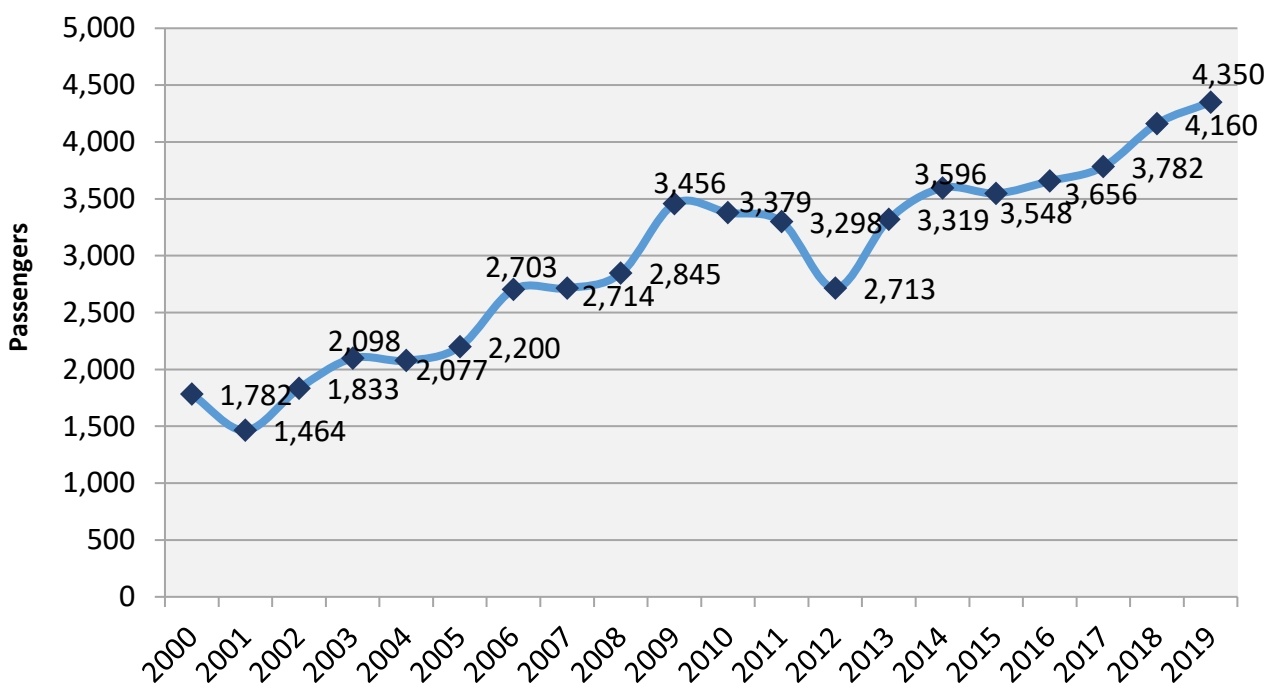


The supply of newer and larger cruise ships propels the industry forward. The deliveries for 2020 and beyond are still preliminary and likely will increase further over the next two years. Vessels with capacities exceeding 5,000 passengers will become a standard vessel in the world cruise fleet. These vessel dimensions, inclusive of LOA, beam, air draft and passenger capacity directly affect the berth and upland support infrastructure (i.e. terminals, berths, GTAs, storing/servicing areas) of all ports. The construction timeframe for a new cruise ship varies based on a number of factors, with two years being a rough approximation for the average vessel.

The cyclical nature of shipbuilding is driven as much by economics, shipyard competition, cost of capital and availability of government support or subsidies as by consumer demand. See Figure 2.3.7 for an overview of historical growth in cruise vessel passenger capacity.

Figure 2.3.7: Average Passengers per Ship by Year of Construction, 2000-2019*

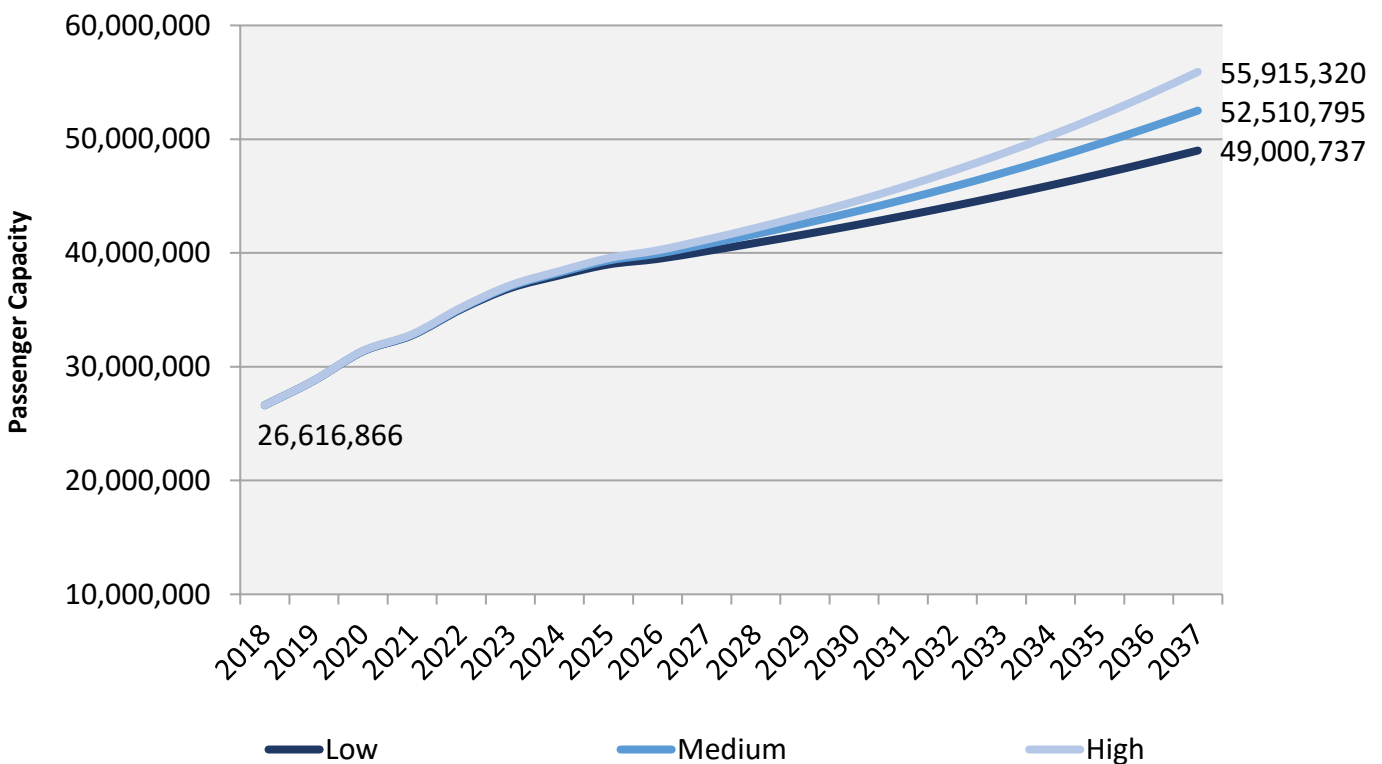
Source: B&A



*Not inclusive of small exploration and river cruise vessels of less than 200-passengers.

Major contemporary cruise brands look at economies of scale in the size of vessels to increase capacity as a preference to additional cruise vessels in their fleets. This is done primarily as a means to reduce operational expenses associated with fuel, labor, port and other variable costs. For example, it is more cost-efficient to deploy two 4,500 passenger ships in a single market than three 3,000 passenger ships because: a) the fuel spend per passenger in a two-ship vs. three-ship operation is substantially lower; b) the number of berths required for two ships vs. three is one-third less, meaning port costs such as dockage, line-handling and pilotage are also reduced; and c) fewer crew are required to operate and service two 4,500 passenger vessels vs. three 3,000 passenger vessels.

While large cruise vessels – more than 1,000 passengers – are the leading orders in the newbuild orderbook, there are also purpose-built exploration and high-end luxury ships ranging from 184-930 passengers that are being built to target specific cruise tourist demographics. There are fewer cruise vessels in the secondary (used/leased) market than in the past as cruise lines continually look to enhance onboard experience and revenue options through aggressive newbuild and fleet modernization programs. Based on the continued newbuild delivery trends, market capacity opportunities and low penetration rates to date in the major markets, the range of potential worldwide passenger growth through 2038 is estimated to be between 49 and 55 million passengers.

Figure 2.3.8: Global Cruise Growth Projections, 2018-2038*Source: B&A*

The range shown in Figure 2.3.8 is predicated by the following series of variables:

- Overall newbuild introductions
- Overall retirement of existing capacity based on a range of ages of the vessels
- A variety of deployment patterns that dictate the length of the cruise and therefore the number of customers needed
- Expansion of key existing markets as well as new markets such as Asia, India, South America and the Middle East

This forecast is based on the additional supply of cruise vessels placed into the consumer market and a minimal withdrawal factor of 5 percent for older ships being taken out of the conventional cruise fleet on an annual basis over the 20-year period. New ships entering the market over an extended period of time have slowed this down as have major refurbishments of vessels on a regular basis. There are no regulations in place or on the horizon that are forcing vessels out of service at an accelerated rate. Typically, a cruise vessel has an approximate 20-25 year life

before being removed from the major fleets. However, today, lines are investing in their older vessels to extend their commercial life well beyond this, a trend which is expected to continue. In addition, the new vessels being placed into the fleet are larger overall, thus creating more berth capacity in the marketplace. The projections consider both factors as well as the annual volume of vessels being built. The low, medium and high scenarios are the differences in the number of cruise vessels placed into the fleet and withdrawn on an annual basis. Cases are based on eight (low) to 16 (high) mid-size to large vessels being delivered per year, average newbuild vessel capacity (ranging from 3,186 to 3,538) and the existing fleet in service minus a withdrawal factor of 5 percent.

Factors that impact numbers of vessels delivered per annum include:

- Euro vs. USD vs. other currencies (with new vessel building options in Asia) exchange rates
- Cruise line desire to limit supply vs. increase demand to optimize per cabin per diems
- Competition
- The number of large vessel newbuild vessel slots available in shipyards with the surrounding technological expertise

2.3.6 Global Cruise Industry Summary

World cruise tourism is a supply-led industry that is expanding rapidly, but small in terms of worldwide tourism products. It impacts each continent and is fed by the development of regional itinerary patterns that attract consumer demand, which is the key growth driver.

Cruise tourism has done well during socio-political conflicts, economic instability and recession among other challenging conditions. This is accomplished through the ability of cruise brands to move their vessel assets to locations passengers want to go that are free from conflicts and where the consumer feels secure.

Most cruise brands also have the ability and determination to adjust ticket pricing and length of sailings (e.g. moving from a 7-night pattern to a 3, 4-night pattern) to increase the overall passenger throughput and increase the ability to generate onboard revenues. The cruise industry is highly focused on profitability but the willingness of different brands to discount ticket price and/or adjust itinerary

patterns in order to increase occupancy varies widely. Regardless of the individual brand philosophy, “filling the ship” remains important to some extent, but profitability is the ultimate goal and occupancy is not the only driver of profitability.

Continuously balancing supply against demand and ticket price against other revenue opportunities (food and beverage, casino, shore excursions, etc.) is the key to cruise line profitability and is at the core of the business model of the industry as a whole.

World growth is propelled by the development of larger cruise vessels with greater passenger capacities providing for better overall economies of scale for the cruise lines and their brands. However, the smaller exploration and luxury vessels being built and introduced to the market are also driving a larger part of the overall consumer market with some 1 million passengers per year and are targeted toward a particular demographic niche(s).

Given the still low overall penetration rate of the global cruise industry there is reason to be optimistic about future growth. The introduction of new capacity (supply) has generally been met with strong consumer interest and a correlating increase in demand. The industry is constrained primarily by the ability to build new ships at a faster pace (two years on average); the overall number of newbuild large ship slots (approximately 15); larger vessels per annum; and regional homeport berth and downstream berth and upland tourism infrastructure to support growth. New cooperative agreements and partnerships are allowing for newbuild options in Asia so more cruise vessels can be delivered each year. This will allow for more growth overall and may exceed the current projections.

Further cruise line consolidation is likely limited to strategic brand acquisitions to move into new market segments. The heavy lifting of major brand mergers appears to be done. Any additional movement over the next few years will focus on Asia/Pacific market expansion.

The North American market serves as the primary world market for deployments. Growth will continue at a solid rate, but movement of vessel capacity to create new markets will lower overall penetration in the main North American marketplace. For regional North American itinerary patterns, such as the Caribbean, Alaska, Canada & New England, West Coast, etc., this is offset by the development opportunity of European and Asian cruise operators deploying vessels into these

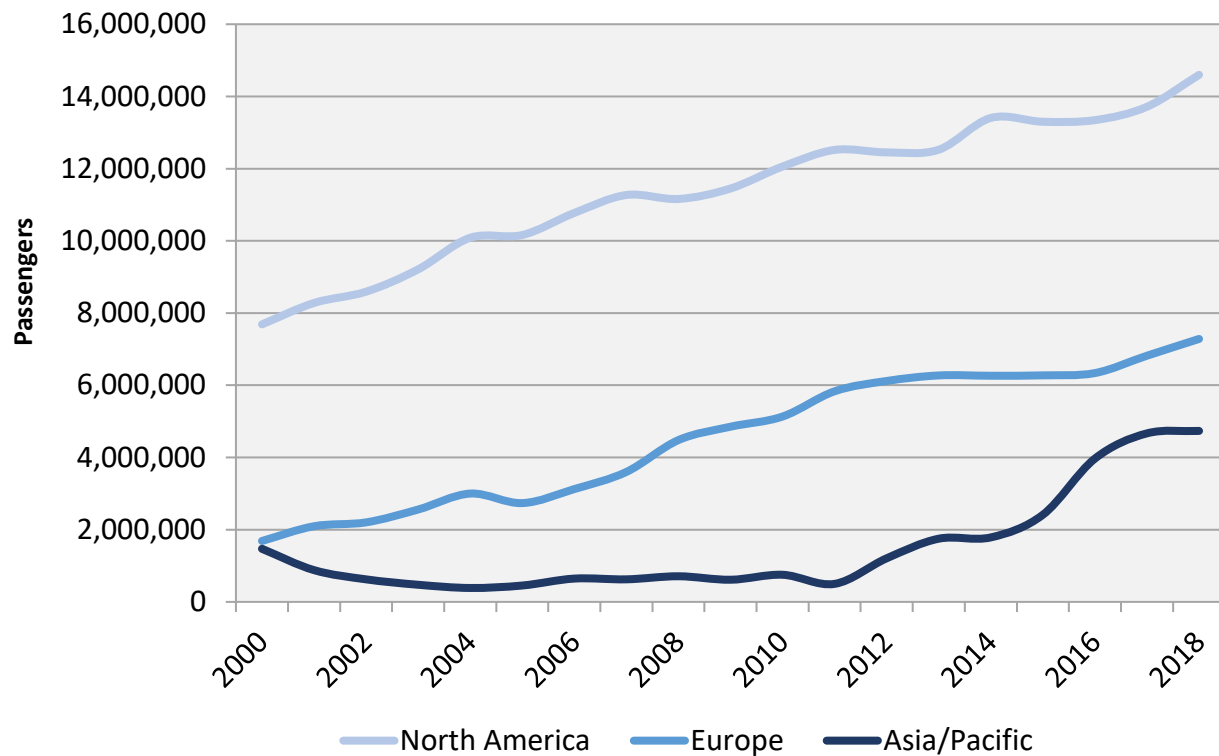
regions to meet the demands of their core consumer groups.

2.3.7 Cruise Markets and Caribbean Cruising

While North America has the largest direct impact on the market capacity within the Caribbean/Bahamas region, there is also continuing influence by the European and to a lesser degree Asian consumer markets. As the industry continues to expand worldwide there is a larger and more diverse passenger mix on the cruise vessels sailing from South Florida, the Gulf and other ports throughout the Caribbean as brands look to target and expand other markets. There are also seasonal placements of brands into the region targeting the German, UK and other specific consumers.

The North American consumer is the primary customer for Port Everglades-based cruises. International passengers also factor in for certain brands thanks to the proximity and connectivity of Miami International Airport (MIA), whose airlift capacity is a major strength of South Florida as a homeport and will become even more important going forward as new brands seek to diversify their product offerings among non-U.S. source demographics. FLL also continues to grow and increase its international flight offerings, which leads to similar competitive benefits for South Florida and Port Everglades in particular.

Figure 2.3.9 illustrates the historical growth of the primary world consumer markets in terms of passenger capacity, which has propelled the industry forward since its inception. The North American market, due to historical marketing efforts and proximity remains the largest cruise source market globally as well as for Port Everglades and the Caribbean basin.

Figure 2.3.9: Key Cruise Market Growth, 2000-2018*Source: Cruise Industry News*

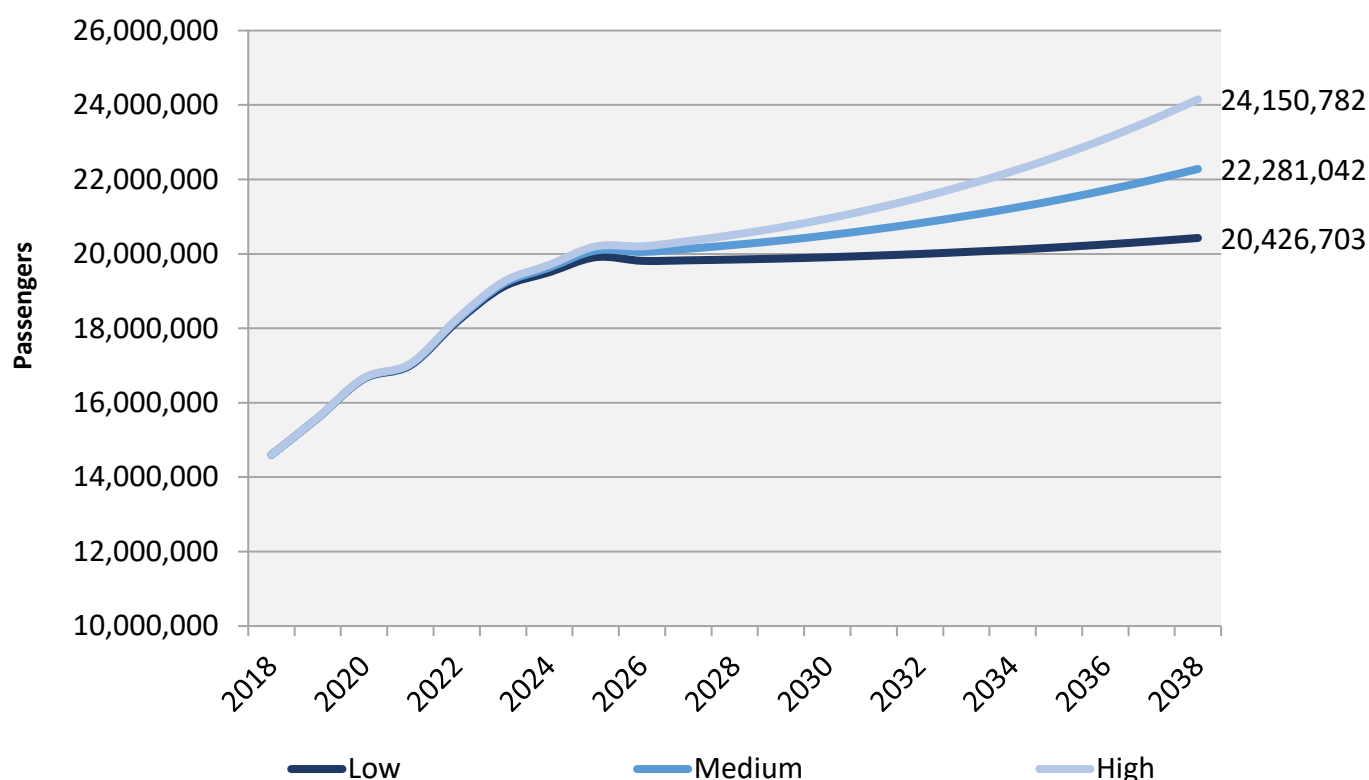
According to Cruise Industry News Annual, North American capacity will increase 41 percent between 2018 and 2027 compared to 25 percent between 2008 and 2017. Overall, 2022 will be the most significant year in terms of net new capacity with more than 1 million additional bed nights coming into the market. On average, passenger capacity in North America is expected to increase 4.5 percent per year for the next 10 years for net average annual growth of approximately 700,000 passengers per year. In terms of demand, with a penetration rate still below 4 percent (3.7 percent in 2017) there remains massive untapped potential in North America, which new destinations, vessels and brands should all help to unlock in the coming years. The Caribbean region is also attracting further attention from European cruise operators and it is only a matter of time before Asia-based cruise brands begin to diversify their deployments as well, in which case Port Everglades and PortMiami would clearly be top contenders.

Based on known newbuild delivery orders, informed assumptions about which vessels are likely destined for the North American market, competition amongst

regions moving forward and historical market capture rates for the region, a range for growth of the North American market for the period from 2018-2038 has been developed (see Figure 2.3.10). As shown, annual growth projections for North America as a whole range from 1.7 percent under the low projection up to 2.5 percent under the high projection.

Figure 2.3.10: North American Cruise Market Growth Projection, 2018-2038

Source: B&A



Within the North American market there are a number of sub-markets or regions, including Alaska, Canada-New England (CNE), Mexican Riviera/U.S. West Coast, coastal, Gulf, Bermuda and of course the Caribbean, among others. Within the Caribbean there are also a number of specific sailing patterns as shown Figure 2.3.11.

Five primary Caribbean cruise sectors generate homeport operations for Port Everglades and account for some 97 percent of the patterns in the region. Today there are many overlaps in ports and regions, thus it is not clear cut in terms of where ships are slotted into each itinerary pattern. Other segments also contribute

differing levels of cruise traffic to Port Everglades including repositioning sailings to and from Europe and South America.

Figure 2.3.11: Caribbean Sub-Region Sailing Patterns

Source: B&A



Table 2.3.3 illustrates the percentage of itinerary patterns for the Caribbean region in 2018. The Bahamas (i.e. Nassau and Private Islands with Cuba options) and Western Caribbean (typically including Grand Cayman, Jamaica, Cozumel, etc.) account for more than 70 percent of the patterns in the region.

Bahamas

Mainly comprises offerings in Nassau, Freeport, and a private island experience, as well as newly opened ports in Cuba. New products in Nassau and Cuba provide for an excellent option. Cuba has also assisted in traffic development.

Western Caribbean

Today, this sector has the second highest capacity offering in the Caribbean, with three primary destinations (Cozumel, Grand Cayman, and Jamaica). In addition,

most major lines also offer a private island opportunity. While considerable congestion occurs in these major ports, cruise lines are continuing to address this issue by developing new ports and infrastructure to serve growth requirements. This can be operated with 7-day and/or 5/5/4-day patterns.

Table 2.3.3: Caribbean Itinerary Patterns, 2018

Source: B&A

Itinerary	Caribbean Overall %	Port Everglades %	Port Miami %	Port Canaveral %	Port Tampa Bay %
Bahamas	36.6%	20.7%	78.1%	86.9%	1.0%
Western	34.5%	24.1%	61.6%	14.8%	6.4%
Eastern	14.6%	29.5%	22.8%	21.9%	
Caribbean	6.6%	18.6%	11.4%	0.4%	0.2%
Southern	3.5%	0.8%	3.8%	2.5%	
Bahamas/Caribbean	2.2%	3.4%	7.2%	0.4%	
Panama Canal	0.7%	3.0%			0.2%
Bahamas/Bermuda	0.2%			0.4%	

Eastern Caribbean

This region typically consists of the main ports of San Juan, St. Thomas, and St. Maarten. The industry is continuing to expand offerings with new destinations in the region such as Antigua, St. Kitts, and others. Typically, cruise lines have offered rotating Eastern and Western sailings from Port Everglades, but this is changing rapidly as revenue management provides for a better picture of seasonal sailings.

Southern Caribbean

From a geographic perspective, the Southern Caribbean region extends from South America East to include the Windward Islands (also referred to as the West Indies). Typical ports visited on North American and European line itineraries include St. Thomas, Aruba, La Guaira, Dominica, Curacao, Barbados, St. Kitts, and Martinique.

An overall high level of consumer demand by European travelers has continued to increase European cruise operators' presence in this sub-region.

Caribbean

The overall Caribbean itinerary generally includes itineraries of 8-14 days. For both European and North American cruise operators, these itineraries often embark from homeports in the U.S., primarily Port Everglades and Port *Miami*, and travel to a greater variety of both traditional and nontraditional Caribbean destinations.

Other itinerary patterns influencing Port Everglades include the following repositioning sailings that are outside the specific Caribbean realm:

- **South America**

Infrequently operated market sector generally comprised of a seasonal vessel repositioning movement between the Caribbean and the South American cruise sector

- **Transatlantic**

Used in the repositioning of the North American and European fleets from European Summer cruising regions to the Winter market in the Caribbean

- **World Cruise**

Very limited and caters to wealthy passengers who can be away from their homes for an extended time; these sailings are typically 80 to 120 days in duration, divided into more modest 15-24 day cruise segments; sailings are also seen as exotic and do not spend much time in the Caribbean

- **Bahamas/Bermuda/Caribbean**

Consists of sailings from/to the Northeast region of the U.S. including New York, Baltimore, Charleston, etc.; vessels from Port Everglades sail short haul cruises that provide for ports in the Bahamas and Caribbean as well

- **Panama Canal**

Moving to and from the U.S. West Coast for repositioning and regular sailings, these are longer duration cruises with a limited audience; Port Everglades has more of these sailing types than other ports in the region

In addition to above, Baleária offers cruise transfers to the Bahamas with the ability

to move cargo. This is a niche ferry-type market within Port Everglades and the South Florida region. They are currently based at Terminal 1, but will lose this location once the Convention Center expansion project moves forward. The port has provided an alternative passenger location at the old U.S. Customs Building, with a shuttle service to an available berth in the port (that could change daily) and the movement of cargo to the berths as well. This scenario will pose a logistic and passenger challenge that will certainly disrupt any growth initiatives for the company. Baleária Cruises is a very large Spain-based entity with operations in five countries with more than 30 vessels sailing on many routings. Several proposals have been provided to the port for the development of a ferry hub and an investment by Baleária of ~\$35 million for infrastructure that will meet the demands for their operation to allow for expansion as shown below. Based on ferry stakeholder input, growth and risk factors for this sector of Port Everglades traffic are as follows:

- To achieve the target passenger volumes below in the mid term to long term a designated berth/terminal is required
 - Bimini – 80,000 PAX
 - Nassau – 100,000 PAX
 - Cuba – 180,000 PAX
 - Dominican Republic – 60,000 PAX
 - Freeport – 150,000 PAX
- Inability to operate from a central berth-adjacent location at Port Everglades will likely cause a rapid increase in operational costs and a lowering of consumer satisfaction with the product
- Expansion of the cruise and ferry market with Cuba opening will positively impact operations within the region; cargo volume increases are already being driven by cruise, airline and other transportation

2.3.8 Port Everglades Fit

Port Everglades' strength in terms of strategic fit is to serve as a primary homeport for regional cruise deployments. These deployments are mostly Caribbean and Bahamas driven due to speed and distance issues and rely on both regional Southeast consumers and a growing international consumer market. The repositioning itinerary patterns for European brands also provide for some level of

port-of-call options, as do extended sailings within the Caribbean region where passengers remain onboard for a combination Eastern/Western pattern that can last as long as two weeks. Table 2.3.4 provides an overview of the fit for each of the target markets identified above with respect to Port Everglades.

Table 2.3.4: Port Everglades' Fit within Different Itinerary Patterns

Source: B&A

Target Cruise Type	Homeport	Port of Call
Bahamas	■ / ↑	↓
Western	↑	↓
Eastern	↑	↓
Caribbean	↑	↓
Southern	↑	↓
Bahamas/Caribbean	■ / ↑	■
Panama Canal	↑	↓
Bahamas/Bermuda	↓	↓
World	■ / ↑	■ / ↑
Daily/Non-Conventional	↑	N/A
Key: Strong (↑), Fair (■), Weak (↓)		

Overall deployment to the Caribbean region is shown in Figure 2.3.12 on a worldwide basis.

The Caribbean market has fluctuated from year-to-year in terms of market share, but actual overall capacity increased substantially during the 18-year period shown even as market share declined slightly. The decline of market share is due mainly to the aggressive deployments in Asia/Pacific during the same period, which skewed market share downward for North America even though actual capacity

deployed was relatively strong.

Figure 2.3.13 provides a look at the regional deployment trends for the various North American sub-regions during the past five years, expressed as percentages of total global capacity each year.

Figure 2.3.12: Caribbean Deployment vs. Worldwide Cruise Market Capacity, 2000-2018

Source: B&A

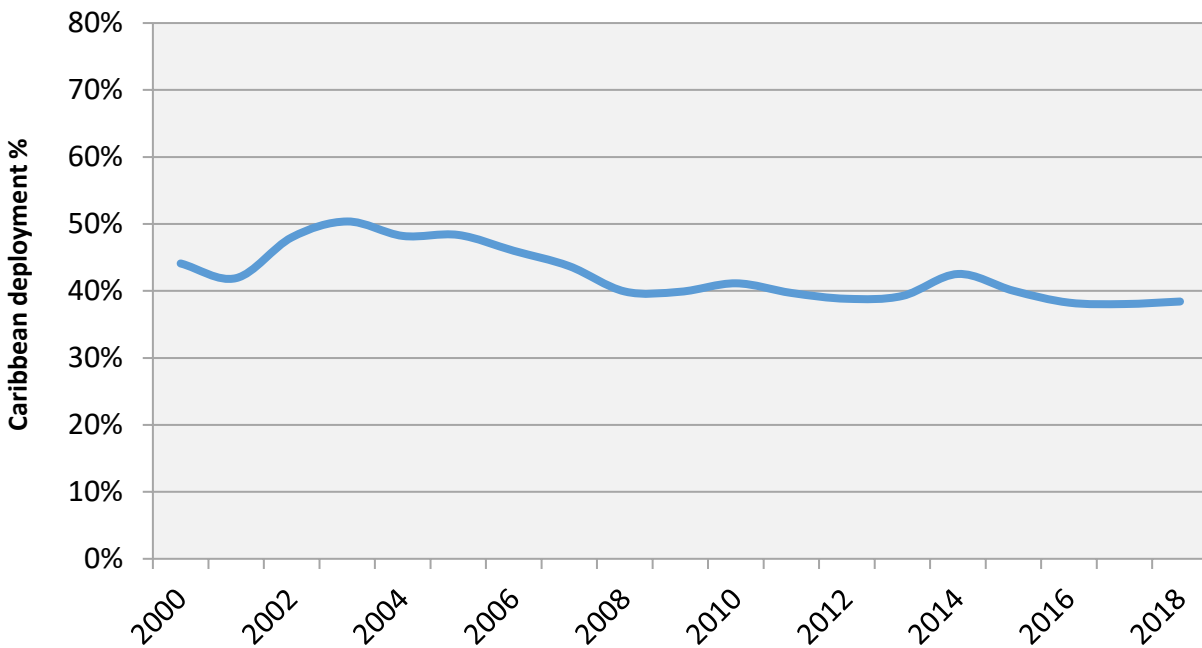
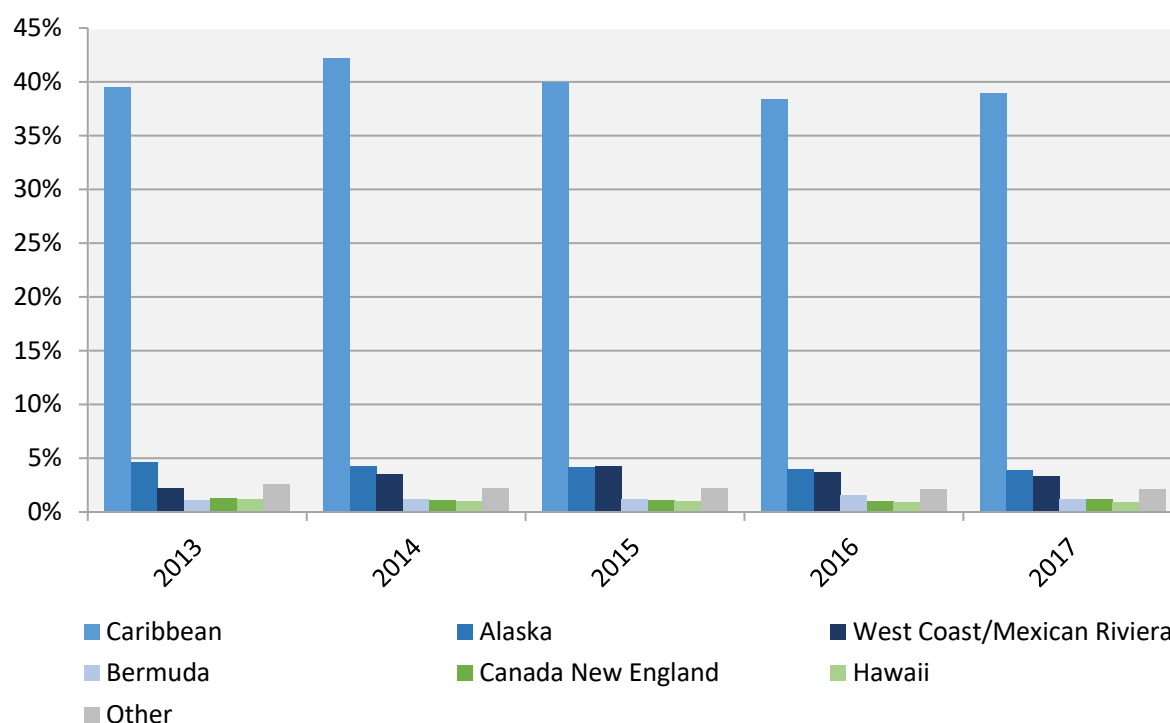


Figure 2.3.13: North American Sub-Regional Deployment Trends, 2013-2017*Source: Cruise Industry News*

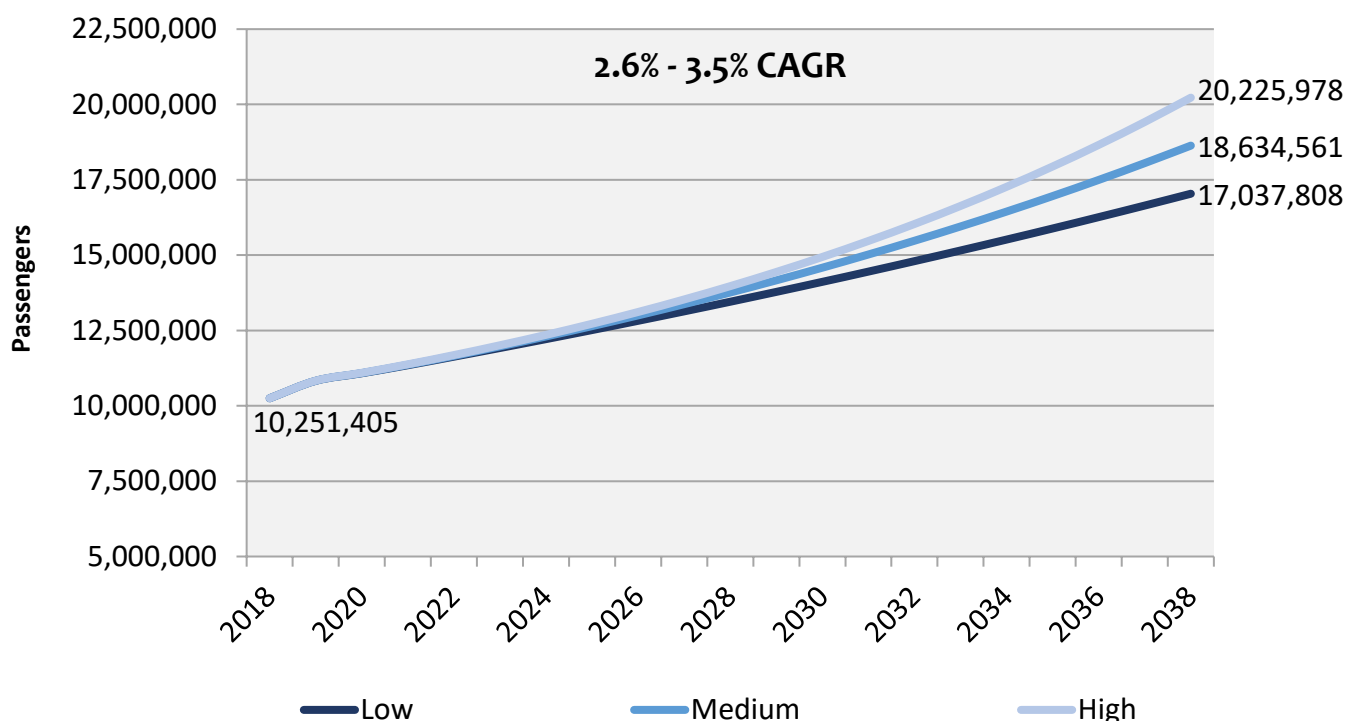
Going forward, while Asia/Pacific remains a priority market for most major global cruise brands, there is sufficient newbuild capacity in the orderbook to support simultaneous growth in multiple markets during the coming several years and beyond. B&A believes that all current signs point toward aggressive near- to mid-term capacity expansion in the Caribbean market, particularly if no additional barriers to accessing Cuba as a still-emerging and highly-desirable cruise destination arise, as well as the renovation of Nassau, Grand Cayman and other downstream ports and private islands currently under construction.

Figure 2.3.14 shows the range of projected growth in cruise passengers for the Caribbean (including Bahamas) market between 2018 and 2038. B&A has used past trends within the region as well as forward-looking trends such as increased world cruise berth capacity spurred by newbuilds and new brands, private island development and the opening of Cuba to estimate potential future capture levels based on cruise offerings which make up the identified key patterns feeding cruise passengers to the region and Port Everglades in the future. B&A has also estimated a capture rate for North American cruise passengers based on historical analysis

and future assumptions for growth in the context of overall worldwide growth projections and competitive factors in the Caribbean and other regions.

Figure 2.3.14: Caribbean Cruise Market Projections, 2018-2038

Source: B&A



The low, medium and high projections shown in Figure 2.3.14 are not intended to represent specific alternative scenarios per se, but rather to define the range of potential future growth for the Caribbean market overall. Future growth in the region will occur within the range defined by the low and high projections, with the medium projection reflecting the most likely growth trend during the next 20-year timeframe.

B&A's general assumption is that the Caribbean will remain a stable and desirable base for cruise operations with some degree of year-to-year fluctuation and variance from the overall trend occurring as a result of natural business cycles related to global geopolitics, macroeconomic conditions, regulatory policies, hurricanes and continuously evolving industry trends, opportunities and consumer preferences.

2.3.9 Caribbean and Bahamas Growth Factors

The major factors that control growth and capacity with the Caribbean and Bahamian market segments are:

- The Bahamas is one of the geographically closest markets to the U.S., making it very attractive to cruise lines as they try to limit fuel consumption to reduce costs
- Operators' continuing trend toward U.S. homeports that can reach and drive consumer market/demand
- Operators have a harder time reaching the lower Caribbean/Central America cruise region due to the lack of proper air links into the region and the high demand for drive-in cruises in the Gulf, Florida and East Coast
- Carnival (Corporation) controls the majority of all beds in the region
- NCL focusing on U.S. market – expanding presence and Caribbean foothold focus
- RCI moving small ships in favor of larger ships with higher international passenger mix (50 percent)
- Lower ticket pricing has been seen in the Southern Caribbean due to residual hurricane issues; this will drive more deployment to Florida ports in the short-term
- Key North American brands are reducing newbuild capacity in secondary regional homeports serving the Caribbean region; they are also continuing to modify sailing durations (i.e. 3-5 days) with a shift to key passenger source homeports (Port Everglades, PortMiami, Port Canaveral); average cruise length is 6.1 days in the region
- Absorption of new brands into the Caribbean market (i.e. MSC, Virgin, etc.) may impact key financials of the large legacy brands
- There are very few geopolitical factors – minimal with Cuba change – and they are generally limited to island, regional issues
- Hurricane events impact deployments, depending on the year and location within the region; shift of vessels dependent upon the scale of the issue and location away from the affected zone; secondary shift out

- of region to safe harbor zones in North America as warranted (i.e. Bermuda, CNE)
- Overcrowding and environmental factors have not been identified in the region as impacting deployments, at least not yet
 - Brands can shift to alternative ports or berth at their private islands to provide relief
 - Doubling regional capacity in the next 15 years will require the following:
 - Berth demand to downstream ports will most like increase by 50 percent
 - Ports will need to redevelop to allow Oasis-class plus vessels
 - New ports in closer proximity to Florida are needed
 - New homeports in the Western and Southern Caribbean will evolve for European brands

Other Caribbean and Bahamas market observations include:

- Potential for growth of shorter cruises to Bahamas/Caribbean/Private Island combinations from the key homeport in Florida
 - Example – the deployment of Majesty of the Seas to Port Everglades operating short sailings
- Poor Bahamas infrastructure and services impacting passenger and cruise brand deployments
 - Planned renovation of the current berth configuration and downtown core in Nassau will provide for needed downstream capacity
 - Cruise operators are continuing a trend toward U.S. and key Caribbean homeports to reach drive-in consumer market (unlimited market supply)
- Cuba provides for increased port and itinerary options
 - This island is within a good itinerary pattern sphere to service a variety of patterns from South Florida ports

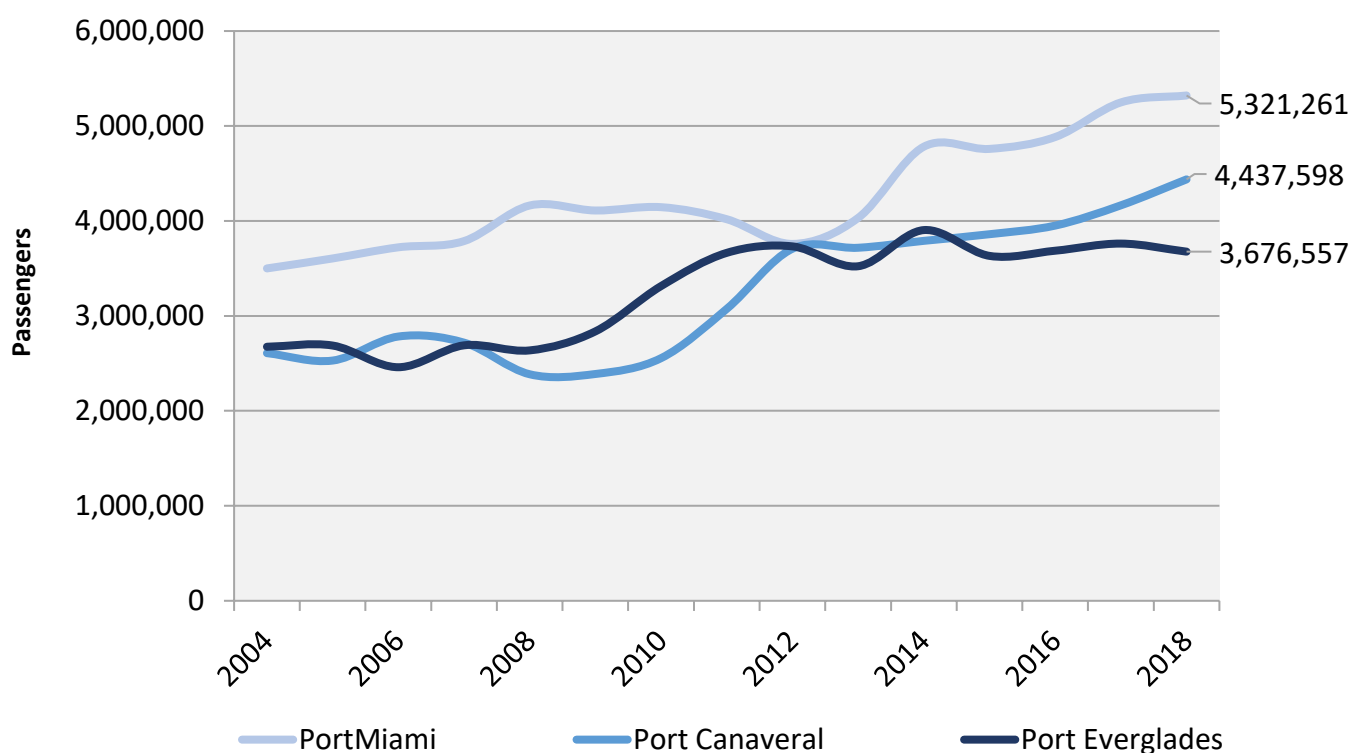
2.3.10 Competitor Ports within the Region

Port Everglades' primary competitors are Port *Miami* and Port Canaveral. Each of these competitor ports taps into the same primary core consumer target markets, national drive/fly market and international traffic and has the ability to deliver downstream Caribbean cruise products. Secondary competitors include Port

Tampa Bay and JAXPORT. At present neither of the two latter ports has the ability to homeport the large cruise vessels in the world fleets due to air draft issues at each port (bridge and power lines). For continued growth to occur at Port Everglades it is likely that traffic will need to increase due to a balancing of berthing by the cruise lines with the primary competitor ports. International cruise operator growth and further expansion of Port facilities to accommodate the volumes and sizes of vessels required over the projection period are also critical competitive issues.

Figure 2.3.15: Competitor Port Passenger Throughput, 2004-2018⁶

Source: B&A



Port Everglades, PortMiami and Port Canaveral provide for a very large share of Caribbean cruise traffic. PortMiami has done a good job of negotiating cruise infrastructure contracts limiting participation by other ports for MSC Cruises traffic. Port Canaveral and Port Everglades have also contributed to berth/terminal supply with new infrastructure. However, traffic has stagnated at Port Everglades with 10-year growth averaging 3.4 percent while growth during the past five years has only

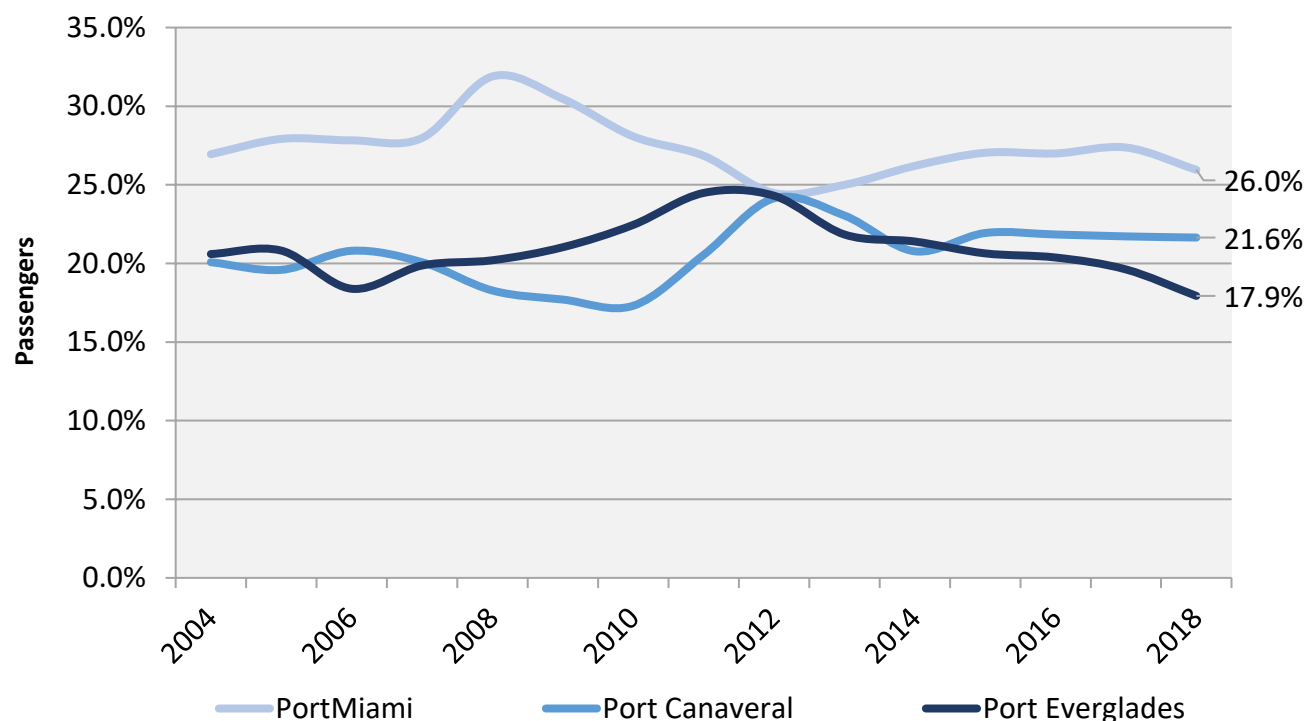
⁶ Does not include daily cruise passengers.

averaged 0.9 percent per year. By comparison, cruise passenger growth for PortMiami averaged 2.5 percent during the past 10 years and 5.7 percent since 2014 while Port Canaveral saw 6.4 percent average annual growth during the past 10 years and 3.6 percent growth during the past five years. Port Canaveral's growth is mainly the result of growth in homeport activity but Canaveral is also receiving additional Southbound POCs, primarily from NY/NJ. See Figure 2.3.15.

Caribbean cruise traffic market shares (multiday passengers only) are presented in Figure 2.3.16. In 2012 all three of the major Florida cruise ports were within 0.4 percentage points of each other in terms of market share. That has since changed.

Figure 2.3.16: Competitor Port Market Share, 2004-2018

Source: B&A



Port Everglades' Caribbean market share has dropped 6.4 percent since 2014 (-27,996 passengers) while Port Canaveral has added approximately 365,000 passengers and PortMiami has jumped 781,596 passengers during the same period. Factors contributing to this redistribution of market share among Florida's main cruise homeports include:

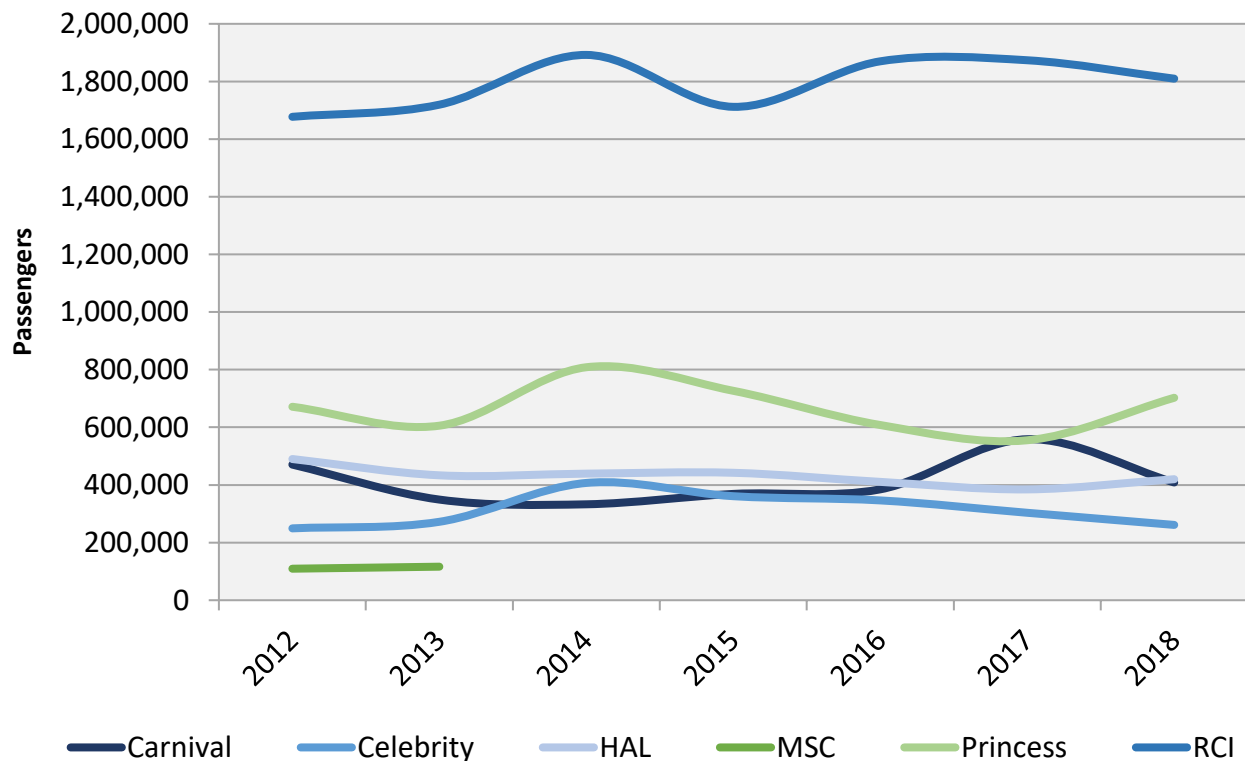
- Introduction of key new cruise operations to Port *Miami* including NCL, RCI, Disney Cruise Line, AIDA and MSC vessels
- Minimal changes in the fleet status for Port Everglades over the period and a shift of some larger vessels from Port Everglades to other regions and ports (i.e. MSC)

Figure 2.3.17 illustrates the changes in the largest cruise operators for Port Everglades from 2012-2018. The CAGR over the seven year period for the brands that contributed more than 90 percent of the traffic to the port are as follows:

- CCL (-2.0 percent)
- Celebrity Cruises (0.7 percent)
- HAL (-2.2 percent)
- MSC (loss of all traffic)
- Princess (0.6 percent)
- RCI (1.1 percent)

Figure 2.3.17: Port Everglades' Largest Cruise Operators' Passenger Throughput, 2012-2018

Source: B&A



Clearly, six years is a long time for the port to have such limited growth with its key brands considering the rate at which worldwide, regional and competitor port volumes have grown during the same timeframe. This stunted performance is directly connected to the port's key brands moving vessels elsewhere in pursuit of better opportunities. The specific rationale for deploying vessels more aggressively at Port Everglades' major competitor ports – Port *Miami* and Port Canaveral – likely varies from near-term financial considerations to long-term strategic operational and deployment considerations. Specific to Port *Miami*, this latter factor could be the result of a perceived lack of ability to develop new cruise berth/terminal infrastructure at Port Everglades to support mid- to long-term deployment plans and revenue growth goals. Based on stakeholder feedback there are also subtle market preferences between Port *Miami* and Port Everglades related to the draw of Miami for international travelers and airline offerings for international/domestic cities.

2.3.11 Port Everglades Cruise Operations and Historical Activity

In FY2017 nearly 3.8 million conventional cruise passengers sailed on 588 cruises from Port Everglades on 47 different vessels representing 12 cruise brands. Compared to its nearest competitor port, Port *Miami*, Port Everglades offers a greater variety of sailings due to its many cruise brands (i.e. luxury to budget), itinerary variations (i.e. daily to 120-day sailings), vessel types (i.e. *Jaume I* to *Allure of the Seas*) and other factors. However, Port *Miami* has experienced growth from brands such as Oceania, Seabourn and Azamara, as well as AIDA, MSC and Disney Cruise Line in the past few years. Port Miami now also offers a ferry service to Bimini via FRS Caribbean onboard the HSC San Gwann – a high-speed 400-passenger catamaran.

Port Everglades' multiday cruise passenger throughput peaked in 2014 at approximately 3.9 million passengers. Since then, traffic has decreased to less than 3.7 million (FY2018 estimate). Port Everglades has also seen a slight decrease in multiday cruise vessel sailings with larger vessels deployed to the port and a decline in sailings from 644 in FY2014 to 581 in FY2018. In FY2019, with the deployment of *Majesty of the Seas* on short sailings from Port Everglades the number of sailings is expected to increase to 690.

Daily ferry traffic will be at approximately 133,000 on 295 sailings by the end of FY2018. This reflects a 7.9 percent CAGR from 2013.

The major focus of cruise operations at Port Everglades is homeport logistics. This can be defined as the ability to move passengers efficiently and effectively between the vessel and shore and through a ground transportation area (GTA) that offers the safe and practical marshaling of multiple transportation elements, for movement to the airport, local hotels, or home via highway. The port does also get some level of port-of-call visits (62,393 passengers in FY2018) for which the focus is ensuring a high level of satisfaction for independent cruise visitors and crew to spend a limited amount of time in the Fort Lauderdale and surrounding communities. Port of call activity is relatively insignificant compared to the volume of homeport passengers handled however.

Port Everglades assets include an accessible international airport with expanding domestic and international services and the ability to work with the County and Convention and Visitors Bureau (CVB) to develop long-term complementary tourism products. Specific strengths include:

- **Access to regional consumers**

Port Everglades and South Florida in general offer a strong regional base of consumers for cruise operations, both for daily and multiday sailings

- **High quality tourism infrastructure and tourist offering**

Broward, Miami-Dade, and Palm Beach Counties are well known for their ability to accommodate visitors to the region through a variety of quality tourism infrastructure, comprising airports, hotels, retail venues, and other entertainment facilities, all within proximity to Port Everglades via major roadways

- **Deepwater marine access**

Port Everglades provides an entry channel able to accommodate the largest cruise vessels currently operating and those planned for future deployment to the region overall. The short distance from pier to international waters is also of great benefit to cruise lines, allowing for

lower expenses and additional flexibility in speed and distance issues involving itinerary planning.

- **Number and length of cruise berths**

At present, Port Everglades provides seven berths of approximately 1,000 feet in length, with the upland terminal facilities to support vessels with more than 6,000 passengers. The ability to support future vessels is an important factor in Port Everglades' growth over the long term both in terms of capacity and infrastructure.

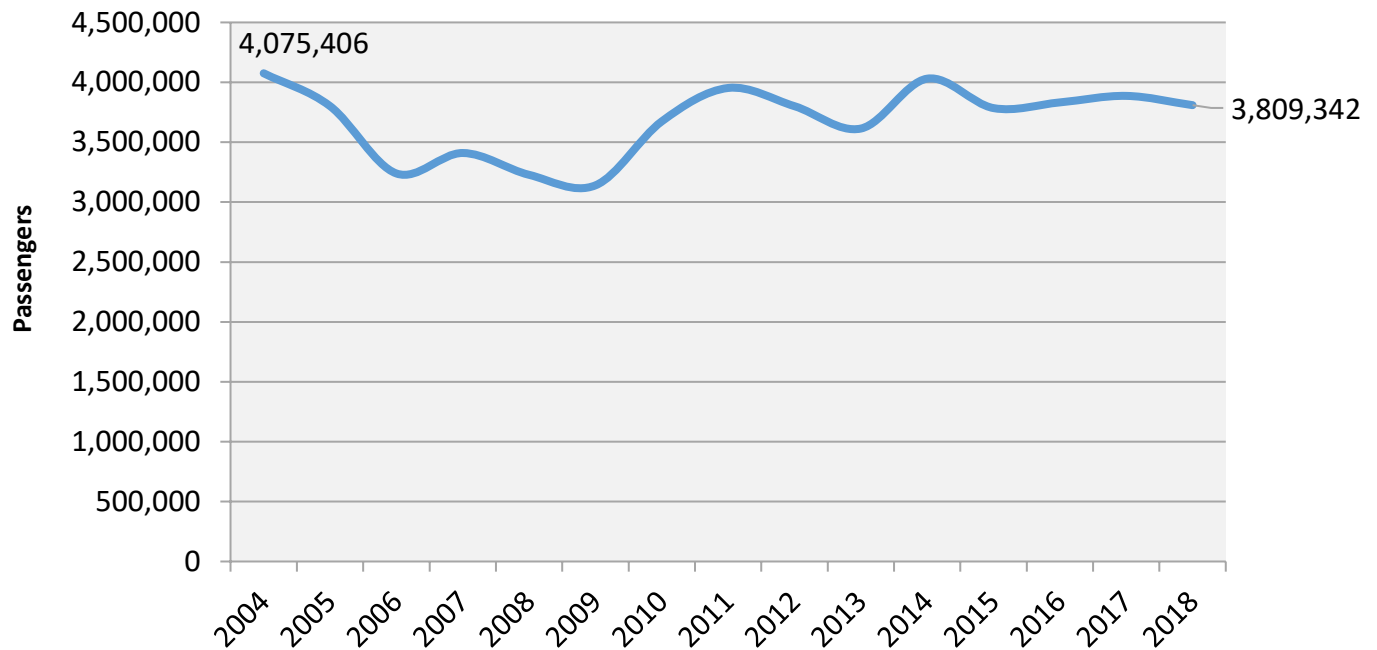
Based on stakeholder feedback there are several operational elements at Port Everglades that call for continued development and improvement. Ingress and egress issues impacting cruise operations and parking are one of the most important challenges. About 50 percent of Port Everglades' cruise passengers arrive by aircraft with the remaining 50 percent driving in. Both means of arrival generate substantial numbers of private vehicles as well as shuttles/vans, Uber/Lyft transfers from FLL, MIA and PBI airports, surrounding hotels, etc. Large numbers of coaches, taxis, limousines, service vehicles, employee vehicles, provisioning trucks, and others also enter and exit Port Everglades on peak cruise days. The port's ability to efficiently and effectively allow for expeditious movement of these vehicles, while maintaining security requirements is a key to future growth. Additionally, the ability for the terminal GTAs and parking areas to accommodate increased numbers of passengers will also be a factor in the port's success. Key input and discussion includes the following:

- Ease flow into Port Everglades via security entry gates. Removal of the security gate barriers and refinement of security processes Portwide – including moving the primary security for cruise operations from the gate to the terminal entrance – should be seriously evaluated. On peak days 2.5 hour delays are being reported by cruise stakeholders though Port data suggest a maximum delay of 45 minutes on “full-house” days.
- Provide staging areas for service and provisioning vehicles within the port area so they are not stretched along the inbound roadways on peak days.
- Review the GTAs of the terminals to address separation of traffic. Uber/Lyft “rideshares” have created an added issue in the area and need to be better controlled.

- Meld together Port (cruise) and FLL operations to better service cruise passengers inbound and outbound. This may include linkages to the airport as part of an intermodal system for movement of baggage and passengers as well as remote check-in processes at the airport/intermodal center. Post-cruise options for baggage storage, shuttles to the downtown core, retail areas, etc. prior to flights (particularly on the international routes) would also add value and improve the guest experience while potentially generating additional in-destination expenditures.
- Revise crew facilities in the terminals.
- Provide flexibility for security zones at the port and terminals to allow for increased passenger numbers.
- Port traffic congestion on peak days (Friday-Monday) during the high Caribbean (i.e. Winter) season needs to be reviewed.
- Additional staff parking is needed adjacent to terminals.
- Improve the capability of Port Everglades terminals to receive the world's largest cruise vessels. Port Everglades already has the capability to accommodate large cruise vessels at certain terminals. Based on the cruise vessel newbuild orderbook, cruise line trends, and stakeholder interviews, to be competitive in the region for homeport operations, it is imperative that Port Everglades further develop the capability to serve as a homeport for the next generation of cruise vessel to allow for increased LOA and passenger capacity.
- Overall traffic flow, congestion, and parking on peak days need to be reviewed.
- Develop additional berthing areas for peak days of operation. Cruise lines deploy vessels based on consumers' vacation pattern demands, with weekend departures and returns to the homeport still the most common pattern. For Port Everglades, this means assembling the infrastructure capable of accommodating a large number of cruise vessels, passengers, vehicles, and services on peak weekend days and throughout the peak Winter season.
- Increasing berth occupancy from the current five year average of 20.6 percent is an important factor in using the existing berths to their full

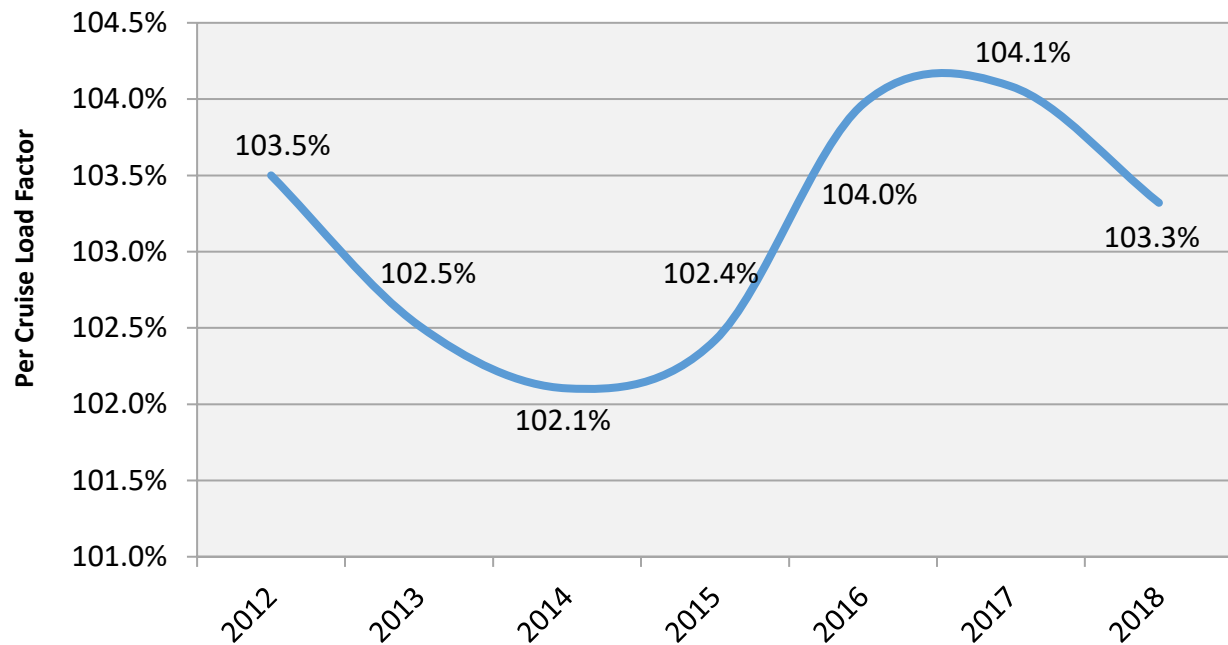
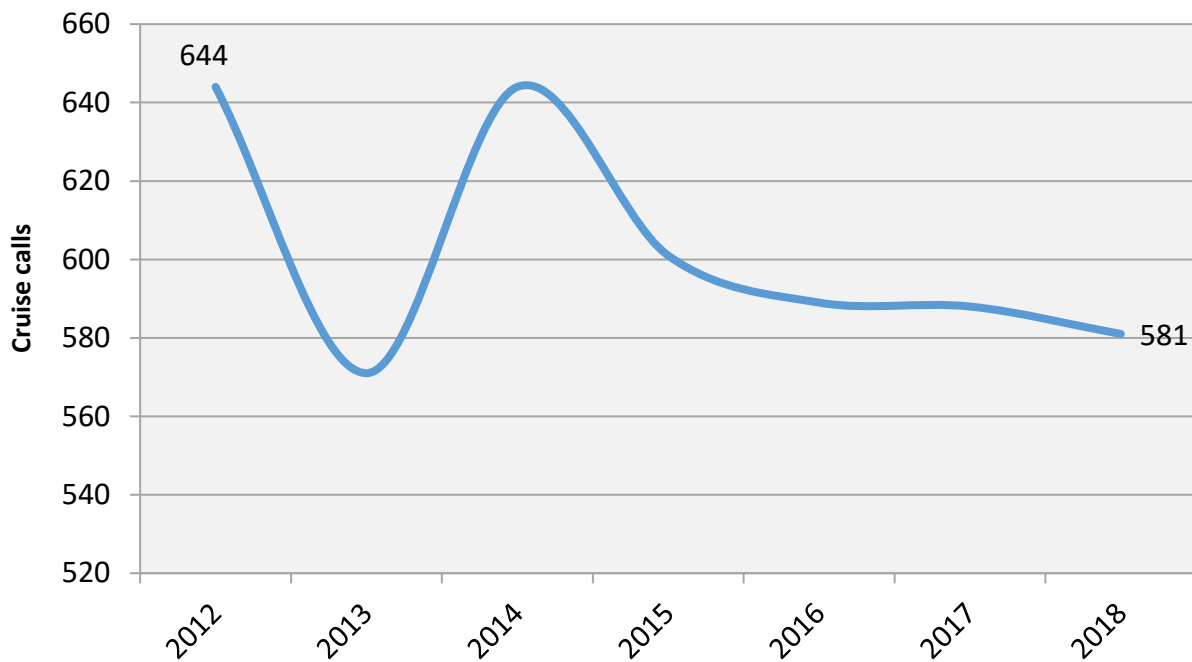
- potential. By comparison Port *Miami* is at a 34.4 percent occupancy rate and Port Canaveral is at 45.5 percent.
- Work with key cruise brands to continue the development of shorter cruise patterns during the peak season: 3/4-day and 5/5/4-day itinerary patterns in particular will help to increase berth utilization.
 - Promote additional off-peak Summer sailings with key cruise brands.
 - Create a multi-modal terminal complex and adjacent berths to allow for increased efficiencies and use, particularly in the Midport area (T19).
 - Either provide for a permanent solution to the Baleária ferry operation or discontinue the service. The company requires a facility to operate efficiently and allow for expansion and is willing to partner with the port. The opportunity is available in the market, but there may not be a physical facility at the port to accommodate Baleária once T1 is demolished.

Figure 2.3.18 shows cruise revenue passenger throughput since 2004 and includes both multiday and daily operations. Overall passenger throughput dropped specifically due to the downturn of daily non-conventional cruise activity from some 1.4 million passengers in 2004 to just 68,000 in 2012. Growth during the past 10 years has averaged 1.7 percent per year. Using revenue passengers as the basis for analysis helps to project and assemble the implications of volume changes for Port Everglades.

Figure 2.3.18: Cruise Revenue Passenger Throughput, 2004-2018*Source: B&A*

Based on overall passenger load, the average number of revenue passengers per vessel operation was 6,328 during the 15 year period. This is well above the same metric for PortMiami (5,077) and Port Canaveral (3,108) during the same period. Passenger load factors for Port Everglades have averaged 103.1 percent since 2012. This is a product of brand mix, cruise itinerary deployments and consumer demographics. For example, the contemporary brands offering traditional 7-night and shorter sailings from Port Everglades saw FY2017 load factors of 113.3 percent (Carnival) and 111.5 percent (RCI), while the HAL and Princess brands that are in the upper contemporary/premium range had load factors of 88.4 percent and 94.4 percent, respectively. The latter traditionally have 7-day plus sailings and cater to a more mature audience.

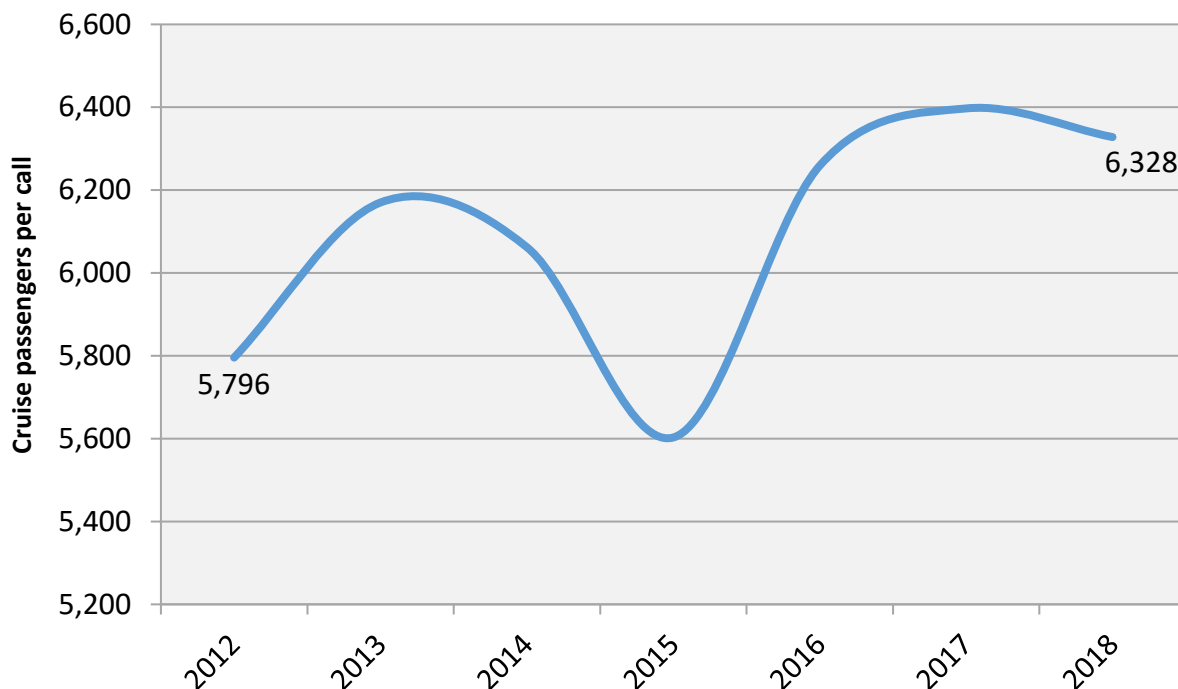
See Figure 2.3.19 and Figure 2.3.20 for corresponding vessel operations.

Figure 2.3.19: Multiday Cruise Passenger Loads, 2012-2018*Source: B&A***Figure 2.3.20: Multiday Cruise Vessel Operations (Calls), 2012-2018***Source: B&A*

The average revenue passenger load has increased since 2004 at Port Everglades. The average passenger count per sailing has grown from 5,796 to 6,328 passengers over the period. These patterns reflect what is happening in the industry more generally and are expected with the traffic mix at Port Everglades and the deployment patterns of the key cruise brands in the region.

Figure 2.3.21: Port Everglades Cruise Revenue Passengers per Call, 2012-2018

Source: B&A



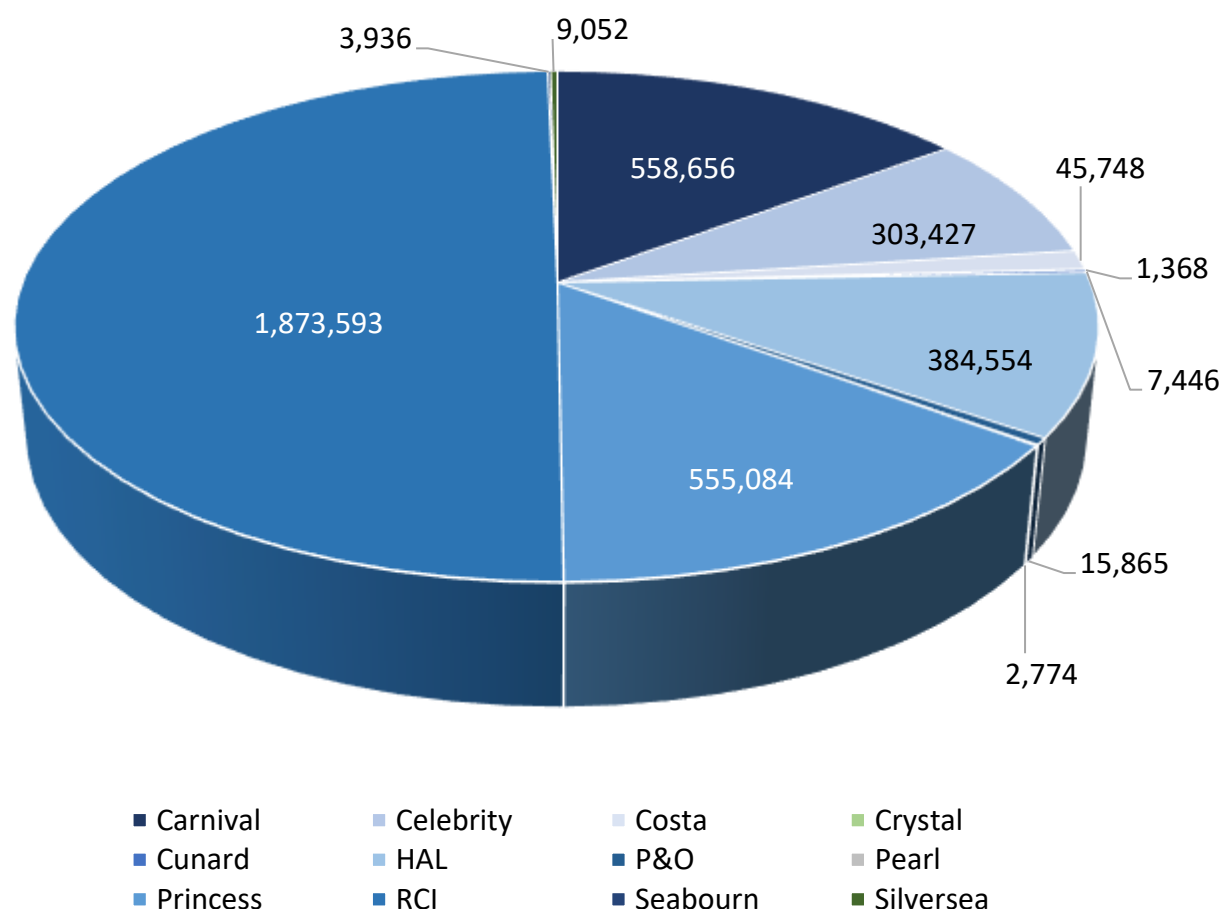
Cruise activity at Port Everglades is divided among a series of cruise lines with major brands providing the largest share of traffic. Two cruise corporations Carnival (41.8 percent) and RCCL (57.9 percent) account for 99.7 percent of the port's cruise traffic. See Figure 2.3.22.

Cruise facility utilization is another important factor in the development and revenue production of cruise facilities for ports. Seasonality, types and numbers of berths, contractual issues and other factors can determine the use rates for the major infrastructure needed to support cruise operations. Tables 2.3.5 and 2.3.6 provide the cruise-related berth/terminal utilization for Port Everglades from FY2012-FY2017 by call and passenger use. As shown, use is tied to berth preference by the major brands with contractual obligations at Port Everglades. The highest

terminal production is at cruise Terminal 18 (T18) and cruise Terminal 25 (T25), both of which are used mainly by RCCL brands (RCI and Celebrity), which have the highest overall call and passenger volumes at the port. Cruise Terminals 2 (T2), 19 (T19), 21 (T21) and 26 (T26, which are used mainly by Carnival brands (CCL, HAL, Princess) are in the second tier of utilization. Utilization goals per facility should be 500,000 revenue passengers each per year.

Figure 2.3.22: Cruise Passenger Throughput by Cruise Brand, 2017

Source: B&A



T4, T21, T26 and T29 should be able to produce higher revenue passenger volumes in the mid- to long-term. This may be accomplished through the revitalization of the facilities (i.e. larger terminals and berth LOA expansion), contractual modifications/additions with existing or new cruise operators or the closure of one or more of these facilities in favor of higher revenue-producing alternative uses in

the short-term with the option to revise the use long-term as the cruise industry requires additional berths at Port Everglades.

Table 2.3.5: Berth/Terminal Utilization by Year (Calls), 2012-2017

Source: B&A

Terminal	2012	2013	2014	2015	2016	2017
1	0	0	0	0	0	1
2	75	81	121	100	91	80
4	46	75	36	28	64	23
18	121	122	130	138	145	146
19	50	63	76	59	57	96
21	105	67	101	84	70	64
25	104	73	75	64	59	68
26	106	57	77	95	74	76
29	37	33	28	33	29	34
1	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%
2	11.6%	14.2%	18.8%	16.6%	15.4%	13.6%
4	7.1%	13.1%	5.6%	4.7%	10.9%	3.9%
18	18.8%	21.4%	20.2%	23.0%	24.6%	24.8%
19	7.8%	11.0%	11.8%	9.8%	9.7%	16.3%
21	16.3%	11.7%	15.7%	14.0%	11.9%	10.9%
25	16.1%	12.8%	11.6%	10.6%	10.0%	11.6%
26	16.5%	10.0%	12.0%	15.8%	12.6%	12.9%

Terminal	2012	2013	2014	2015	2016	2017
29	5.7%	5.8%	4.3%	5.5%	4.9%	5.8%

Table 2.3.6: Berth/Terminal Utilization by Year (Revenue PAX), 2012-2017*Source: B&A*

Terminal	2012	2013	2014	2015	2016	2017
1	0	0	0	0	0	272
2	395,820	452,822	694,775	568,408	516,862	442,640
4	214,845	276,572	146,641	123,993	319,561	108,000
18	1,338,087	1,346,609	1,348,796	1,322,428	1,473,314	1,506,624
19	222,927	353,055	411,228	316,493	301,088	571,330
21	395,899	242,302	372,651	299,335	238,813	208,783
25	603,084	465,449	499,918	429,947	416,014	413,402
26	352,068	199,257	225,347	355,968	220,381	256,840
29	209,679	187,058	204,624	215,534	200,469	253,612
1	0.0%	0.0%	0.0%	0.0%	0.0%	0.01%
2	10.6%	12.9%	17.8%	15.6%	14.0%	11.8%
4	5.8%	7.9%	3.8%	3.4%	8.7%	2.9%
18	35.9%	38.2%	34.5%	36.4%	40.0%	40.1%
19	6.0%	10.0%	10.5%	8.7%	8.2%	15.2%
21	10.6%	6.9%	9.5%	8.2%	6.5%	5.6%
25	16.2%	13.2%	12.8%	11.8%	11.3%	11.0%

Terminal	2012	2013	2014	2015	2016	2017
26	9.4%	5.7%	5.8%	9.8%	6.0%	6.8%
29	5.6%	5.3%	5.2%	5.9%	5.4%	6.7%

2.3.12 Cruise SWOT Analysis

The following SWOT analysis provides a look at the issues and opportunities faced by Port Everglades as the cruise industry looks to the region and to the port for future growth opportunities. The issues outlined change over time and in some cases overlap into different categories. However, each can be reviewed and approaches assembled to address each as part of a joint marketing, infrastructure and operations strategy.

For this exercise B&A has divided the strengths and weaknesses into categories. Based on our experience in assembling these assessments the information shown may be factual, based upon past and present experience or in some cases can be perceived based on second party input or lack of definitive information. A tourism brand and a strong marquee value are components of deployment that are key considerations for future development. Long term growth is inevitable for the industry, but they will require port partnerships to accomplish this growth. See Table 2.3.7.

Table 2.3.7: Port Everglades SWOT Assessment*Source: B&A*

Strengths	Weaknesses
<ul style="list-style-type: none"> • Access to SE regional drive market • Expanding domestic and international airport reach • Distance to major airport(s) – FLL, MIA and roadways (595/95) • Cooperative association with primary cruise corporations • South Florida tourism draw • Existing cruise facilities with 8 berths • Ease of access to Bahamas and Caribbean product via speed & distance inclusive of Cuba product 	<ul style="list-style-type: none"> • Lag in commitment to new berths for major brands • Security gate access for cruise operations on peak days • Two major corporations dominate traffic (99.7%) • Inside ECA zone • Preferential berth agreements limit flexibility for use (except T29 midweek)
<ul style="list-style-type: none"> • Cooperative effort to expand passenger services with airport / county convention and tourism center • New cruise facilities to accommodate key brands, larger vessels and continued deployment by industry • Cruise relationship building with re-energized cruise business approach • New cruise business options with key brands – NCL, MSC, Virgin, etc. 	<ul style="list-style-type: none"> • Continued cruise facility development by major port competitors with no PEV response • Local community impacts port growth options • Lack of expansion with new cruise brands • Stagnation of Caribbean region for NA market
Opportunities	Threats

Port Everglades can choose to work to ensure that infrastructure development coincides with industry growth and the assets are used to full potential. Joint tourism/Port/airport development of the hard and soft upland tourism infrastructure needed to propel growth forward is a broader master planning concept for the County and ultimately the entire tri-county region to contemplate as part of an intermodal transit system and tourism marketing opportunity. Each of the cruise projection models developed in the following pages requires work to build the cruise brand market for Port Everglades. At the same time, competing ports will also be working to build their brands and infrastructure to support growth. In the long-term, establishing a more diverse range of brands and volumes may provide a more stable cruise business environment while continuing to grow the primary corporate brands that have been excellent partners for the port over the past decade and beyond. Port Everglades has an opportunity to host several

other brands if there are peak day berths available for homeport operations during the Winter season.

2.3.13 Cruise Market Projections

This section examines the potential future cruise passenger and vessel throughput for Port Everglades and presents a set of future projections based on current knowledge of the region overall, cruise brand deployment characteristics, future newbuild trends, historical data collected during the assessment process and scenarios produced based on stakeholder input. From the berth demand assessment the required infrastructure (facilities, berths, GTAs, parking) required to support cruise operations for Port Everglades can be established over the long-term (through 2038). All projections presented are unconstrained in order to define Port Everglades' potential future market. Constraining factors will be documented and considered during Phase 2 of the 2018 Update.

These projections are used as the baseline to determine Port Everglades' future cruise demand. The cruise projections assess the current industry trends impacting future cruise passenger and vessel throughput for the port over a 20-year planning period (2019-2038) using 2018 as the baseline year. These cruise projections are based on an examination of Port Everglades' existing position in world and regional cruise deployments, levels and types of cruise operations, and overall traffic patterns based on the most probable range of passenger (first) and vessel (second) throughput. The assessment includes the growth analysis of the regional future trends for the Caribbean region as the primary influencer of cruise traffic at Port Everglades.

It is inherently difficult to project cruise line growth for a region or port beyond 3-5 years since for the most part cruise operators themselves rarely know their deployments outside of this time period due to external factors and market trends. To project out 20 years is especially challenging since numerous assumptions must be made. However, this exercise does provide a perspective of the potential market over the period should all of the fundamentals be maintained in the industry and region over the period. Current and anticipated contractual obligations also assist in defining the throughput potential of the port.

Multiday Cruise Projections

The projections that follow anticipate that the cruise industry will continue to follow fundamental positive trends; methods and various assumptions incorporate the best interpretation of demand and supply conditions in the marketplace. The projections that follow are also unconstrained in nature and do not take into account the potential berth capacity, utilization or other limiting factors of Port Everglades or downstream ports of call. There are several factors that have been considered in contemplating the projections. The projection models used include:

- Trend regression that is a basic test and is based upon past success
- Market capture based on past achievements in gaining market share in the primary Caribbean market (with varying types of itinerary patterns) that impact Port Everglades
- Growth scenario based on cruise line trends and opportunities

The latter approach – growth scenarios – are crucial for Port Everglades in assembling actionable opportunities associated with additional traffic growth in the short- to mid-term. The following items have been considered within the growth scenarios:

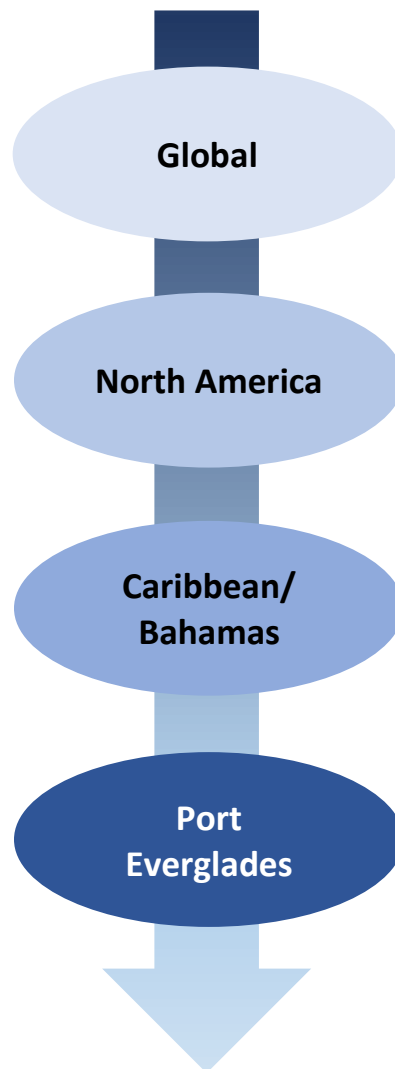
- Growth from smaller cruise vessels deployed in the short- to mid-term on shorter sailings (3/4-day, 5/5/4-day) allowing for more revenue passenger days and higher overall berth utilization
- Larger newbuild vessels moving to regional competitor ports, such as PortMiami, due to contractual obligations and new facility development
- Sea-change shift for a major cruise operator to allow for additional overall growth in the mid-term with a new facility/berths as a key anchor tenant
- Princess/HAL continuing to shift to larger vessels deployed in the mid- to long-term
- New and existing brand newbuild deployments that drive expansion opportunities for Port Everglades allowing for new business opportunities (mid- to long-term)

The B&A market capture methodology is shown in Figure 2.3.23 and summarized as follows:

- Understanding of global forecasts
- Market capture of North America/Europe/Asia (primarily for Port Everglades)
- Market share of key Caribbean market deployments (including Bahamas)
- Market share to Port Everglades
 - Homeport and port-of-call options
 - Expansion or contraction due to global position/competition

Figure 2.3.23: B&A Market Capture Methodology

Source: B&A



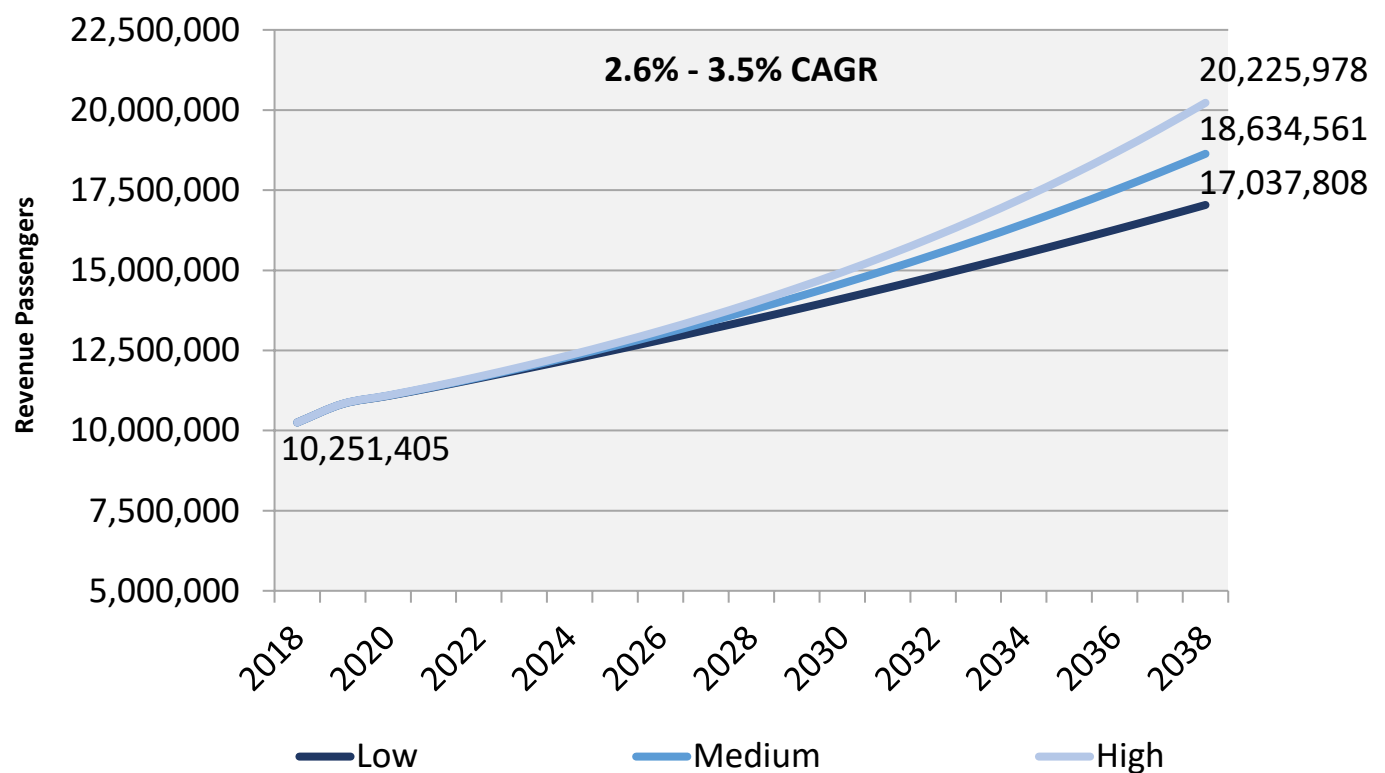
Other key projection factors include the following:

- Caribbean market growth (long-term)
- Competition and deployment splits
- North America (Southeast) and future Europe and Asia consumer desire
- Cruise duration (lower vs. higher mid- to long-term)
- Cruise season extension beyond peak seasonality into the Summer months

Figure 2.3.24 shows projected growth of the Caribbean (with Bahamas) cruise market between 2018 and 2038.

Figure 2.3.24: Caribbean Cruise Market Projections, 2018-2038

Source: B&A



B&A has used the past trends of the region to estimate future capture levels based on cruise offerings which make up the identified key patterns feeding cruise passengers to the region, particularly Port Everglades, into the future. Capture rates of overall cruise passengers are based on historical analysis and future

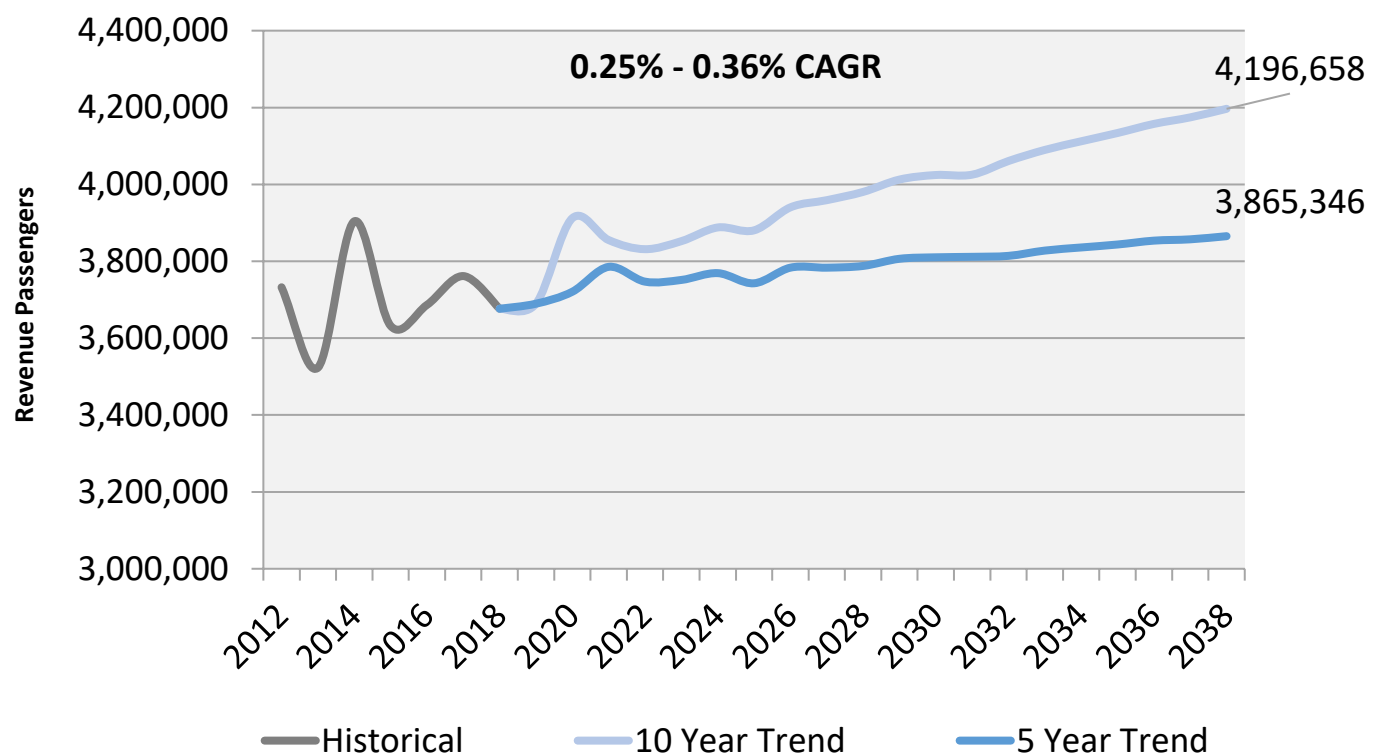
assumptions for growth considering worldwide and North American growth projections and impacts of other competitive regions.

Port Everglades Projection Methodology 1 – Historical Growth (Trend Regression)

Figure 2.3.25 shows the trend regression model based on historical events to project future throughput. This model is basic and used as a guideline. The annual growth based on a 10-year trend is 0.66 percent (CAGR) reaching just short of 4.2 million passengers in 2038 on 541 cruise vessel calls. Based on a one-year trend, growth is 0.25 percent (CAGR) with nearly 3.9 million passengers in 2038 on 498 cruise vessel calls. The trends are directly reflective of Port Everglades' cruise growth over the past 10 years, which has been relatively flat overall.

Figure 2.3.25: Historical Growth Trend Projection (Revenue PAX), 2012-2038

Source: B&A



Projection Methodology 2 – Market Capture

The market capture approach is based on Port Everglades' past track record for capturing a percentage of passengers in the Caribbean on a multitude of itinerary patterns. The historical cruise passenger capture rate over the past five years

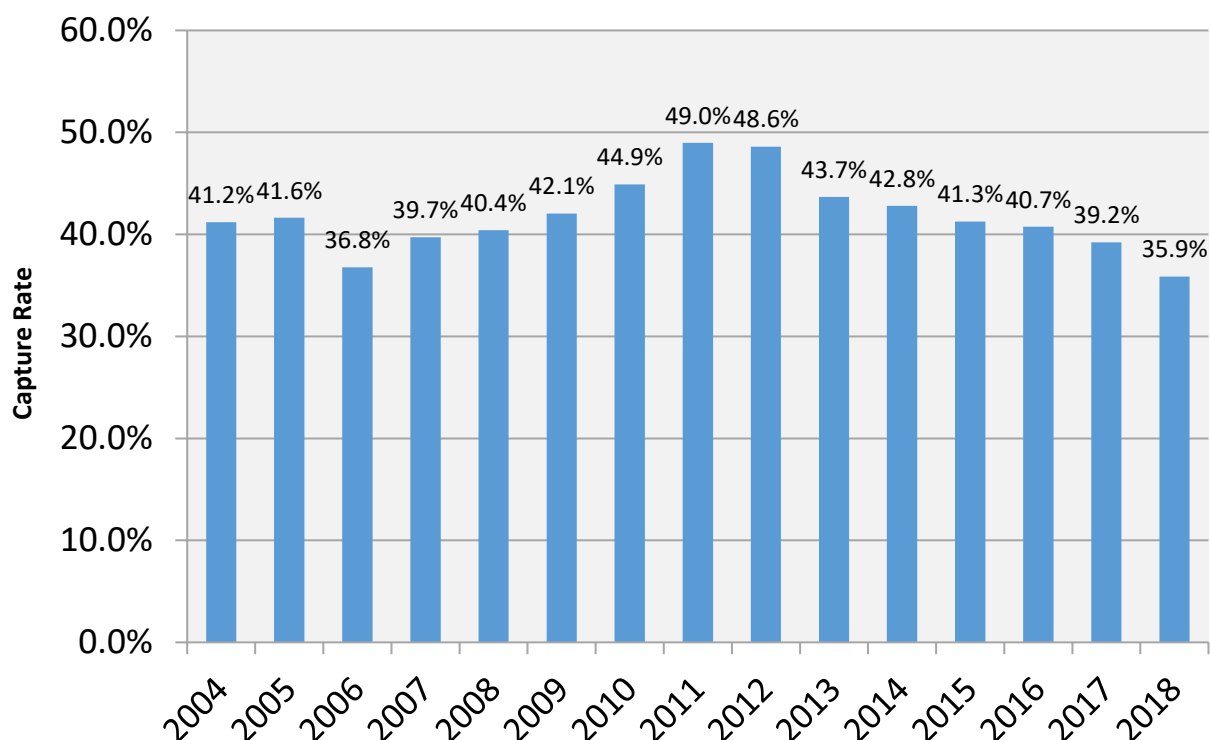
(2014-2018) is 40.0 percent of the overall market; the five year trend is 35.2 percent; and the growth trend over the 2004-2018 period was 43.3 percent.

Over this same period, Port Everglades has seen a continued transition to larger cruise ships and a steady flow of existing cruise brand deployments. Port Everglades has also invested in the extension of the T4 berth to accommodate larger ships, the enhancement of T2 for Princess Cruises' new Medallion systems and the current T25 gut renovation for Celebrity Cruises.

The infrastructure requirements to meet the expectations of the next generation of cruise ship, passenger and technology is continuing to move forward.

Figure 2.3.26: Port Everglades Market Capture Rates, 2004-2018

Source: B&A

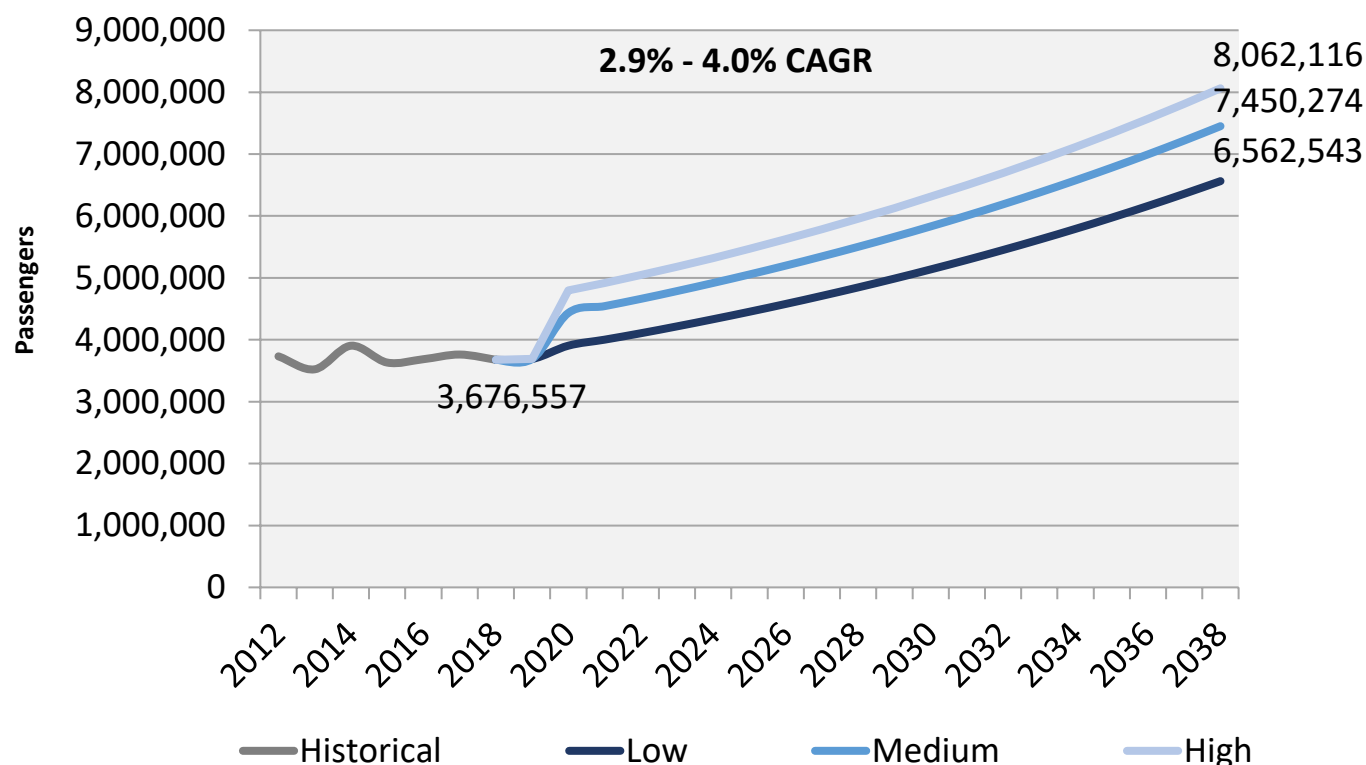


While this is a relatively high capture percentage it must be noted that both Port Canaveral and PortMiami compete for a large portion of the same market, but also tap into additional Caribbean/Bermuda traffic that increases their overall world market capture as well.

Into the long-term B&A projects a capture rate range between 35.2 percent and 43.3 percent for Port Everglades.

Figure 2.3.27: Market Capture Rate Projection (Revenue PAX), 2012-2038

Source: B&A



Based on the market capture model, Figure 2.3.27 shows the growth through 2038 to be from 6.5 million to 8.0 million cruise revenue passengers on 846-1,039 cruise calls. This model is unconstrained and would likely require additional cruise facilities over the long-term as the industry will not stop growing in the timeframe shown.

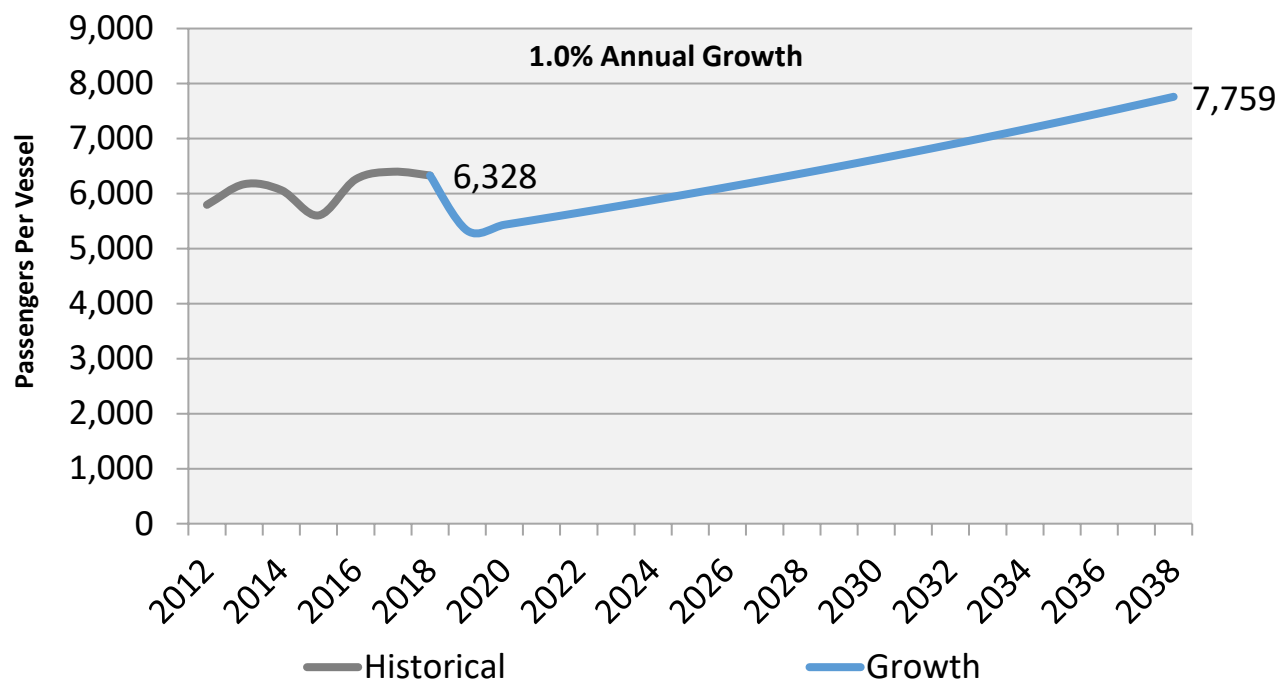
Projection Methodology 3 – Vessel Deployment Scenario

Under the standard models outlined, there is overall growth of cruise vessels and corresponding growth in passenger capacity per sailing. As shown in Figure 2.3.28, B&A projects passenger capacity per call to move from 6,328 in FY2018 to 7,759 revenue passengers by FY2038. This represents growth of 1.0 percent per year. The

drop in capacity from 2018 to 2019 is due to the deployment of *Majesty of the Seas* (2,356 lower berths), which will operate on short sailings with multiple calls next year. This pushes down the average overall size of vessels operating at Port Everglades in the initial year of the projection and so too impacts future growth. However, it appears this will likely be a trend for Port Everglades in the short- to mid-term due to new large vessel facilities being built in competing ports and the current mix of cruise operators at the port with smaller ships, such as HAL and Princess Cruises.

Figure 2.3.28: Cruise Vessel Capacity Growth Model, 2012-2038

Source: B&A



Under the vessel deployment scenario methodology, based on past trends of the cruise industry; Caribbean growth trends; and the push and pull factors relevant to the industry overall, marketplace assumptions have been made as to the deployment of cruise vessels to and from Port Everglades as a primary homeport and a small port-of-call destination into the long-term. This approach requires additional work on the part of Port Everglades, County and regional partners to attract cruise deployments and provide the platform for success (i.e. cruise infrastructure, efficient and stable operations, tourism attraction growth, etc.).

In the cruise industry, success breeds success. Thus, as one cruise line brand is successful with a cruise product in the region another will then look to also come into the marketplace and set up its product for its target consumer market. Additionally, an understanding of the competitive environment impacting Port Everglades and how the port can take advantage of opportunities must be considered. For example, the development of T18 for the Oasis-class did not just happen. Port Everglades developed a strategy and moved forward with RCCL to induce the development of T18 and the deployments that followed. The deployment scenarios modeled below illustrate levels of deployment to Port Everglades based on current and projected contractual throughput levels, the development of new downstream ports/berths in the market, North American and European deployment trends, ECA impacts, and the draw of new consumers to the Caribbean (i.e. from Asia) into the long-term. Consumer demographics are continuing to change allowing for new brands in the marketplace and the cruise operators are taking advantage of this development. Port Everglades needs to be prepared to support market growth in the sector over the mid- to long-term.

B&A has established the ship size and range of vessel calls for the scenarios based upon our interpretation of the potential growth of the region, seasonality, type of vessels that are likely to be deployed to the region and Port Everglades as well as historical context as relates to the types of itineraries in the region based on speed and distance issues and the current downstream development of Cuban and Bahamian destinations that will be frequented by different cruise brands. Scenario targets include primarily North American and European brands that could grow at Port Everglades. There are additional opportunities to get cruise traffic for repositioning sailings, etc., but since these are relatively minor cruise allocations they are not outlined specifically in the projections. Introduction of vessels in the short term is based on current contracts and likely scenarios. Mid- to long-term forecasts are based on success and continued positive trends inclusive of per diem and revenue generation from sailings at Port Everglades. The deployment scenarios are outlined in Table 2.3.9, including class and size of vessel, as an illustration.

Under this scenario the projection model for cruise passenger throughput rises to 8.6 million revenue passengers by 2038 on 1,597 calls. The passenger capacity per call averages 2,738 under this scenario, which drives a much higher cruise call total over the 20-year period. This trend toward more calls by smaller vessels is a

potential trend that could impact Port Everglades in the near-term given the movement of larger ships to Port *Miami* and Port Canaveral, among other ports and long-term financial/contractual commitments that will likely keep those large ships in those locations for many years. This trend could disadvantage Port Everglades if it plays out since a shift to smaller vessels would actually reduce berth utilization rather than increase it unless itineraries shorter than 7-days (i.e. 3/4 and 5/5/4) become the norm at Port Everglades.

Average annual growth is expected to be approximately 4.4 percent through 2038. These scenarios will require strategic planning to accomplish. See Figure 2.3.29.

Table 2.3.8: Homeport Growth Dominant Scenario

Source: B&A

Vessel Class	Sailing Pattern	Cruise Calls	Lower Berth Capacity	Year of Deployment
Dream	7	26	3,652	2022
Dream	7	52	3,652	2025
Dream	5 / 5 / 4	26	3,652	2028
XL	7	26	5,400	2021
XL	7	52	5,400	2026
XL	5 / 5 / 4	26	5,400	2030
Freedom	7	26	3,634	2023
Vision	5 / 5 / 4	104	2,730	2027
Solstice	7	26	2,850	2032
Edge	7	26	2,900	2024
Breakaway	7	26	4,200	2022
Breakaway	7	52	4,200	2029
D. Dream	3 / 4	26	4,000	2026
New Euro	7	13	3,250	2034

Vessel Class	Sailing Pattern	Cruise Calls	Lower Berth Capacity	Year of Deployment
New NA	7	26	3,250	2025
New NA	7	52	3,250	2031
Costa	7	26	3,800	2036
Grand	7+	52	3,600	2027
Coral	7+	52	2,600	2033
Signature	7+	26	2,660	2026
Signature	7+	52	2,660	2035

Figure 2.3.29: Homeport Dominant Scenario Projection (Revenue PAX), 2012-2038

Source: B&A

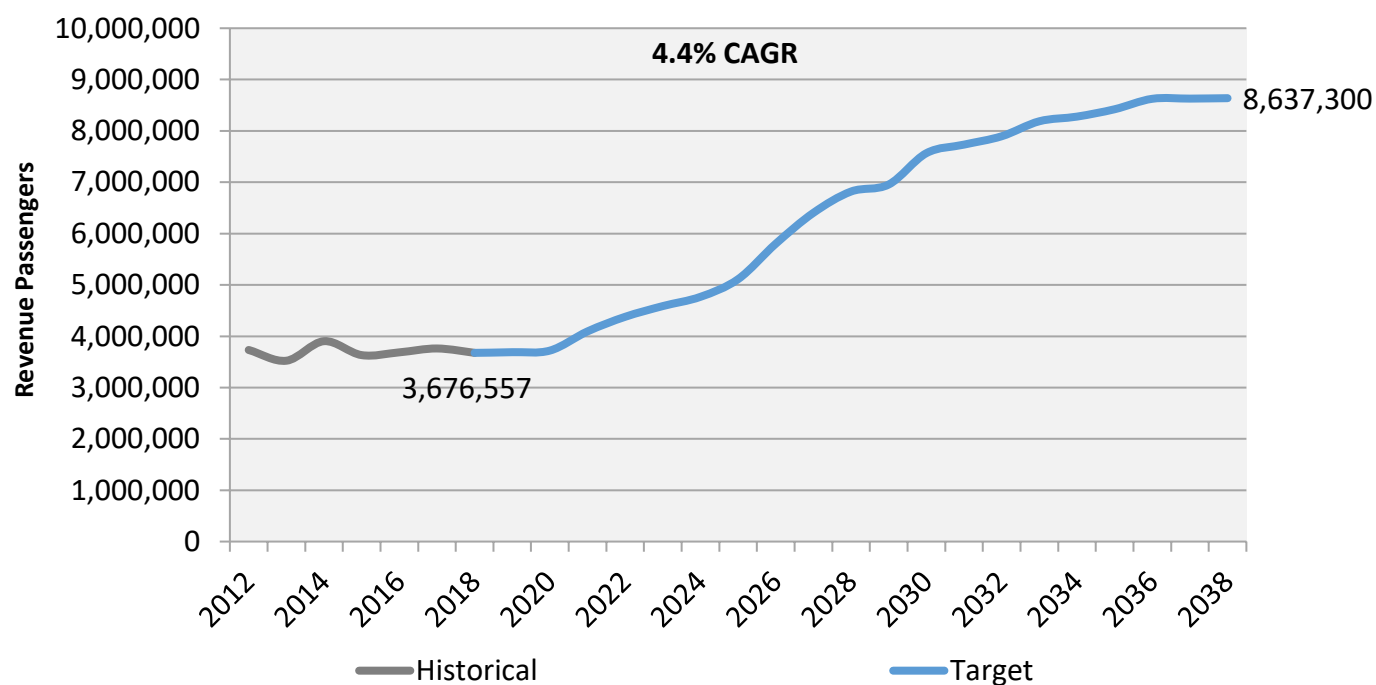


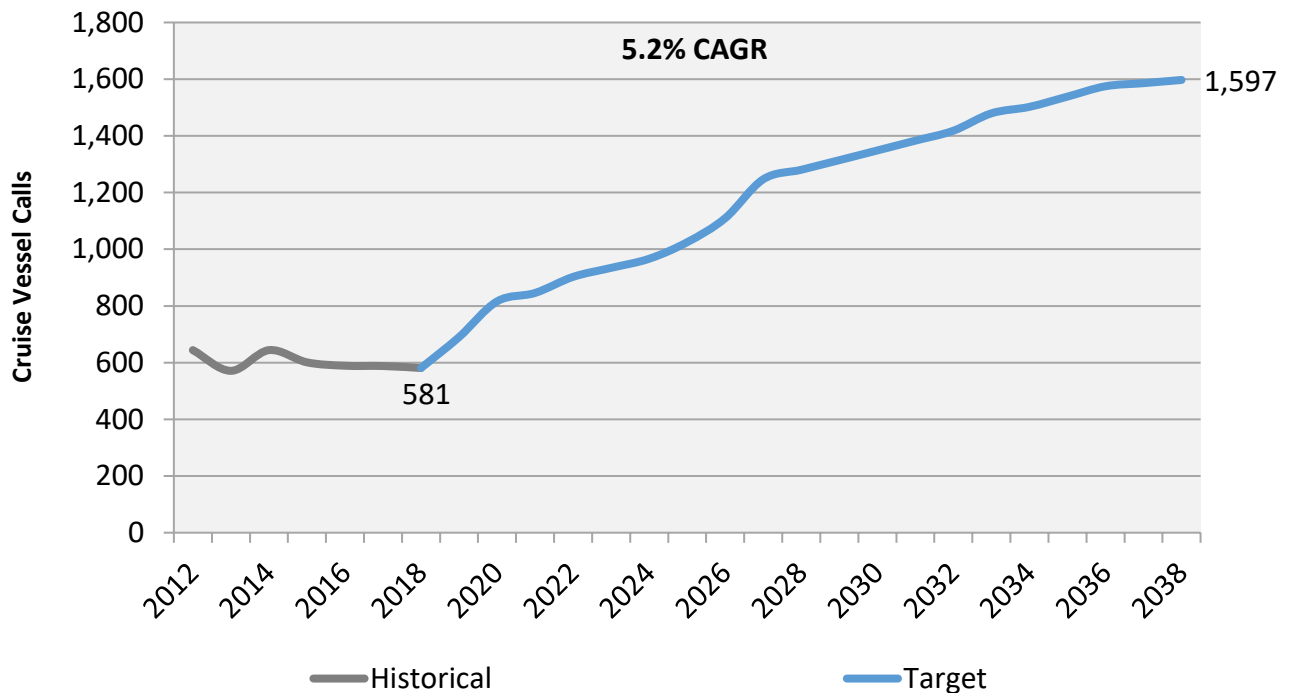
Figure 2.3.30: Homeport Dominant Scenario Projection (Calls), 2012-2038*Source: B&A*

Figure 2.3.30 illustrates the number of calls based on the revenue passenger volume presented in Figure 2.3.29. These calls would boost the overall berth utilization at Port Everglades over the long-term since they would include slightly smaller ships sailing on shorter patterns that would require weekday port calls in addition to weekend slots. The total number of calls is based upon the passenger projection divided by the projected number of passengers per vessel since the vessel calls (supply) are driven by the overall number of passengers in the market (demand).

Taking into account the results of each of the three methodologies, Figure 2.3.31 shows the expected low, medium and high projections, with the medium (most likely) projection growing at a rate of 3.4 percent (CAGR) during the 20-year forecast period to nearly 7.2 million revenue passengers in 2038.

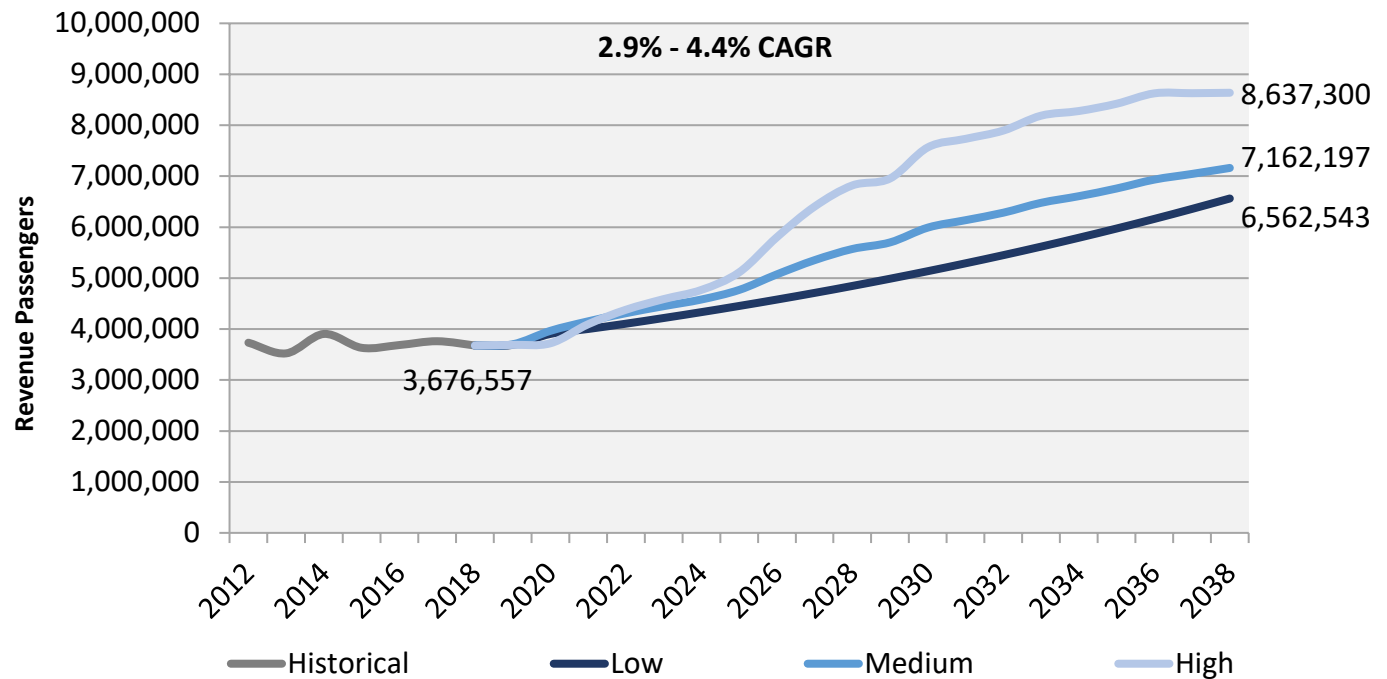
Figure 2.3.31: Range of Revenue Passenger Projections, 2012-2038*Source: B&A*

Figure 2.3.32 shows the range and most likely number of cruise vessel calls through 2038 based on the passenger capacity per call projection. As shown, cruise vessel calls are expected to grow from 581 to between 846 and 1,597 by 2038. The change in ship size is based on a shift in large vessel deployments in the competing homeports and the historical and projected brand deployments at Port Everglades.

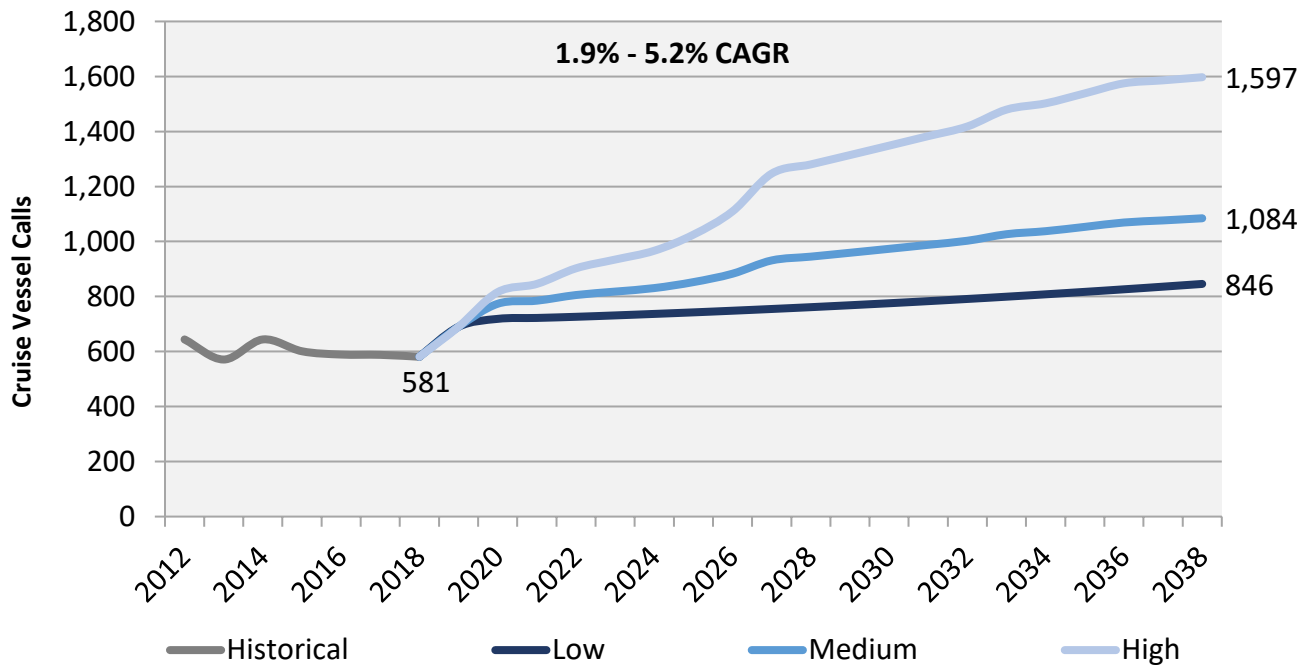
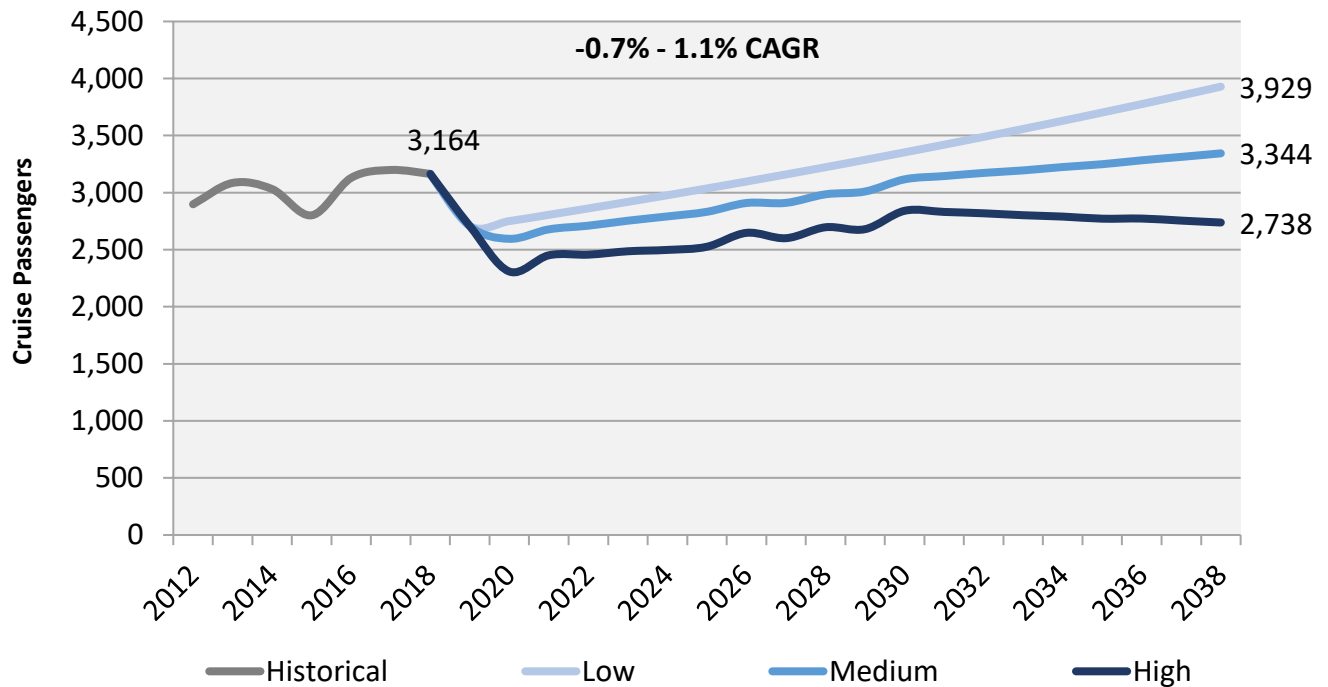
Figure 2.3.32: Range of Cruise Vessel Call Projections, 2012-2038*Source: B&A***Figure 2.3.33: Range of Expected Cruise Passengers per Call, 2012-2038***Source: B&A*

Figure 2.3.33 shows the range of actual cruise passengers per sailing tied to the overall acceleration of cruise calls at Port Everglades. As shown, the range is from 2,738-3,929 passengers by 2038.

Multiday projection conclusions are as follows:

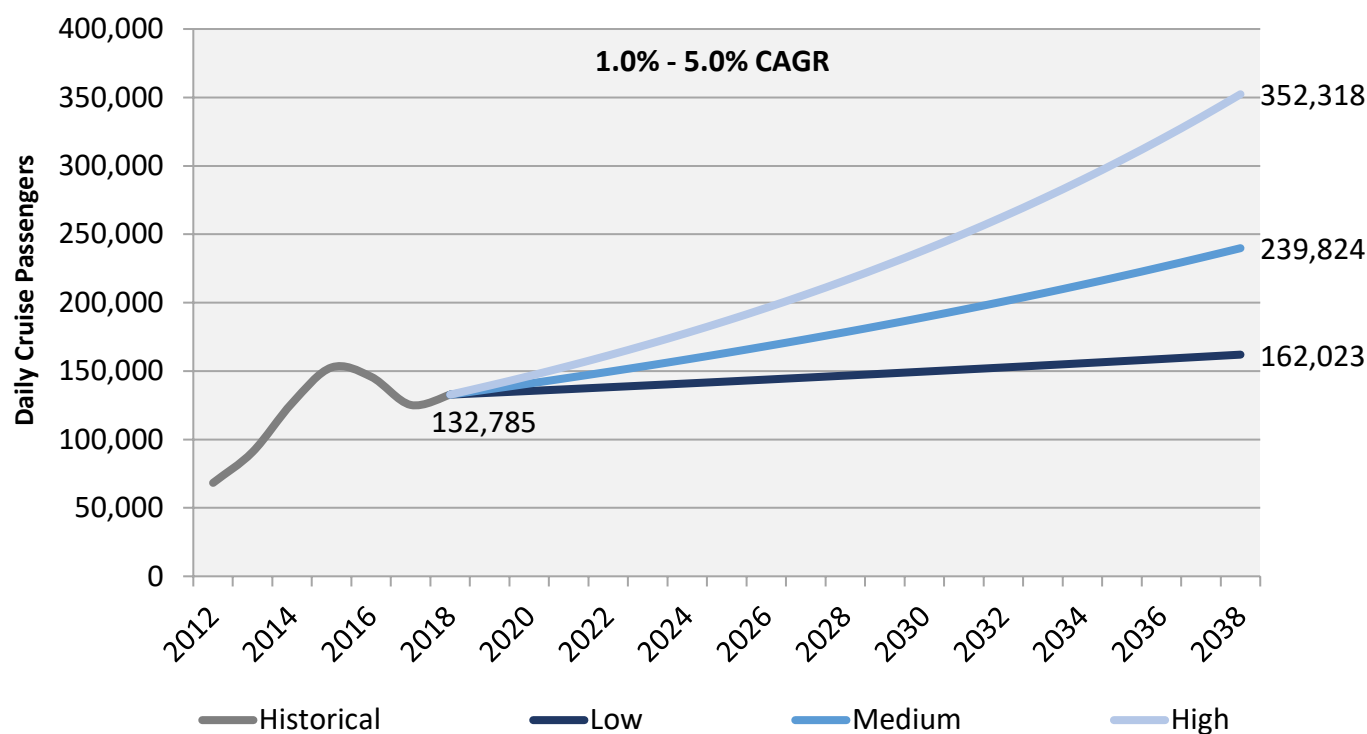
- Growth will occur in a non-linear fashion as vessels are deployed to the peak weekend days (homeports) and new patterns with smaller vessels (short-to mid-term) and larger ships (long-term) are deployed on shorter patterns to take advantage of Bahamas/Cuba growth
- Growth is likely to be generated by a combination of new and upgraded deployments; understanding the competitive realm in the region for homeport operations and working 3-5 years out will be critical over the next two years due to the extensive existing newbuild orderbook
- New traffic is possible from both the current primary cruise operators (i.e. Carnival, RCCL) and new lines from both North America and Europe; mid-term (NCLH, new brands); long-term (Asian lines)
- Cruise infrastructure, both within the port (i.e. berths, terminals, gangways, GTAs and access points) as well as transportation hubs (intermodal) and tourism infrastructure must keep pace with industry growth for Port Everglades to be successful

Daily Cruise/Ferry Operations

Port Everglades' daily cruise/ferry passengers through 2038 have potential to grow and are projected to reach between 162,023 and 352,318 passengers per year on 242-527 calls with a per sailing occupancy of 669 passengers (2 percent CAGR).

Baleária is positioned to capture the potential ferry market in the region from Port Everglades. Based on stakeholder interviews with this operator their business goal is to achieve some 550,000 passengers per year. Once the current T1 facility is no longer available, however, it will be difficult to sustain an effective operation at Port Everglades due to the continuous movement of the vessel to different berths, subject to availability.

For the current operator to be successful in building a sustainable business at Port Everglades a dedicated facility is required to meet the projection expectations outlined by the operator and as shown in Figure 2.3.34.

Figure 2.3.34: Range of Daily Cruise/Ferry Passenger Projections, 2012-2038*Source: B&A*

2.3.14 Port Everglades Design Vessels

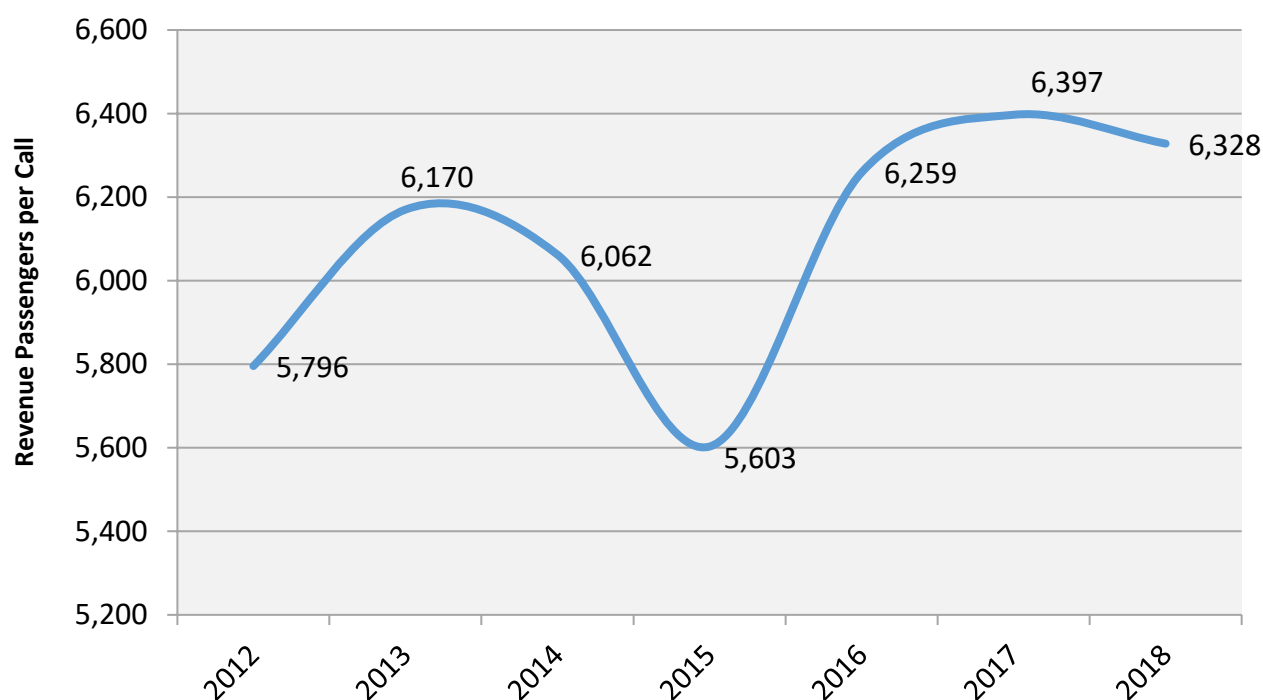
With the number of passengers and calls forecasted for Port Everglades over the next 20 years, and the average growth of cruise ships over the same period projected, forecasting the facility requirements to serve this future demand and vessel typology becomes paramount. Port Everglades must take into account the anticipated trends in ship construction and specific deployment patterns for the region and facilities must be sized for the peak demand created by the market. As one of the top cruise ports in the world, Port Everglades will continue to be used by the primary brands and their fleets into the long-term for access from various consumer markets sailing into the Caribbean region.

The evolution of the cruise vessel has been one of the most visible components of the industry over time. During the past several years, the newest and most popular generation of vessels continues to have greater passenger volumes, beams, and lengths to accommodate the area needed for large-scale outside cabin development. These vessels range in length from 965 feet to 1,300 feet and can

have a total passenger complement of more than 7,000 passengers. Figures 2.3.35-2.3.37 illustrate the trends related to vessel size at Port Everglades from 2012-2018. The average vessel capacity increased from 5,796 to 6,328 during this period. Vessel tonnage per call increased from 115,910 to 123,650 in 2018 and the length overall of vessels moved from 883 feet to 988 feet per ship per call on average.

Figure 2.3.35: Cruise Revenue Passengers per Call, 2012-2018

Source: B&A



For Port Everglades, the net result of the trends in cruise vessel development is that current and future berths, terminals, and upland support areas will need to accommodate these large cruise vessels to remain competitive in the regional marketplace and be able to fully accommodate the service requirements of the future generations of cruise vessels. Selection of a model design vessel or vessels established in conjunction with stakeholders dictates a programmatic response that will allow the port to meet cruise industry needs, maintain competitiveness in the region, and plan for operations as deemed viable and within best practices. This is critical for Port Everglades to continue to be a marquee cruise homeport.

Due to the nature of the competitive environment and the legacy cruise brands positioned to Port Everglades, the port has a wide range of vessels from smaller 200-passenger luxury/exploration ships to the largest built today in the Oasis-class ships.

Figure 2.3.36: Gross Tonnage per Call, 2012-2018

Source: B&A

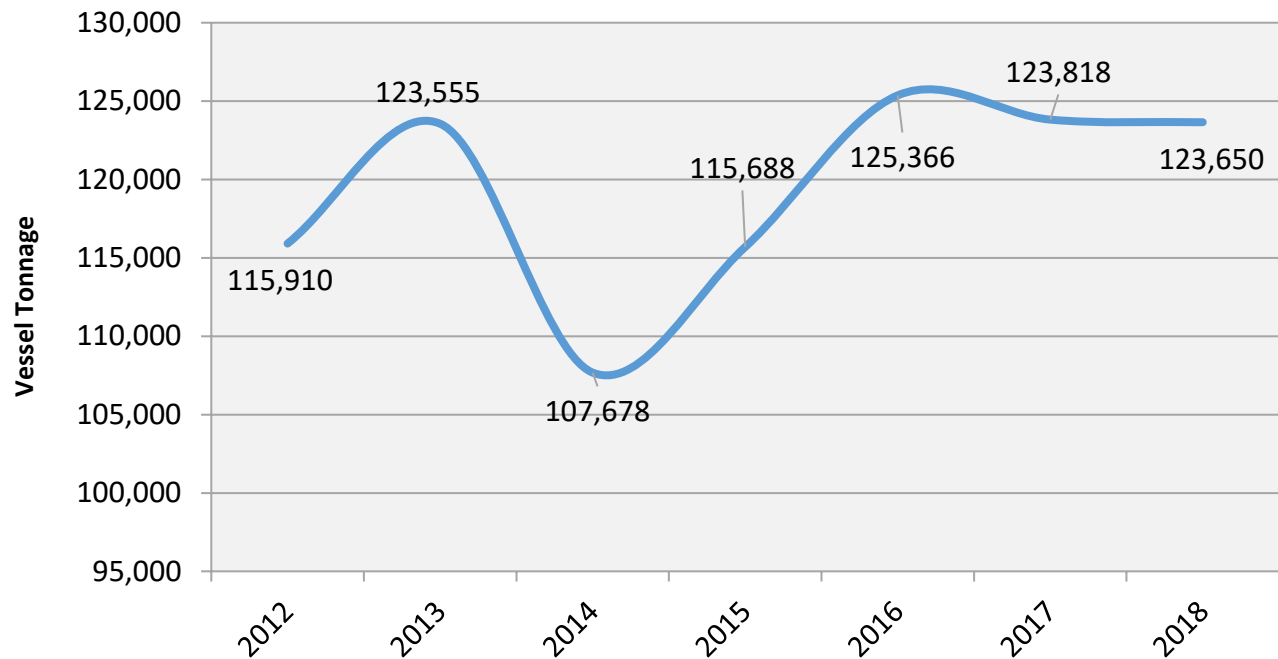
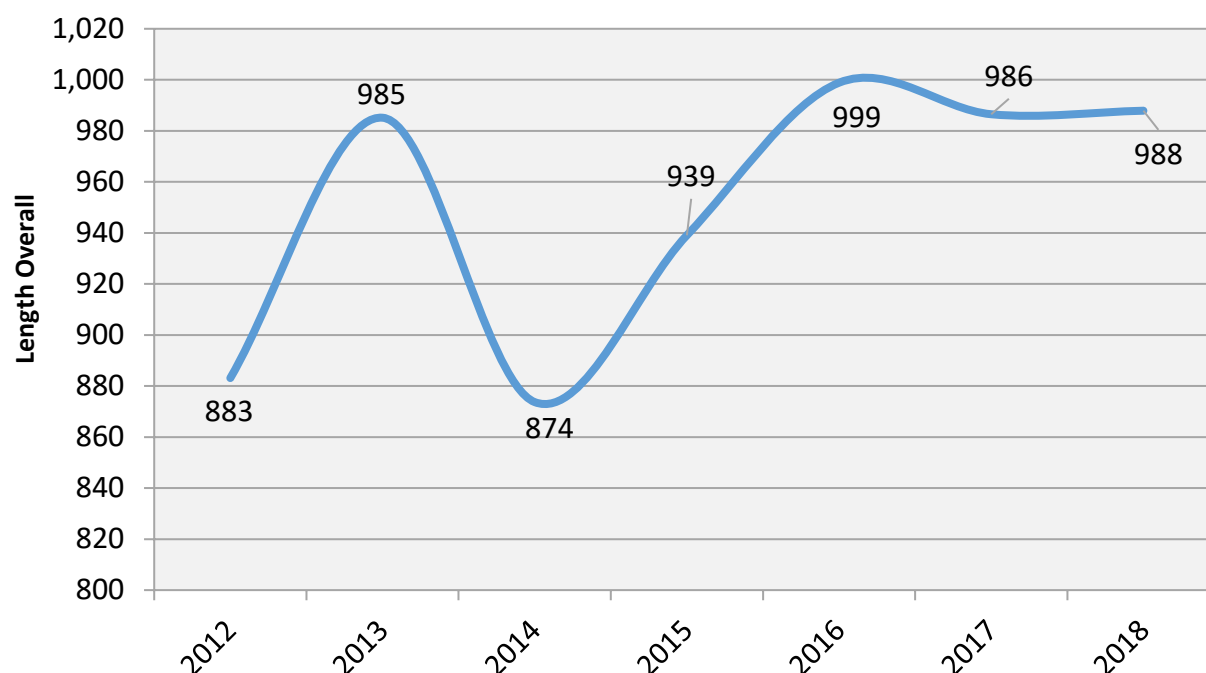


Figure 2.3.37: Length of Vessel per Call (Feet), 2012-2018*Source: B&A*

Although the deployment of a single vessel does not dictate a trend, the deployment of *Majesty of the Seas* to Port Everglades is indicative of the fact that top competitor ports (i.e. PortMiami, Port Canaveral) now have (or soon will) multiple facilities to accommodate the largest ships in the world that at one time Port Everglades had a lock on. With the development of new facilities and long-term agreements at Port Everglades that encourage the continued use these facilities for higher passenger volumes it is possible that Port Everglades may see additional smaller, older vessels deployed by their primary cruise customers, meaning Port Everglades may not push the upper limits of vessel size in the mid-term.

The design vessel(s) provide the criteria for berth requirements including apron, fenders and mooring structures, gangways in terms of quantity and capacity, terminal space allocation, GTA size and configuration for motorcoach, taxi, rideshare, private vehicle and mini-bus access and parking needs.

For planning purposes, two design vessels are shown in Table 2.3.9: the current/immediate design vessel and the future design (target) vessel.

Table 2.3.9: Design Vessel Template*Source: B&A*

Type	Current	Immediate	Future
Passengers	2,500 to 5,400	4,200 to 5,400	+7,000
Crew	800 to 1,400	+1,200	+1,500
Gross Tons	90,000 to 230,000	140,000 to 230,000	+230,000
Length Overall (feet)	985 to 1,185	1,100 to 1,200	1,300
Beam (feet)	130 to 165	140 to 185	185
Draft (feet)	28 to 32.8	28 to 34	36
Air Draft (feet)	Up to 210	210	+210

These design vessels incorporate features of the various classes that are becoming industry standards, including Quantum, Victory, Voyager, Freedom, Oasis and Epic classes. Thus, as shown, the design vessel template can be used for existing cruise facilities and the development of new homeport facilities. This template will allow Port Everglades to compete for cruise deployment opportunities in the region mid-to long-term.

Eventually all of the port's cruise facilities, with maybe one or two exceptions made for small to mid-size ships, will need to be capable of accommodating the future design target vessels.

Based on these design vessel characteristics, a series of berth requirements for future master planning of cruise infrastructure development is outlined below:

- **Berth**
Capable of handling a 1,300 foot LOA ship (1,400 foot operational berth)
- **Draft**
32-36 feet (channels and alongside)
- **Apron**
60-75 feet width
- **Pier**
150-250 ton bollards
- **Utilities**
Water, telecommunications, power (LNG fueling option)
- **Navigation**
Adequate maneuvering and turning basins at 1.2-1.5 times vessel LOA

2.3.15 Traffic Analysis and Berth Demand

Part of the process in identifying long-term berth demand is to develop an understanding of the traffic patterns for the facility. For Port Everglades the patterns are defined by the peak Winter season, where monthly and daily peaking patterns emerge through analysis of historical traffic data. The traffic patterns include the seasonality of the regional cruise market sector (Caribbean), profitability, and competition from cruise regions throughout the year, based on the same deployment factors. Berth demand is predicated by the following traffic characteristics:

- **Total volumes**
The volumes projected in the previous section are the anticipated fiscal year passenger volumes.
- **Size of vessel**
As larger vessels are introduced into the market, specifically Port Everglades, this reduces the growth of vessel calls while increasing passenger throughput. However, if competitor ports are accommodating

larger ships then the port may see an increase in overall calls, but relatively low or no growth due to vessel capacity.

- **Seasonality**

The majority of traffic is set during the peak Caribbean Winter months of November-April due to weather conditions, but also because ships are redeployed to other, more profitable, Summer markets such as Europe, Alaska and the Mediterranean. In the future, Asia may also play a larger role in this equation both as a pull for vessels, but just as importantly as a passenger source market for expansion of the Caribbean/Bahamas region.

- **Length of cruise**

Cruise length directly affects the peak days in which a port experiences the majority of its cruise calls. For Port Everglades, the majority of cruises are less than 8 days with future deployments likely falling into 6-day and shorter patterns for the major brands, while Princess/HAL will continue the longer sailing patterns (more than 7-days). These patterns drive the peaking of weekend days and use of weekdays.

- **Daily fluctuations**

Port Everglades is relatively consistent in the types of sailing patterns. Thus, peak days occur on peak weekend days (i.e. Friday-Monday) with other days of the week filling gaps required for the cruise lines to fill out their deployment patterns in the region. Over the years, these patterns have not changed that much as cruise lines believe that these are the most attractive for their customers. But more importantly, ports have competed by building new facilities to allow these patterns to occur. At some point in the future, due to economic and physical limitations, these patterns will give way to more evenly distributed departures throughout the course of a given week. For purposes of the 2018 Update, the current patterns have been retained. However, based on a regional competitive pattern it is likely that Port Everglades will see more sailings in the short-to mid-term on smaller ships.

Cruise vessel traffic patterns for Port Everglades were evaluated based on historical traffic and the best estimate of traffic patterns moving forward. Figures 2.3.38 and 2.3.39 show the actual numbers of Port Everglades passengers and calls, respectively, on a monthly basis from FY2012-FY2018. The trends in this distribution of the port's traffic are used as the long-term patterns for monthly traffic throughput as there are some options for Summer traffic to increase, but overall the Winter months will continue to be the key peaking period.

Figure 2.3.38: Monthly Passenger Throughput, 2012-2018

Source: B&A

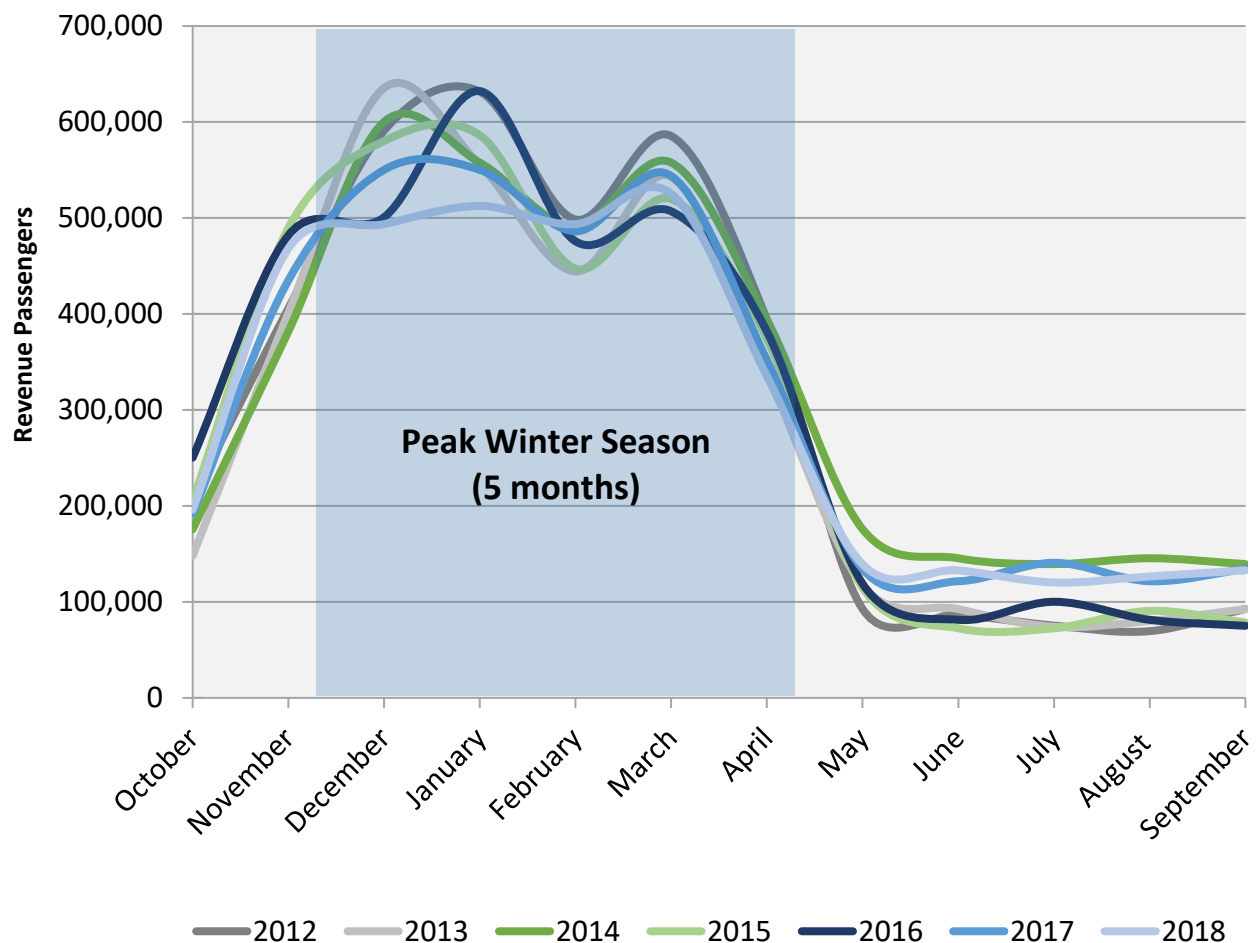
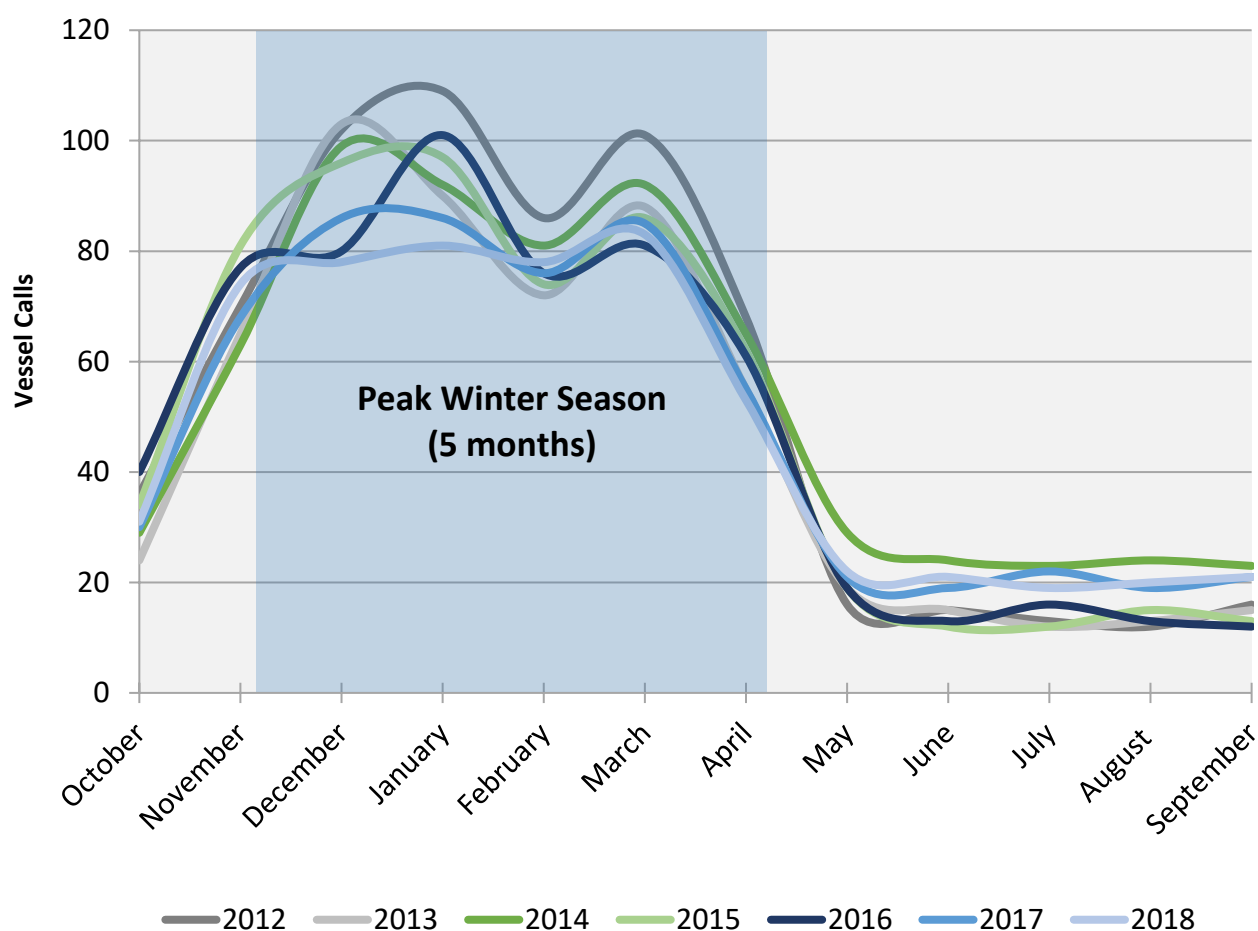


Figure 2.3.39: Monthly Vessel Calls, 2012-2018

Source: B&A



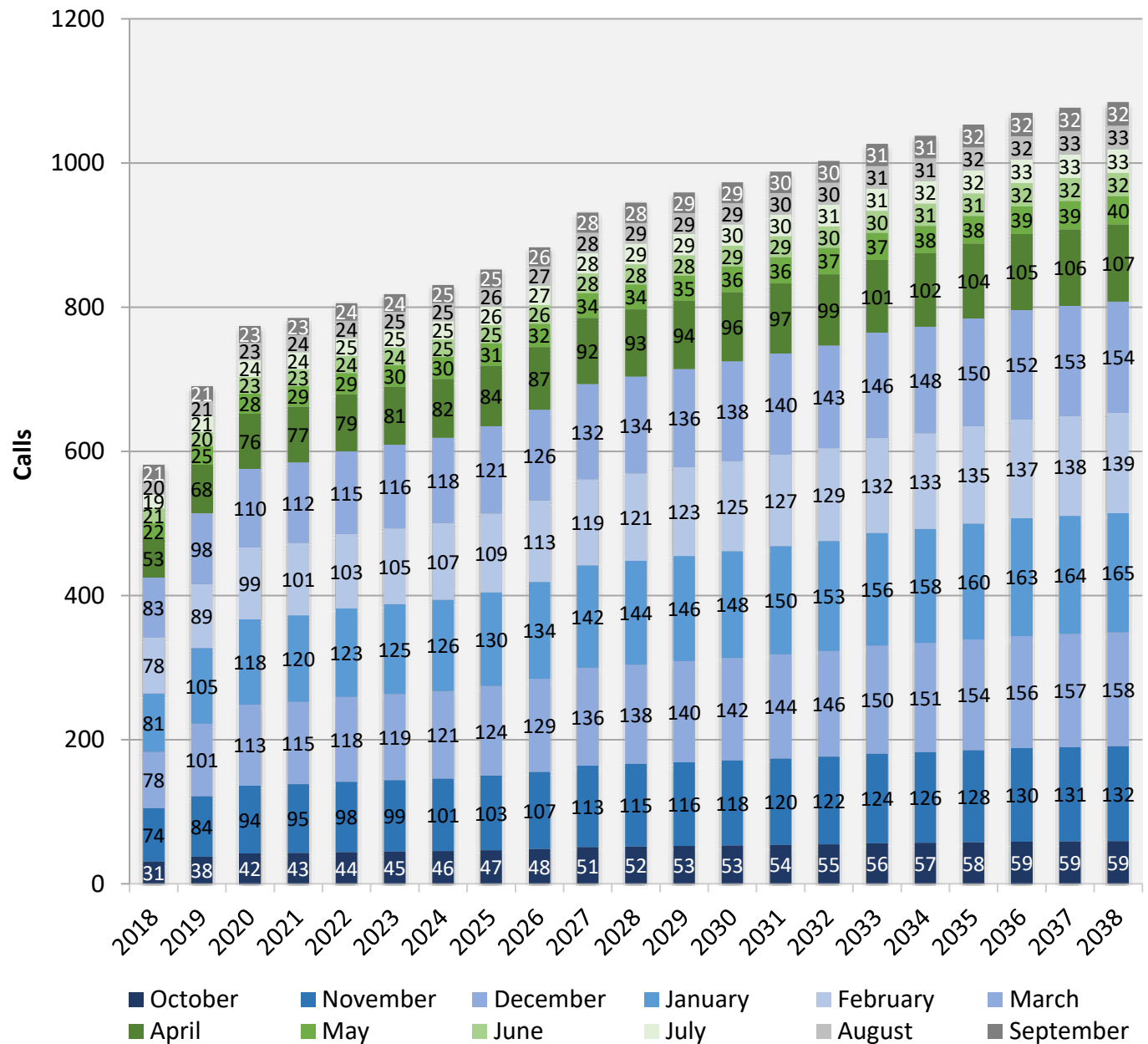
As shown in the figures above, the peak months within the period also have peaking corresponding to key North American holiday and vacation patterns during the months of November and December as well as March (Spring break). It is unlikely that the seasonality will change toward a more uniform pattern due to other market opportunities. European and Asian consumer holiday patterns may impact the cycle in the long-term dependent upon the brands deployed to the region and Port Everglades specifically.

Based on the medium passenger throughput scenario for multiday conventional cruise operations over the 20-year projection period (2019-2038), and the trend line from the monthly traffic splits, Figure 2.3.40 shows the long-term monthly

calls. Peak monthly calls are shown by month and year through 2038. This is used as the baseline for daily peaking and berth utilization.

Figure 2.3.40: Projected Multiday Vessel Calls by Month (Medium Scenario), 2018-2038

Source: B&A



Based on the projection assumptions, growth is envisioned to occur in a consistent seasonal pattern for regional traffic on sailings of less than eight days. This is primarily due to the competition from other worldwide Summer destinations whereby the revenue opportunities in other key Summer markets will continue to draw traffic out of the Caribbean region over the 20-year planning period.

Much of the long-term passenger growth at Port Everglades will be a reflection of the increased passenger capacity of cruise vessels. For Port Everglades, this will be defined by the type of cruise sailing from the key regional competitive homeports over the period. Further out into the projection planning period, it is more difficult to accurately reflect this outcome due to the number of influencing factors on deployments.

Figure 2.3.41 shows the daily call patterns for Port Everglades from 2012-2018. As with most U.S. homeports, Saturday and Sunday have consistently shown the highest amount of traffic over the period. There have been minimal traffic increases during weekdays and Port Everglades continues to have a low weekday distribution of traffic. These patterns are also indicative of a short-cruise duration market with an emphasis on 7-day and shorter cruises that meet the demands of the primary North American consumer.

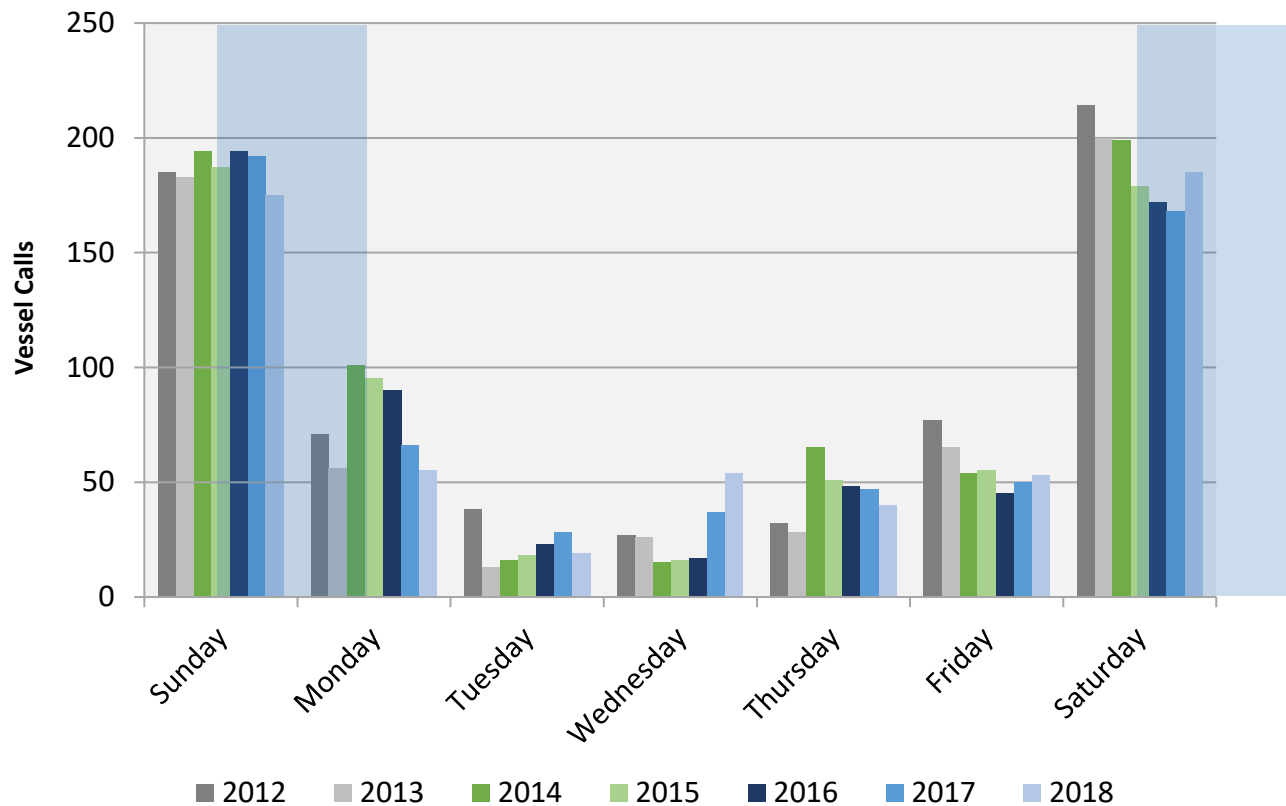
Figure 2.3.41: Daily Vessel Calls, 2012-2018*Source: B&A*

Table 2.3.10 shows the revenue passenger throughput by key day groupings and the percentage of traffic that corresponds to each. As illustrated, more than 60 percent of all traffic moves on the peak weekend days with some 20 percent on Friday and Monday for an average of 83.5 percent of the traffic over the period. In the past two years weekday traffic has risen by approximately five percent primarily due to the 6-day and 5/5/4-day patterns operated from the port.

Table 2.3.10: Daily Passenger Throughput by Key Days, 2018-2038*Source: B&A*

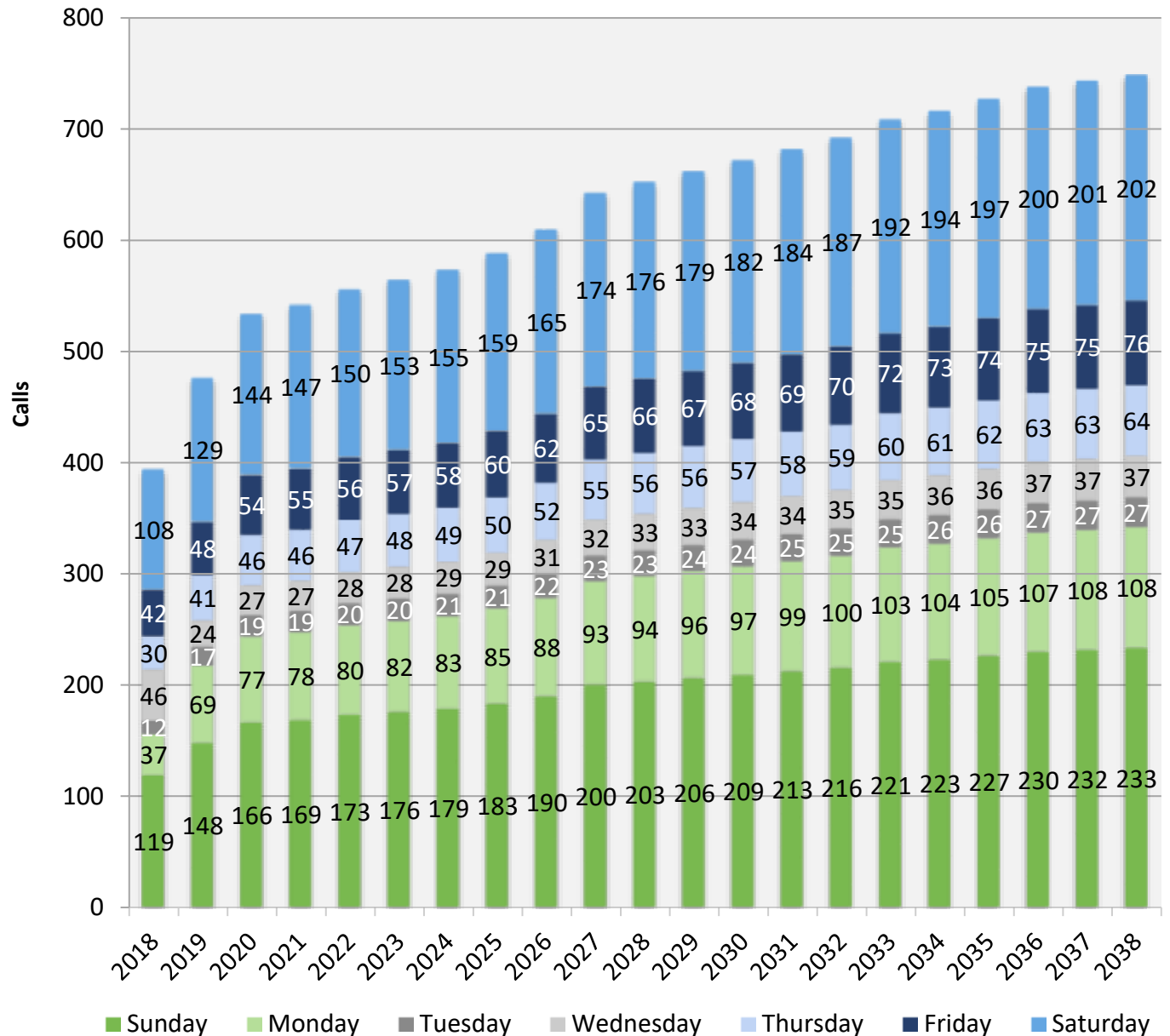
Day	2012	2013	2014	2015	2016	2017	2018	Average
Revenue Passengers								
Sat/Sun	2,312,471	2,363,146	2,382,398	2,211,898	2,290,764	2,302,961	2,278,073	2,293,219
Fri/Mon	857,759	746,581	939,623	906,516	844,954	742,065	683,422	823,316
Tue/Wed/Thu	562,180	413,396	581,960	513,692	550,785	716,477	715,062	615,595
Percentage of Traffic								
Sat/Sun	62.0%	67.1%	61.0%	60.9%	62.1%	61.2%	62.0%	61.4%
Fri/Mon	23.0%	21.2%	24.1%	25.0%	22.9%	19.7%	18.6%	22.1%
Tue/Wed/Thu	15.1%	11.7%	14.9%	14.1%	14.9%	19.0%	19.4%	16.5%

Moving more traffic to weekdays to enhance berth utilization would be preferable, but this is not always easy or even possible so it is likely that Friday-Monday will continue to be the busiest days for Port Everglades due to the vacation patterns of the North American consumer.

For cruise ports, the consistency of cruise traffic calling on a year-round basis is a positive attribute. This consistency allows a port to manage its cruise facilities through revenue planning, personnel scheduling, and other defined areas of operations. If cruise traffic is inconsistent on an annual basis, it poses challenges in terms of apportioning reserves to maintenance during low cruise traffic periods and places more demands on other aspects of the cruise operation. Conversely, the slower periods at high traffic facilities allow for “downtime” during which to complete berth and terminal repairs and renovations or new construction projects (i.e. new terminals). Figure 2.3.42 illustrates the projected long-term daily vessel traffic for Port Everglades.

Figure 2.3.42: Projected Multiday Vessel Calls by Day (Medium Scenario), 2018-2038

Source: B&A

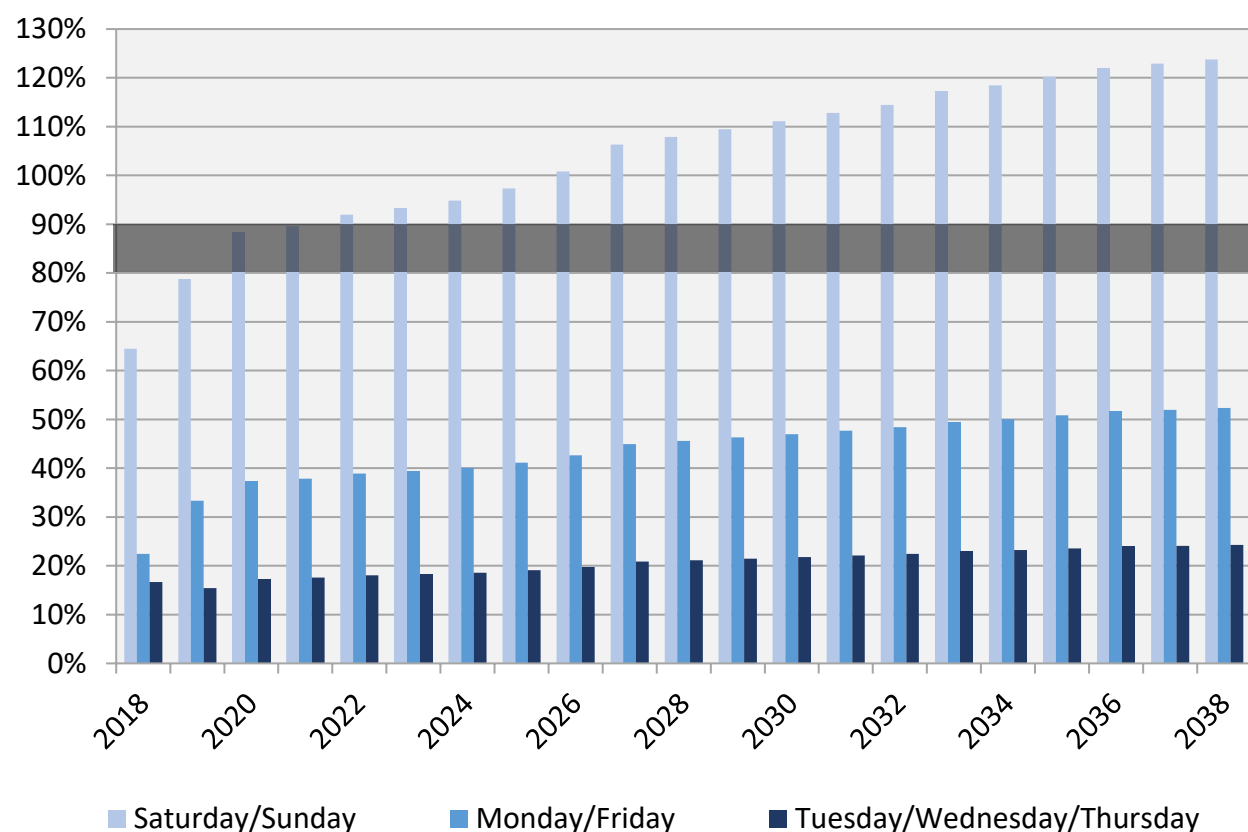


Peaking continues to occur on the weekend days (Saturday and Sunday) with additional calls on Thursdays as part of short cruise programs. Minimal growth occurs on other weekdays.

One of the principal goals of this cruise market assessment is to translate cruise passenger traffic forecasts into berth and facility demand over the 20-year vision period of the 2018 Master/Vision Plan Update. This process allows Port Everglades to identify facility needs over time and, more specifically, to understand the size, characteristics and timing of the facilities required to accommodate future demand so that resources can be mobilized and allocated in accordance with market conditions. Facility demand forecasting relies on identifying cruise deployment patterns, establishing future vessel sizes and forecasting vessel calls. The previously discussed projection scenarios provide a planning perspective that allows Port Everglades to envision the maximum potential use of existing and future facilities, including berths, terminals, ground transportation areas, etc.

Figure 2.3.43: Peak Season Berth Utilization (Medium Scenario), 2018-2038

Source: B&A

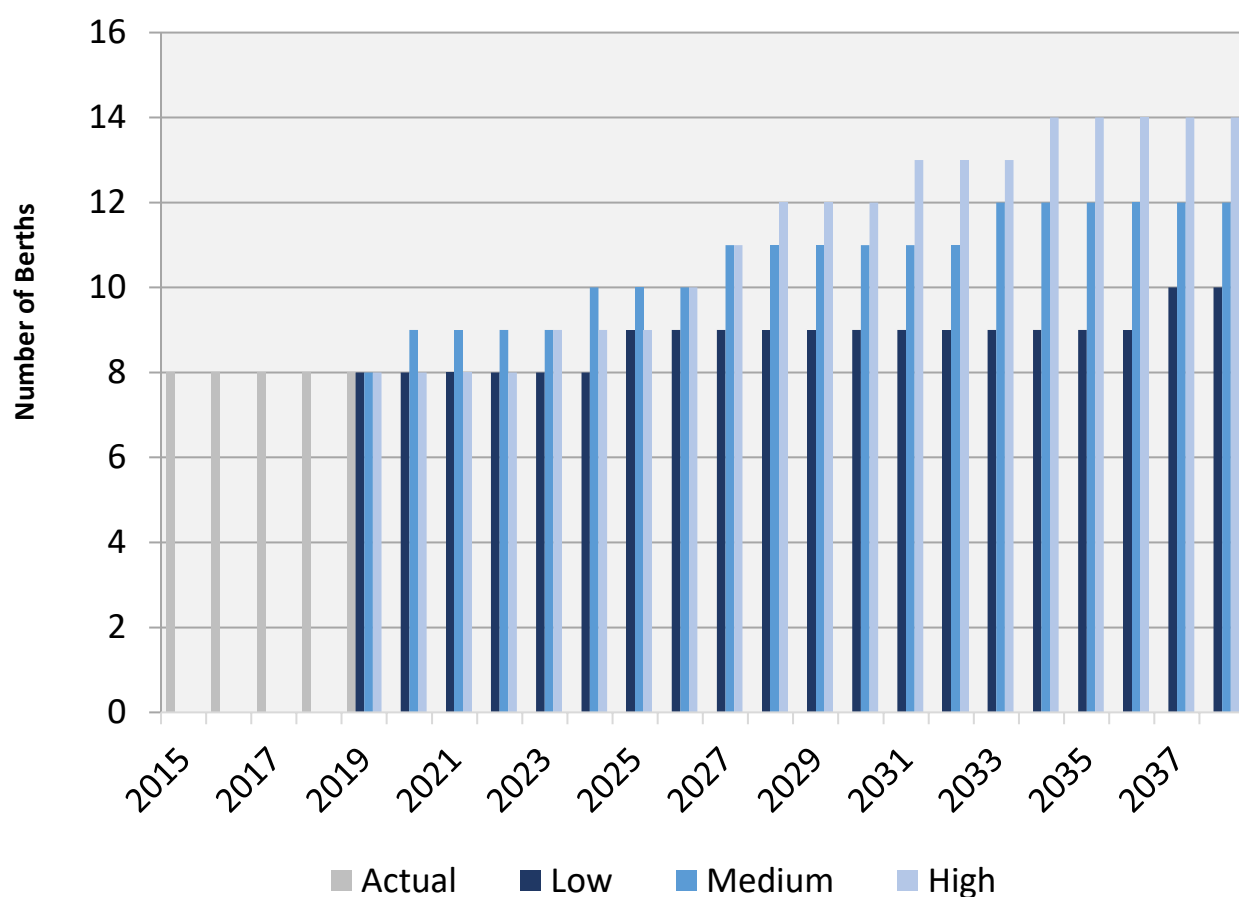


Based on past experience optimal berth usage is 80-90 percent over the peak periods. Once this is achieved, an additional berth is likely needed to be able to

meet the demand and allow for peak use on key weekend days. Figure 2.3.43 illustrates the anticipated berth utilization in the upcoming years (multiday cruise only). Figure 2.3.42 shows the berth demand by day of week using the medium projection presented in Figure 2.3.31. The demand for a berth is triggered when weekend capacity during the Winter months exceeds 90 percent utilization (see Figure 2.3.43). Figure 2.3.44 shows the actual number of berths required under each of the future traffic scenarios.

Figure 2.3.44: Actual Berth Demand by Scenario (Multiday Cruises), 2018-2038

Source: B&A



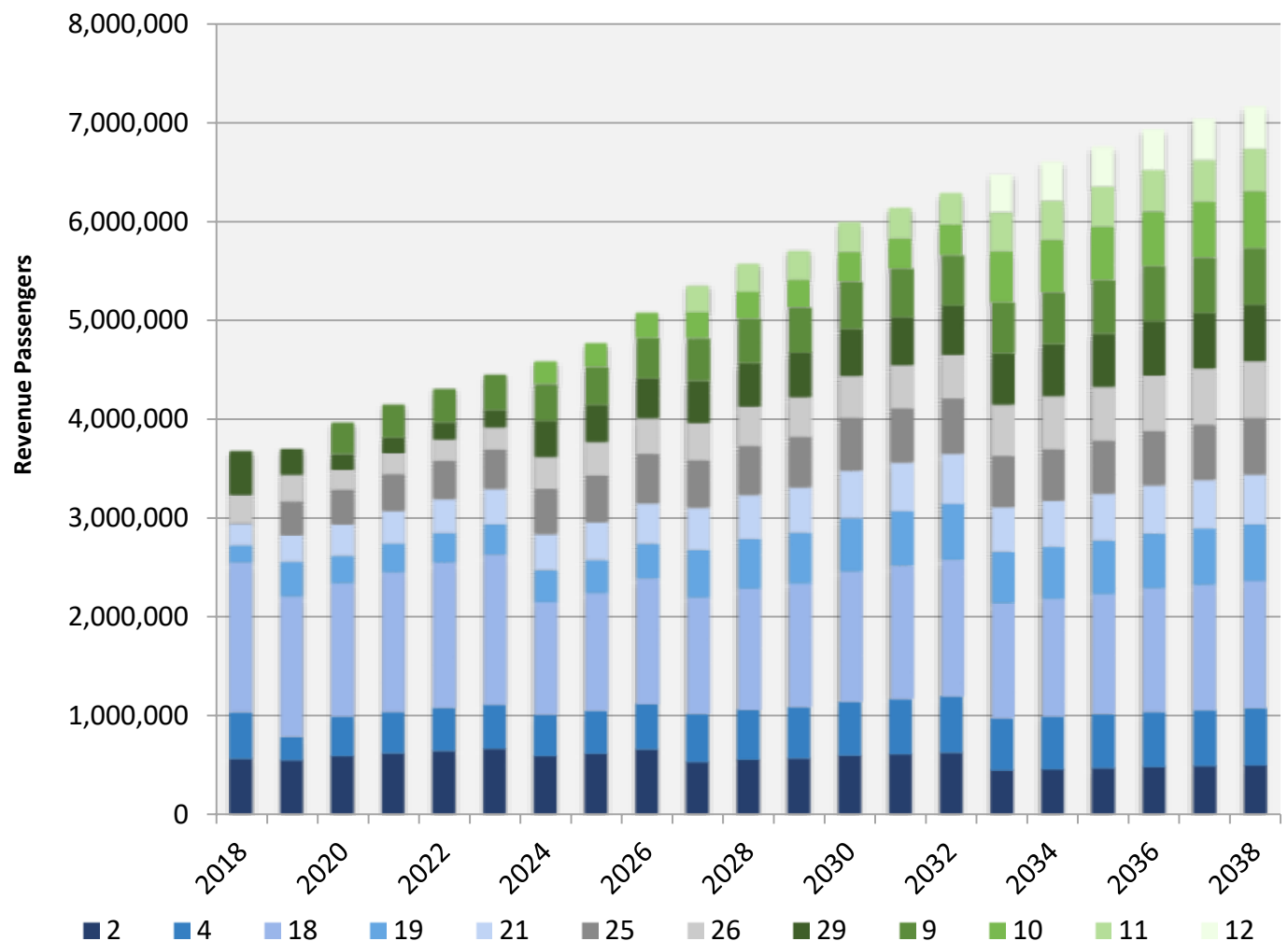
As shown, there is a total demand for 12 berths during the projection period under the medium projection scenario and 10 berths under the low model. For the high scenario the actual daily distribution of traffic has been adjusted to reflect the change in traffic patterns to shorter sailings encompassing more days of the week. However, the overall number of calls during the peak season overwhelms the

model. Thus, for Port Everglades to absorb this level of traffic 14 berths would be needed; or traffic would need to be adjusted to larger vessels and fewer calls as was the trend over the past five years. A single berth would also provide for exploration and smaller boutique ships.

Figure 2.3.45 illustrates projected passengers per berth through 2038. As shown, the goal is to balance usage over time as new berths come on line with the ability to accommodate new vessels.

Figure 2.3.45: Port Everglades Revenue PAX per Terminal, 2018-2038

Source: B&A



Based on all of the preceding analysis, in an unconstrained environment the following would be the physical infrastructure recommendations under the medium projection analysis:

- Add an additional cruise berth/terminal (T9) in 2020-2021 (for a total of nine multiday cruise facilities)
- Add an additional cruise berth/terminal (T10) in 2024-2025 (total of 10)
- Add an additional cruise berth/terminal (T11) in 2027-2028 (total of 11)
- Add an additional cruise berth/terminal (T12) in 2033-2034 (total of 12)
- Reserve space for an additional cruise berth/terminal (T13) for development beyond 2038

There are significant costs involved with bringing new cruise infrastructure on line. At Port Everglades, in particular, the trade-offs of doing so are complex given the already berth-constrained environment and the needs of the port's other lines of business. However, the reality of the market today is that ports must bring new facilities on line to compete. This is especially true in South Florida since Port Everglades' two principal competitors – Port *Miami* and Port Canaveral – have already embarked on aggressive expansion plans.

All Port Everglades cruise facilities moving forward must be sized for the largest ships with the following characteristics:

- Passengers – between 5,000 to 7,000 passengers
- Length – in excess of 1,200 feet

2.4 Liquid Bulk Market Assessment

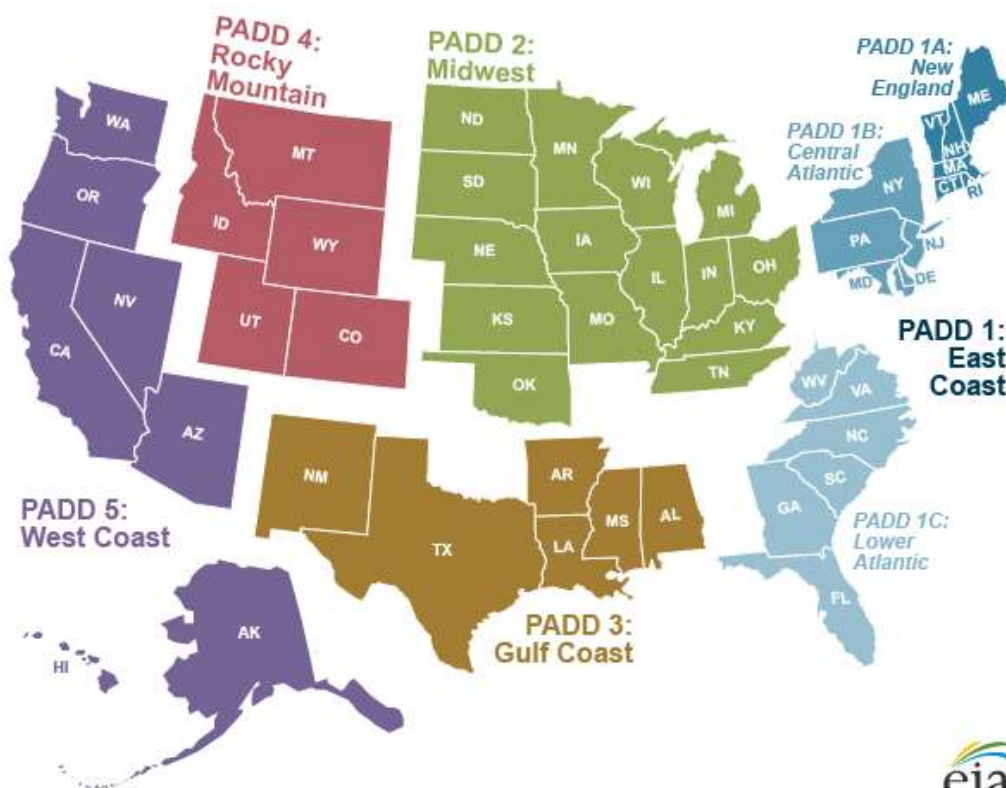
2.4.1 Market Changes and Product Demand

Since the 2014 Update of the Port Everglades Master/Vision Plan, a number of changes have occurred in the U.S. and global markets. The global oil market has seen a rise in supply of crude and crude-derived products from U.S. sources, and a corresponding drop in global oil prices. This rise has changed the market dynamics of the industry, which has had implications for flows into Port Everglades. Accelerated growth in domestic crude oil and natural gas has lowered operating costs for U.S. Gulf Coast refiners, with domestic crude replacing foreign sources.

Additionally, refineries in the Eastern U.S. Petroleum Administration for Defense District I (PADD I) have capitalized on domestic Bakken production, and replaced portions of their crude demand from foreign sources. Various Caribbean refineries, such as Hovensa in the U.S. Virgin Islands, shut down in 2011 and 2012, due to their inability to compete with U.S. Gulf Coast refiners. As a result, Port Everglades has seen its petroleum supply shift from foreign to domestic sources during the past several years. This 2018 Update of the Port Everglades Master/Vision Plan takes these and other recent developments into account. Port Everglades throughput demand, for purposes of the 2018 Update, was forecasted based on historical demand supplied to the 12-county market, and data from the 2018 Annual Energy Outlook (AEO) provided by the Energy Information Administration (EIA). The forecasted demand is also reflected in the vessel-calls forecast, considering propane demand exclusively for LPG barge calls. Port Everglades' historical throughput was provided by the port, and supplemented with information relating to rail throughput of ethanol and biodiesel products.

Figure 2.4.1: Petroleum Administration for Defense Districts

Source: EIA (<https://www.eia.gov/petroleum/weekly/includes/padds.php>)



Overall, U.S. light petroleum product demand is expected to grow in 2018 and 2019 at an average rate of 0.6 percent per year, declining slowly thereafter through the end of the forecast period (2038) at a rate of 0.9 percent per year.⁷ The forecast from the EIA factors into increasing fuel economy standards, and the impact of electric vehicles on domestic light oil consumption. PADD I is forecast to follow a similar path as the U.S. overall. Annual growth rates are projected to increase at an average of 1.6 percent per year through 2019, before declining at an average of 0.9 percent annually. Due to expectations of strong population growth, Florida's annual demand growth rate for light products is greater than that of every other state in PADD I. Florida's light product annual demand growth is higher than both the U.S. and PADD average at a rate of 3.0 percent per year from 2017 through 2020 – before decreasing demand from 2020 to 2026, then increasing again to an annual growth rate of 0.5 percent through 2038. Port Everglades is expected to see average annual growth of 1.5 percent through 2019, before experiencing a decline similar to Florida through 2026, after which time growth of 0.4 percent annually through 2038 is expected.

Of the seven major commercial seaports in Florida, four currently have significant liquid bulk handling capability:

- Port Everglades
- Port Tampa Bay
- JAXPORT
- Port Canaveral

One telling shift in market dynamics since 2009 has been the emergence of Port Canaveral as a liquid bulk port, due to its 2009 expansion. Based on the most recent available data, it appears that the expansion did not significantly impact liquid-bulk volumes at Port Everglades. These results are likely because the Port Everglades catchment area is well-served by Port Everglades itself, given its competitive advantages over other port/liquid bulk terminal locations. Both Port Tampa Bay and JAXPORT have, however, lost market share since the Port Canaveral expansion was completed.

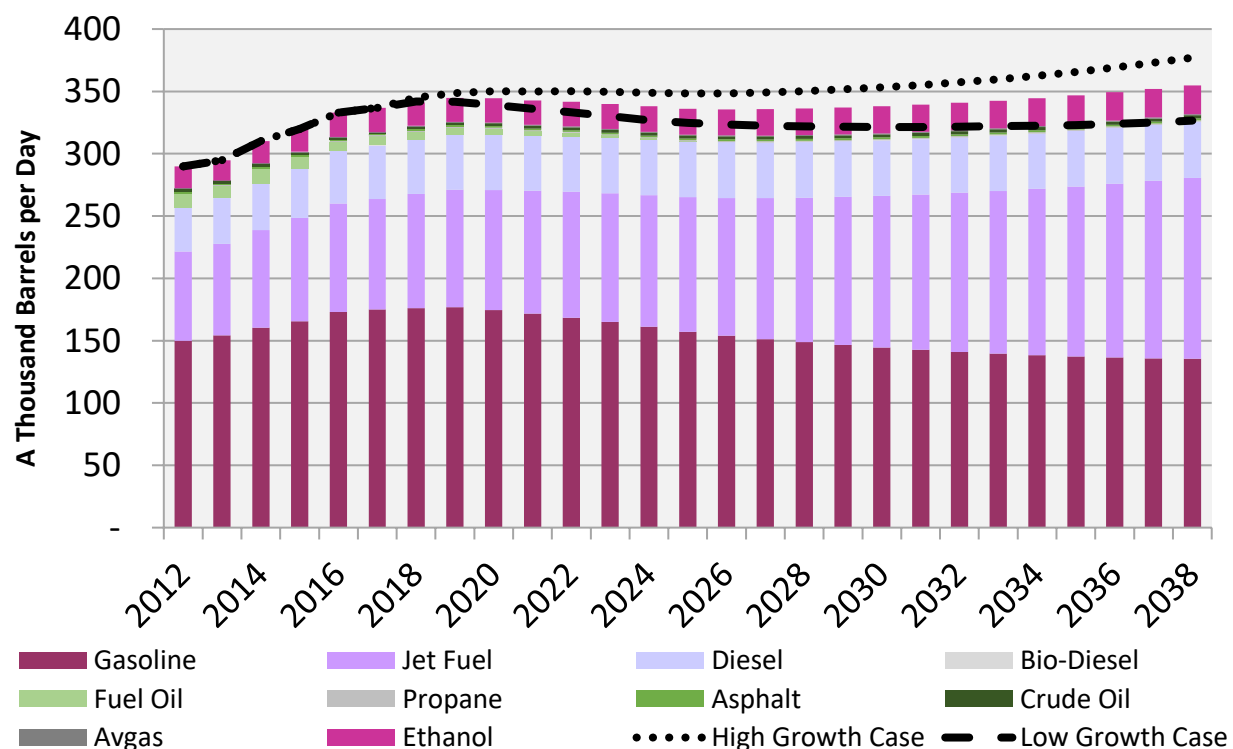
⁷ Source: EIA

Numerous refinery expansions also took place from 2009-2018, and led to increased refinery runs and petroleum product production in the U.S., despite lower domestic product demand. Increased production in the face of falling local demand led to the U.S. becoming a net exporter of refined petroleum products. Strong product-demand growth in Latin America and low refinery reliability in Mexico have led to increased exports from the U.S. Additionally, numerous refinery shutdowns on the U.S. East Coast led to additional Gulf Coast production to be directed to the Northeast U.S. via pipeline, due to the relatively lower pipeline transfer costs. Strong gains in domestic crude production have led refining projects to shift focus from increasing product volumes to increasing crude-slate flexibility. Expectations of continued low-cost natural gas and crude oil advantages for U.S. Gulf Coast refineries will lead to sustained utilization rates, and provide continued supply into Port Everglades, keeping reliance on foreign barrels at historically low levels.

A summary of the Port Everglades liquid bulk throughput forecast is provided in Figure 2.4.2.

Figure 2.4.2: Port Everglades Liquid Bulk Throughput Projections, 2012-2038

Source: Hatch



The potential restart of Hovensa (St. Croix, U.S. Virgin Islands) in 2018/2019 is not expected to have a negative impact on Port Everglades. It might change the makeup of product vessels on a temporary basis, and potentially even increase shipments. However, the likely scenario is that the product from these refineries will displace supply from the Gulf Coast.

As shown in Figure 2.4.2, total projected volumes are expected to be around 341,000 barrels per day (BPD) by 2018, and will see a slight decrease between 2021 and 2026 before rising again. However, it is unlikely that the volumes will match the highs reached before the global recession of 2008 through the very end of the forecast period, since overall consumption of hydrocarbons is trending downward nationwide. Gasoline continues to be the leading product; however, due to more rapid diesel and jet fuel demand, the percentage of throughput attributed to gasoline is projected to fall over the forecast period, from 52 percent of the total in 2018 to about 39 percent by 2038. Jet fuel throughput will see strong growth, with the percentage of throughput growing from 27 percent in 2018 to approximately 40 percent in 2038.

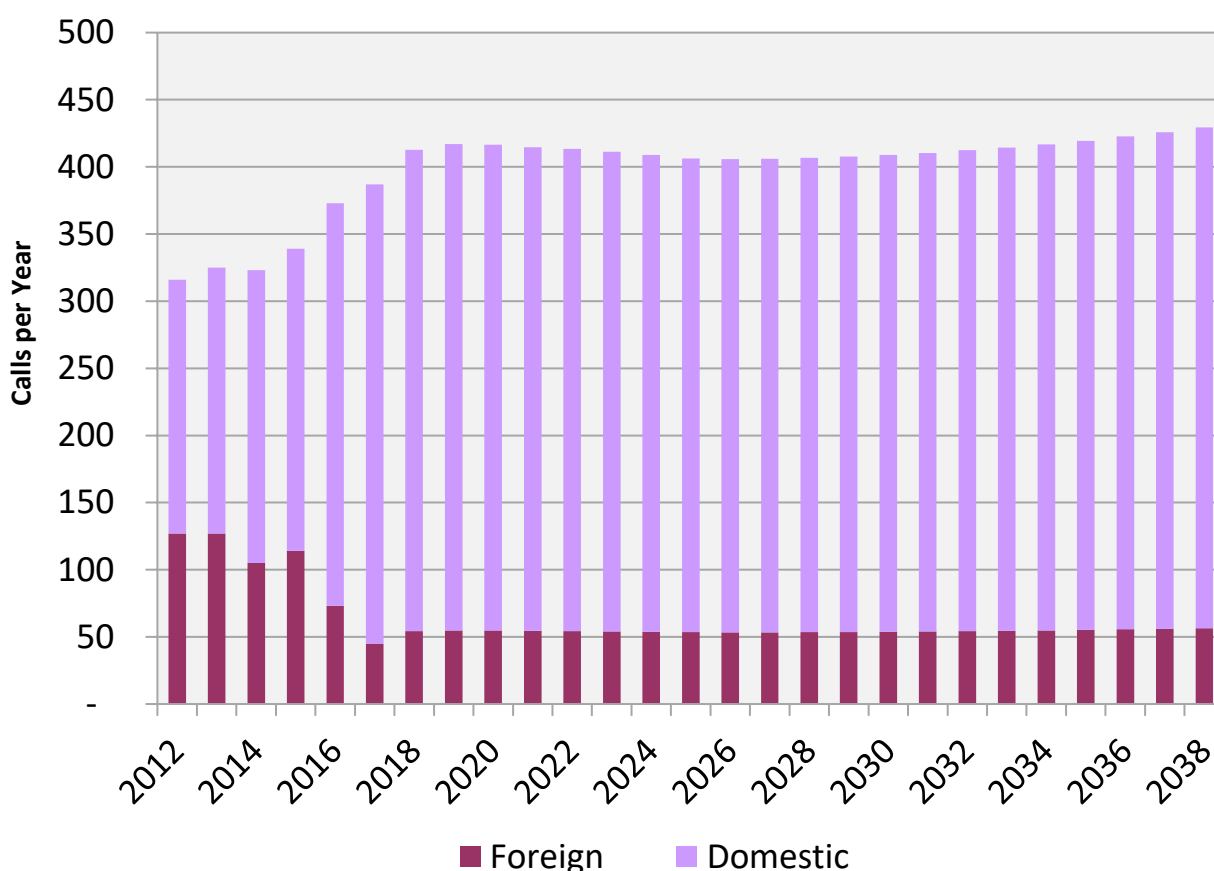
Moving forward, growth in refined products is forecast to be flat, due to declining gasoline demand offset by increasing jet fuel demand, while diesel demand remains flat. The U.S. recently has become a net exporter of diesel and continues to import gasoline. Europe and Latin America are significantly short of diesel and exports from the U.S. have increased to historical highs. Thus, Port Everglades' throughput will increasingly be sourced domestically, since gasoline demand (which can be foreign sourced) is expected to decrease and jet fuel demand (which is now primarily domestically sourced) is expected to grow.

Figure 2.4.3 illustrates the projected number of annual vessel calls for the period from 2018-2038, and includes historical data for 2012-2017. Reduced product demand, the Hovensa refinery shutdown, a move to larger vessels, and increasing competition from Latin America for refined products produced domestically decreased tanker calls between 2006 and 2012. Since 2012, there has been a rebound in the number of vessels coming into Port Everglades, in response to changing domestic fuel production logistics. To meet product demand in the region Port Everglades serves, the number of domestic tanker calls is expected to increase through 2020, then decrease at an annual average rate of 0.4 percent through

2026, in response to the broader market forecast, as supplied by the EIA. After 2026, calls are projected to once again increase through the end of the forecast period.

Figure 2.4.3: Tanker Vessel Calls at Port Everglades, 2012-2038

Source: Hatch



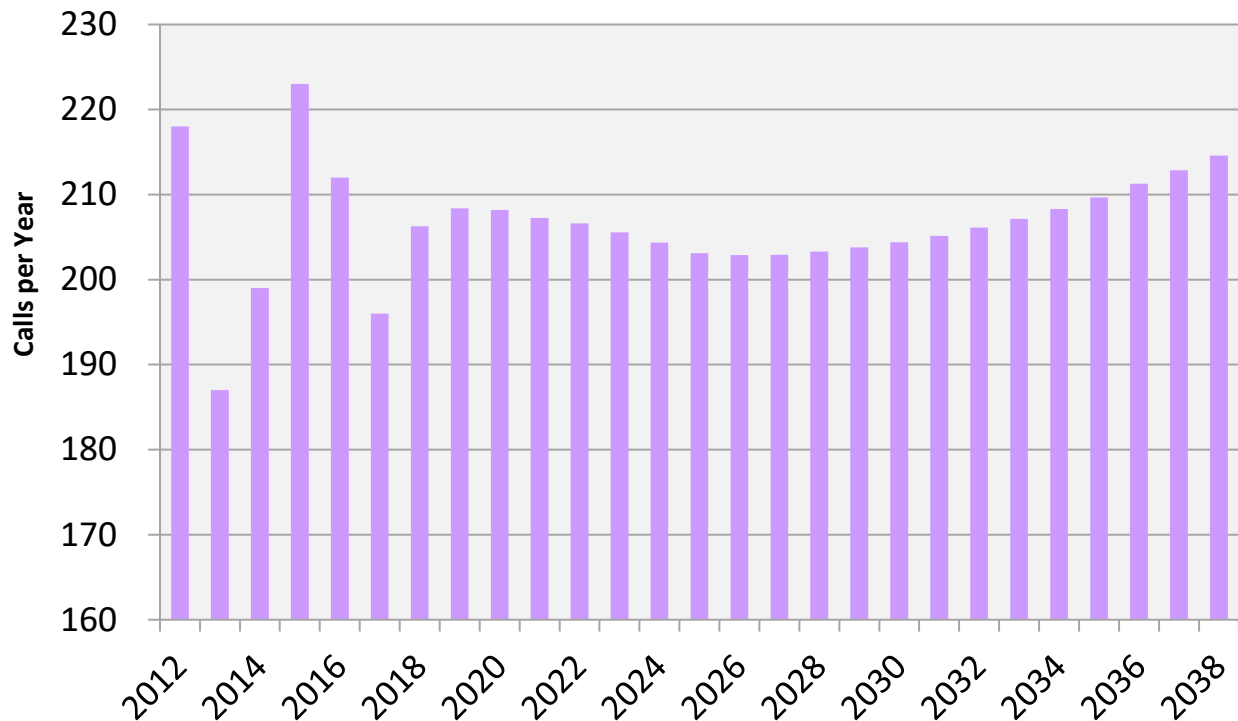
Foreign tanker calls have fallen significantly since the Hovensa refinery shutdown. Supply shifted strongly towards tanker calls from the U.S. Gulf Coast and other regional terminals, such as the BORCO terminal in the Bahamas. After a sharp increase through 2006, however, foreign tanker calls dropped to a new low in 2017. It is expected that the percentage of foreign tanker calls will continue to decrease slightly throughout the forecast period.

Port Everglades and other ports in Florida increasingly depend on barge shipments from Gulf Coast refineries to meet product demand, as evidenced by the decline in tanker calls during the past few years. However, barge calls are expected to remain

flat from 2018 forward in a tight range centered around 225 calls per year. See Figure 2.4.4.

Figure 2.4.4: Barge Calls at Port Everglades, 2012-2038

Source: Hatch



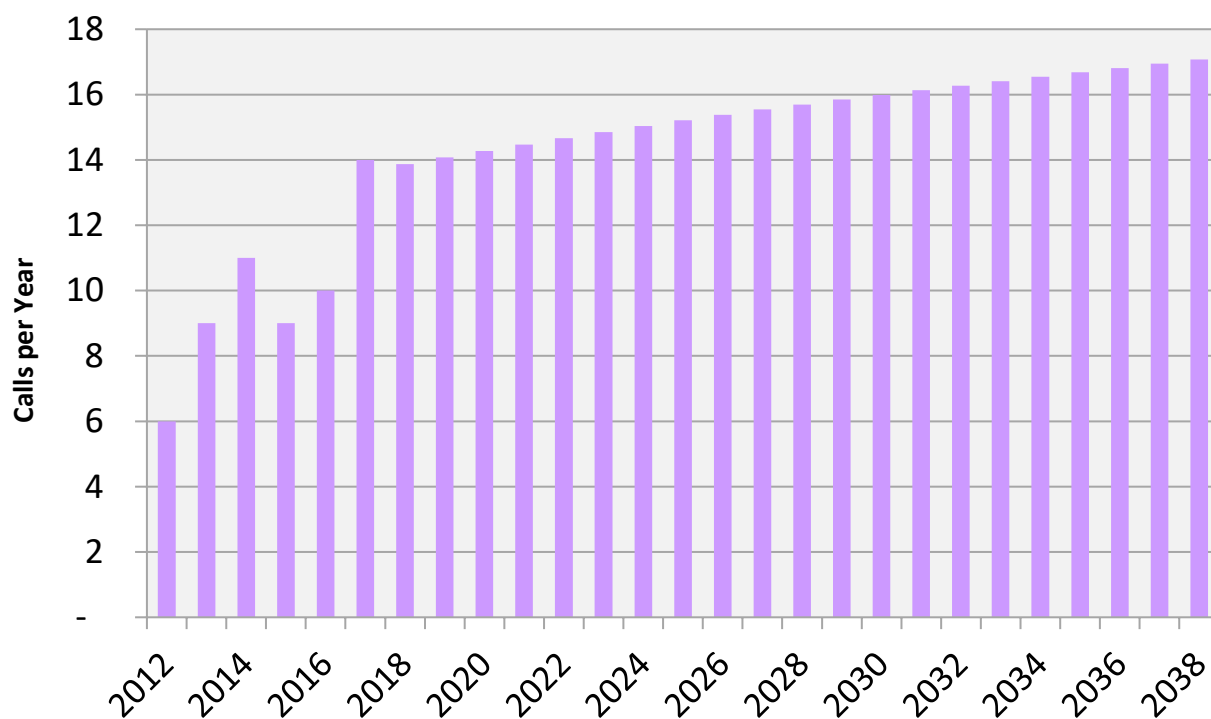
After Hurricane Katrina destroyed the Dynegy/Targa plant in Venice, LA, in 2005, the volume of their available propane to bring into the port decreased significantly. Much of their market share has since been taken by C-3 through Tampa, resulting in the dramatic decrease in barge calls to 2012, which has since flattened out. Demand for propane is not expected to return to Port Everglades, but is expected to be around 15 calls per year (See Figure 2.4.5).

Several factors must be considered when making decisions regarding Port Everglades' liquid bulk infrastructure. They include:

- Deliveries to the port are not ratable, and annual average volumes may not reflect peak activity at the port, masking actual facility limits.
- Reductions in demurrage costs may create a competitive advantage.
- Crude and natural gas prices are inherently volatile. If Gulf Coast refiners lose their competitive advantage, petroleum products may shift once again to foreign sources.
- There is uncertainty in the planning basis, as forecasts are inherently uncertain.

Figure 2.4.5: LPG Barge Calls at Port Everglades, 2012-2038

Source: Hatch



2.4.2 Market Forecasting Methodology

Port Everglades' liquid bulk market includes a diverse portfolio of petroleum products, and accounts for a substantial portion of port revenue. For the most part, the analytical basis for this section has been derived from the EIA, and data acquired from the port. Additional specifics have been derived from B&A's

interviews with several of the port's liquid-bulk facility operators. The most significant change from the 2014 Update to the present is an update of EIA's methodology. In response to advancement in electric vehicle technology, the EIA now incorporates an increased replacement of combustion engine vehicles, with electric ones leading to a decline in gasoline demand after 2020.

Total demand for refined products in the U.S. is influenced by many factors. The relative strength of the economy, petroleum prices, the regulatory environment, the extent of travel, the fuel efficiency of the fleet, and assumptions regarding alternative motor fuels all affect the outlook for petroleum-based fuels.

Economic activity is a strong driver of U.S. petroleum demand. Demand for light products grew at an average rate of 1.1 percent per year from 2000 to 2007. The low rate of growth can be attributed to a weak economy in 2001/2002, and the increase in oil prices in 2004-2007. From 2007 to 2009, however, light product demand fell by over 1.1 million BPD, in response to high prices and the economic collapse. This demand only started to grow again towards the latter part of the economic recovery (2013). Demand growth remained relatively flat, at an average rate of 1.3 percent, between 2013 and 2018, and is expected to experience negative growth past 2020; after that, declining gasoline demand is expected to outpace growth in other products.

Ultra-low sulfur diesel is expected to show the greatest increase in the long term. Jet fuel growth will occur with airline traffic growth, more than offsetting increased efficiency in airline fleets. Gasoline demand is expected to continue to decline, with increasing supplies of ethanol displacing petroleum-based gasoline as a result of continued application of the Energy Independence and Security Act of 2007 (EISA). Looking further ahead, total gasoline demand (including blended ethanol) is expected to recover through about 2020, then decline as more efficient new vehicles mandated by the EISA, and the introduction and sale of greater numbers of electric vehicles, starts to impact the fuel economy of the overall fleet.⁸

Annual PADD-level consumption for each refined product is based on EIA data. The PADD consumption is divided by the total population of the PADD, producing a demand-per-capita value for each year. The PADD-level forecasts are derived from a U.S.-to-PADD demand allocation, based on forecasted population data by the U.S.

⁸ The EISA requires a gradual increase in light duty vehicle fuel efficiency requirements up to 54.5 MPG by 2025.

Census Bureau and historical PADD level consumption (excluding jet fuel). Jet fuel demand is forecasted using a similar method of U.S.-to-PADD demand, based on forecasted operations from the Federal Aviation Administration (FAA) on a PADD-level basis.

Annual state-level consumption for each refined product is derived from the State Energy Data System (SEDS) data published by the EIA for the State of Florida. Statewide historical consumption estimates include gasoline, diesel, jet fuel, and residual oil. The SEDS basis was used as the state-to-county allocation for Florida light product demand (excluding jet fuel). For jet fuel, the overall state-level demand, as reported by the EIA, was distributed to the county-level based on the FAA's Airport Operations summaries for each airport operation. As previously stated, the four main airports considered in the 12-county area include:

- FLL
- MIA
- PBI
- RSW

State-level forecasts are derived from a U.S.-to-state demand allocation, based on forecasted population data by the U.S. Census Bureau and historical state consumption (excluding jet fuel). Florida-to-county demand is allocated through the same method. Jet fuel forecasts use the FAA's forecast operations on a U.S.-to-state level, as described above. For the 12-county region served by Port Everglades, the same methodology is used through the four main airports in the region as a percentage of total state flights, according to county.

The PADD, state, and county petroleum consumption forecasts are made based on an independent forecast of the respective population in each geographic region, forecast airport operations, and the forecast of U.S. petroleum demand. Historical per-capita consumption is escalated at the U.S.-level per-capita consumption growth rate. Multiplying the per-capita consumption estimate by the forecast population results in the forecasted consumption.

Population growth has historically been a large determinant in the forecast of gasoline and transportation diesel, and to a lesser extent, heating oil and jet fuel. As the population has grown, the demand for light petroleum products has also

grown, at least historically. This data will change after 2020, as previously discussed. However, population is still a primary determining factor in projecting future demand. See Table 2.4.1 and Figure 2.4.6.

Historically, Florida's population growth has been robust. Between 2000 and 2018, the population in Florida grew an average of 1.9 percent per year, outpacing the U.S. as a whole, which saw growth of 0.8 percent per year for the same period. From 2019 through 2038, population in Florida is expected to grow at an annual average rate of approximately 1.8 percent. This rate is stronger than the expected average annual growth for the entire U.S. over this period (0.6 percent). Recent projections indicate that Florida, California, and Texas will each gain more than 8.7 million residents, and together will account for 40 percent of the nation's growth (by 2036).

Table 2.4.1: State and PADD Populations Trends (Millions of People), 2018-2038

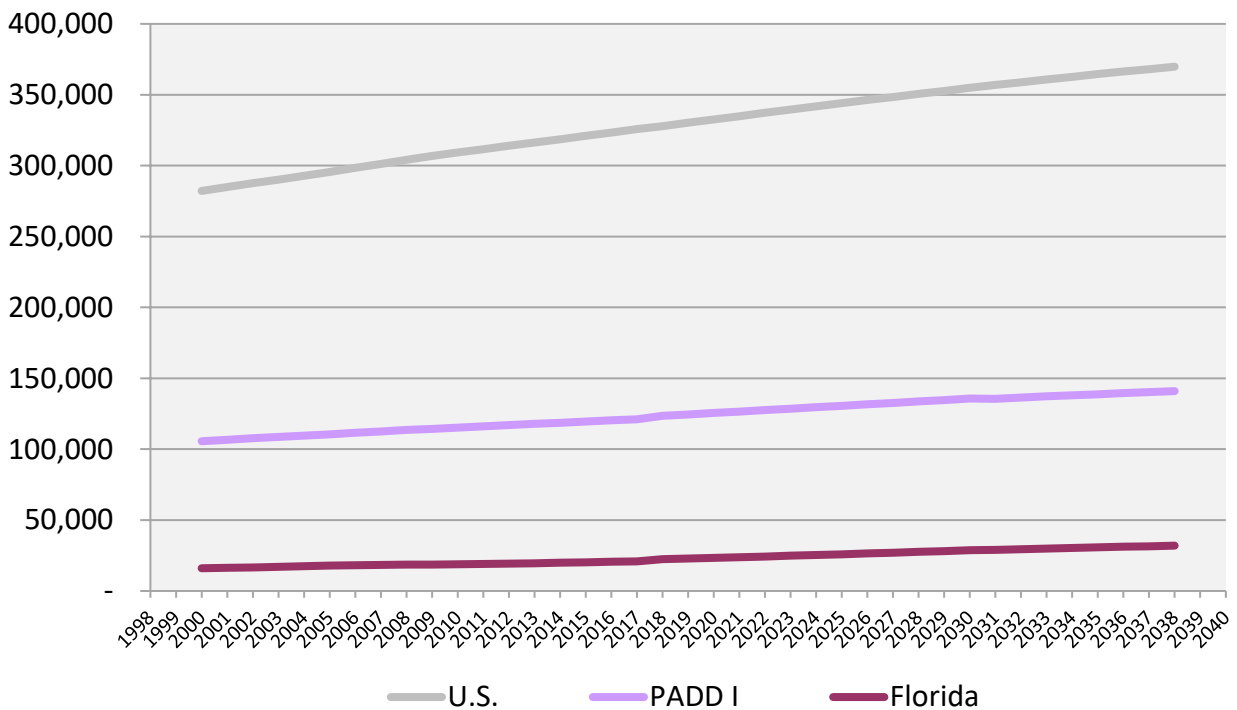
Source: University of Florida BEBR, December 2017

Year	U.S.	PADD I	Florida
2018	327,849	123,588	22,494
2019	330,205	124,584	22,945
2020	332,555	125,577	23,407
2021	334,894	126,572	23,880
2022	337,219	127,571	24,368
2023	339,523	128,576	24,868
2024	341,803	129,585	25,383
2025	344,056	130,599	25,912
2026	346,285	131,620	26,450
2027	348,482	132,645	26,996
2028	350,643	133,678	27,550
2029	352,763	134,717	28,113

2030	354,840	135,764	28,686
2031	356,871	135,541	28,980
2032	358,856	136,361	29,443
2033	360,794	137,162	29,894
2034	362,684	137,943	30,334
2035	364,529	138,706	30,763
2036	366,329	139,450	31,182
2037	368,086	140,176	31,591
2038	369,803	140,974	31,991

Figure 2.4.6: U.S., Florida and PADD I Populations Forecasts, 2019-2038

Source: University of Florida BEBR, December 2017



2.4.3 Future Petroleum Demand Forecast

U.S. refined product demand will experience only moderate growth in the near term. Once vehicle-fleet efficiency gains and a move to electric vehicles take hold, a long-term decline in gasoline demand will kick in. A decline in gasoline demand is expected to average about 2.5 percent per year from 2019 through 2025. Once the 54.5 MPG standards are adopted in 2025, continuous reductions of gasoline demands through 2037 are expected, averaging 1.5 percent per year.

In 2008, gasoline demand in the U.S. was significantly higher than gasoline supply, resulting in gasoline imports of over 700,000 BPD. In addition, another 300,000 BPD of gasoline blendstocks were imported. Primary import sources were Europe, Canada, and the Caribbean. Since 2008, imports of gasoline and blendstocks have fallen by more than 300,000 BPD, as new U.S. refinery capacity has come online, and demand has continued to fall. Gasoline imports are expected to continue to fall faster than earlier estimates, as U.S. refiners continue to run at relatively strong utilization rates, due to low-cost crude and natural gas, along with continued demand declines.

Consumption trends for diesel have not been subject to the trends in vehicle efficiency that have influenced gasoline demand, but are much more closely tied to economic activity and weather changes. The bulk of diesel fuel demand is used in commercial transportation, which moves directly with strength in the economy. Demand for distillate fuel oil in the residential/commercial sectors moves with short-term temperature trends, and has been subject to long-term encroachment by natural gas. Distillate demand grew at an average rate of 0.5 percent from 2000 to 2018. Demand growth for this product closely tracks GDP growth. Demand fell by 6 percent in 2008, and an additional 8 percent in 2009, with the economic downturn. Growth returned in 2010 and 2011, but fell again in 2012 as high prices muted demand. Annual average growth rates through the next two years are expected to average 0.7 percent. Long-term growth in demand is expected to decrease by 0.4 percent on average per year.

Most of the distillate fuel oil consumed in the U.S. is produced domestically. Prior to the Hovensa refinery shutdown, the U.S. East Coast imported diesel in the form of heating oil from the Caribbean. With the substitution of natural gas for heating, along with the Hovensa shutdown, imports have declined significantly. Remaining

heating oil imports today are sourced primarily from local East Coast refineries and Canada. Exports of diesel have increased significantly in recent years, mainly to destinations in Europe. Due to the more robust growth of distillate demand relative to gasoline, refinery production of distillate relative to gasoline will continue to increase.

Other trends in the 2018 Update liquid bulk forecast are as follows:

- Air travel, and therefore jet fuel demand, has recovered from previous lows, due to an improving economy over the last eight years, and is expected to be strong in the near-term.
- The sulfur content of residual fuel oil, specifically bunker fuels, is being reduced, and residual consumption is expected to decline slowly, as natural gas continues to displace residual fuel oil used for electricity generation.

The long-term declines in utility demand and a small amount of industrial demand result in the transportation sector becoming the dominant demand sector for residual fuel oil. This forecast anticipates that residual bunker demand will erode slowly in the long term, with the growing use of gasoil bunkers being the result of new marine pollution regulations. Longer term, these trends result in declining demands for residual fuel oil. Due to the projected recovery in demand growth and the impact of several recent large expansions, crude oil runs continue to increase in the future. The U.S. light product demand saw gains over the last five years, growing at an average rate of just over 1.4 percent through 2017. This growth is expected to continue through 2019, followed by a slight decline from 2020 through the end of the forecast period. PADD I is forecast to follow a similar path, as the U.S. Annual growth rates recovered in 2013 and increased at an average of 1.7 percent per year through 2017. Demand is expected to decline at an average rate of 0.9 percent annually from 2020-2038.

Florida's annual demand growth rate for light products is greater than that of any other state in PADD I. Between 2013 and 2017, Florida's light product demand growth rate averaged 2.5 percent. During the forecast period, Florida's average demand growth for light product is expected to continue to outperform the U.S. and PADD, decreasing slightly from 2021 to 2025, then increasing at an annual growth rate of 0.5 percent through 2038. For the same period, the 12-county

market served by Port Everglades will experience average annual growth of 0.9 percent through 2019, before seeing demand slip to an average annual decline of 0.5 percent through 2038 (see Table 2.4.2).

Table 2.4.2: U.S. Light Product Demand (Percent Change), 2018-2038

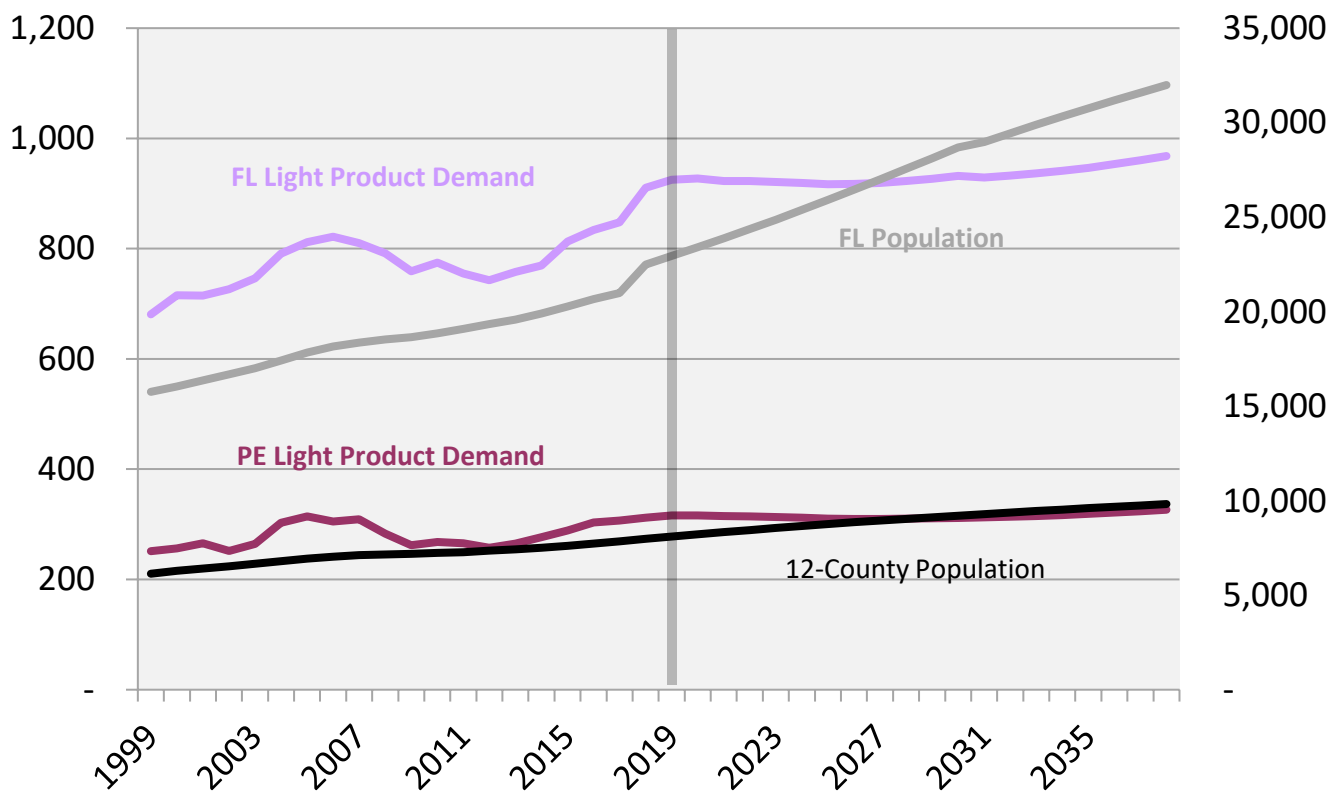
Source: Hatch

	2018	2019	2023	2028	2033	2038
U.S.	0.8%	0.3%	-1.5%	-1.1%	-0.6%	0.0%
PADD I	2.8%	0.4%	-1.4%	-0.9%	-0.5%	0.0%
Florida	7.4%	1.6%	-0.2%	0.4%	0.4%	0.8%
12-County	1.8%	1.0%	-0.9%	-0.7%	-0.3%	0.3%
Port Everglades Throughput	1.6%	1.3%	-0.4%	0.1%	0.5%	0.8%

Total U.S. light product demand is forecast to decline between 2019 and 2038, with a slight rise until 2020, then a decline through the end of the forecast period. PADD I light product demand will shrink from over 5.3 million BPD in 2018 to approximately 4.5 million BPD by 2038. Florida leads all states in PADD I in terms of light product demand volume, and is expected to exceed 927,000 BPD in 2020. This volume will decrease during the following five years, before recovering and reaching upwards of 968,000 BPD by 2038. The 12-county Port Everglades market is expected to fare better than the rest of PADD I, with demand expected to be 323,000 BPD in 2018, then decreasing to 297,000 BPD by 2038 (see Table 2.4.3 and Figure 2.4.7).

Table 2.4.3: U.S. Light Product Demand (Thousands of BPD), 2018-2038*Source: Hatch*

	2018	2019	2023	2028	2033	2038
U.S.	15,079	15,121	14,289	13,340	12,841	12,713
PADD I	5,257	5,276	5,004	4,703	4,515	4,482
Florida	911	925	921	923	936	968
12-County	323	327	317	303	296	297
Port Everglades Throughput	312	316	313	310	315	326

Figure 2.4.7: Florida Light Product Demand (Thousands of BPD), 2019-2038*Source: Hatch*

2.4.4 Market Assessment

Port Everglades competes with other seaports in Florida, as well as with other Gulf Coast, Eastern Seaboard, and Caribbean ports across business sectors. In the petroleum sector, only Port Tampa Bay and JAXPORT currently have diversified liquid-bulk operations on a similar scale to Port Everglades. Upgrades at Port Canaveral have increased its market share, but it remains relatively small on a volume basis. The other ports are primarily oriented around fuel oil operations for ship bunkering, or for supply to local power plants. See Figure 2.4.8.

Of the competing ports within the State, Port Tampa Bay is approximately a 235-mile drive from Port Everglades on the Gulf Coast side of the state. Tampa clearly has a geographical advantage, in terms of supply from Gulf Coast refineries. The petroleum products must, however, be trucked over 80 miles from Tampa across the State, to penetrate the outer 12-county market served by Port Everglades. In 2014, Port Tampa Bay increased capacity, which resulted in increased petroleum throughput, but has since flattened. It is unlikely that Port Everglades will lose market share, given its strong competitive advantages, including flexible operations and receiving manifolds that are preferred by terminal operators.

Port Manatee is 35 miles South of Port Tampa Bay, and about a 210-miles drive from Port Everglades. The receipts at this port have been primarily residual fuel oil for bunkering, and supplying the nearby Florida Power & Light (FPL) power plant. Conversion of the FPL plant to gas sources has caused residual fuel oil throughput to decline to negligible levels.

JAXPORT is located approximately 320 miles North of Port Everglades on the Atlantic Coast of Florida. JAXPORT has a location advantage, in terms of supplies from New York harbor and European imports. To penetrate the outer 12-county market served by Port Everglades, however, products must be trucked over 170 miles, which is beyond the typical trucking range.

Port Canaveral is located approximately 170 miles North of Port Everglades and is within trucking range of counties served by Port Tampa Bay, Port Everglades, and JAXPORT. It is also ideally located to serve the growing Orlando market. In addition to residual fuel oil, Port Canaveral currently receives small volumes of light refined products, but not enough to satisfy the demand in its surrounding area. Port Canaveral has seen significant increases in petroleum throughput since expanding

in 2009, but still remains relatively smaller than Port Everglades, Port Tampa Bay, and JAXPORT.

Port *Miami* is located 35 miles South of Port Everglades along the Atlantic Coast. Port *Miami*'s liquid bulk volumes consist primarily of residual fuel oil for ship bunkering.

Port of Palm Beach is located approximately 50 miles North of Port Everglades, also on the Atlantic Ocean. Essentially all liquid bulk volume moving through Port of Palm Beach is residual fuel oil for power plant use. A terminal completed in 2007 was intended to bring more diesel fuel into the market; however, diesel volumes have remained fairly low since the expansion, as U.S. refiners shifted focus to supply growing Latin American demand.

As indicated in the 2014 Update, trucking companies state that the typical range for truck deliveries is 120 to 130 miles, with rare runs up to as much as 200 miles. Figure 2.4.8 shows radii of 130 miles around each port, indicating the areas of potential overlap of supply. The more typical run distance of 120 to 130 miles is approximately halfway between Port Tampa Bay and Port Everglades, so there can be competition at the outer edges of each port's delivery range. Additionally, Port Canaveral has the opportunity to compete in the ranges of Port Tampa Bay, Port Everglades, and JAXPORT.

As shown in Figure 2.4.8, the greatest overlap is between Port Canaveral and Port Tampa Bay. The Central Florida pipeline, owned by Kinder Morgan, which runs from Tampa to Orlando, gives Port Tampa Bay a significant cost advantage over trucking products to the area. Port Canaveral is, however, located much closer to the area, and will be competitive in this overlapping region. Because of the high waterborne delivery cost from the Gulf Coast and distance from Port Everglades, JAXPORT is not expected to be a significant competitor for Port Everglades. JAXPORT's proximity to the U.S. East Coast refineries may, however, allow it to receive petroleum products at a slightly lower price from Northeastern and Canadian refineries, as compared to Port Everglades.

The petroleum throughput for the 2005-2017 period for the major Florida ports is based on waterborne commerce data collected by the U.S. Army Corps of Engineers (USACE). See Figure 2.4.9. As this chart shows, Port Everglades, Port Tampa Bay, and JAXPORT handle the majority of liquid bulk petroleum products coming into

the State, with Port Tampa Bay (#1) and Port Everglades (#2) being the largest two ports by volume, by a significant margin. Receipts had been growing at most ports through 2004, but that growth slowed or declined in 2006, due to the high price environment for transportation fuels. The only port that has seen growth in total petroleum products received since 2006 is Port Canaveral, due to its capacity upgrade. The 2016 total for Port Everglades is slightly lower than the peak reached in 2004, while Port of Tampa Bay's 2017 totals are significantly lower than its peak in 2004. In 2016, Port Everglades received only 1.6 percent less petroleum product than Tampa, and if growth continues at the same rate, it will soon receive the most petroleum products of all ports in Florida.

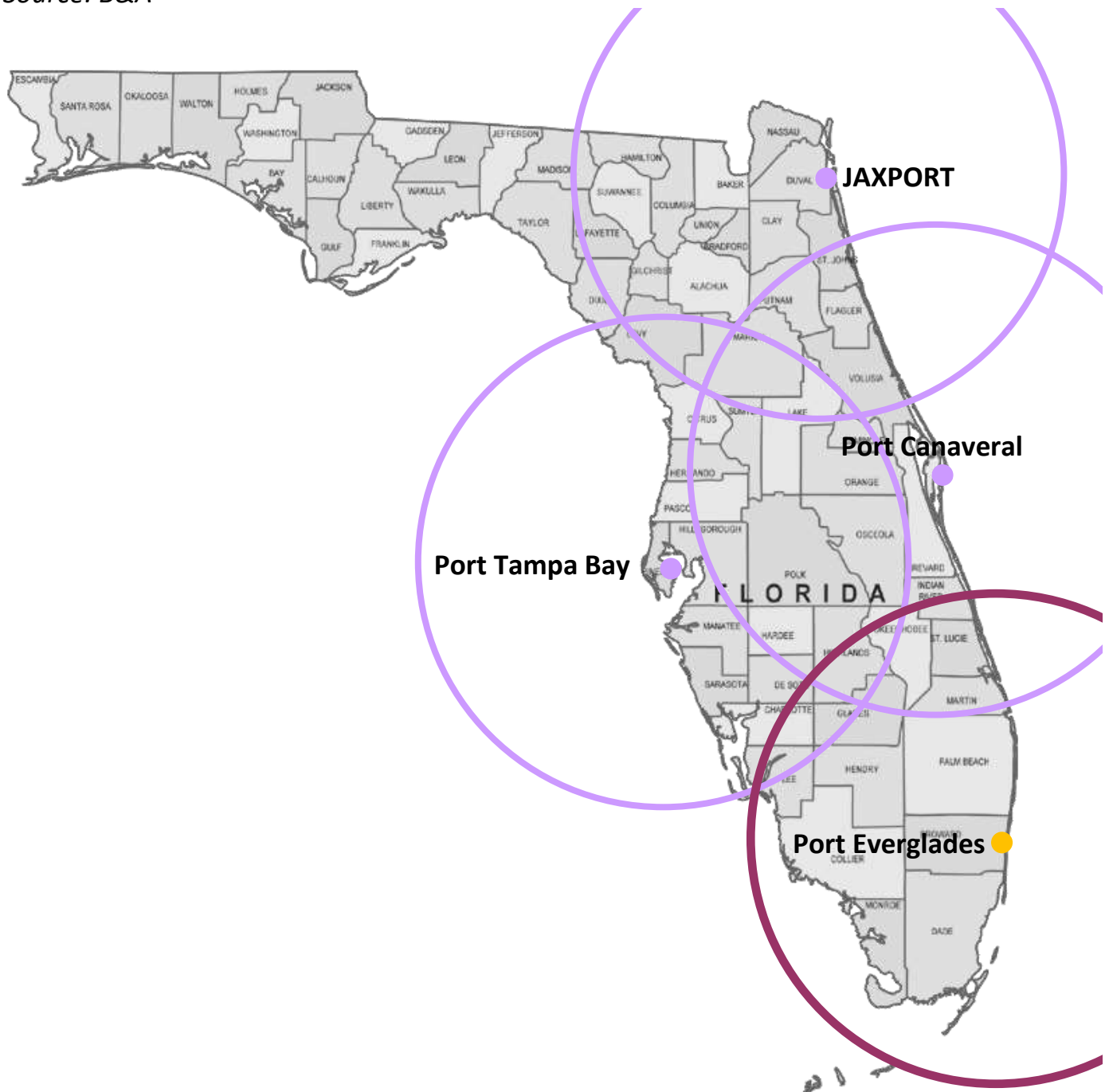
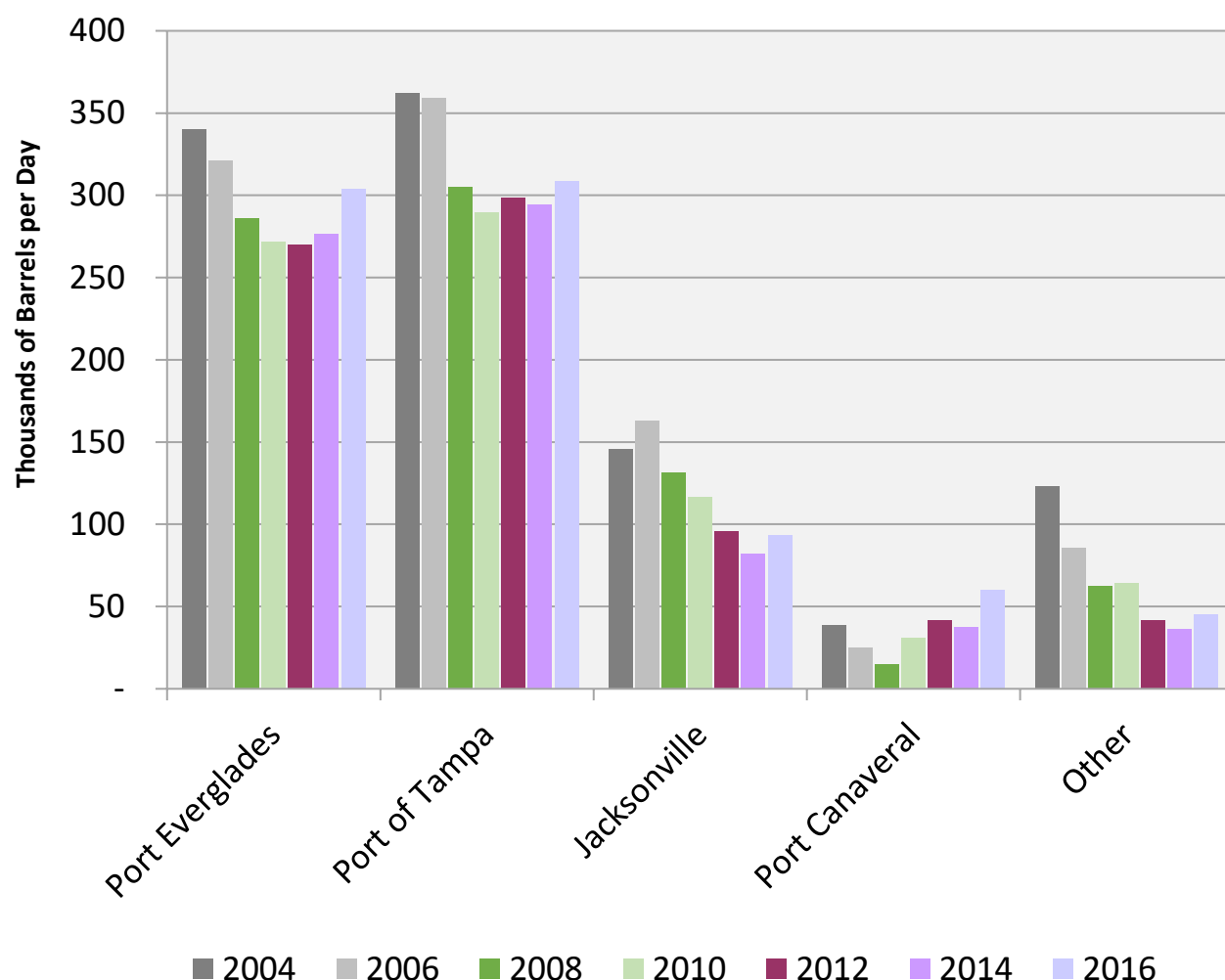
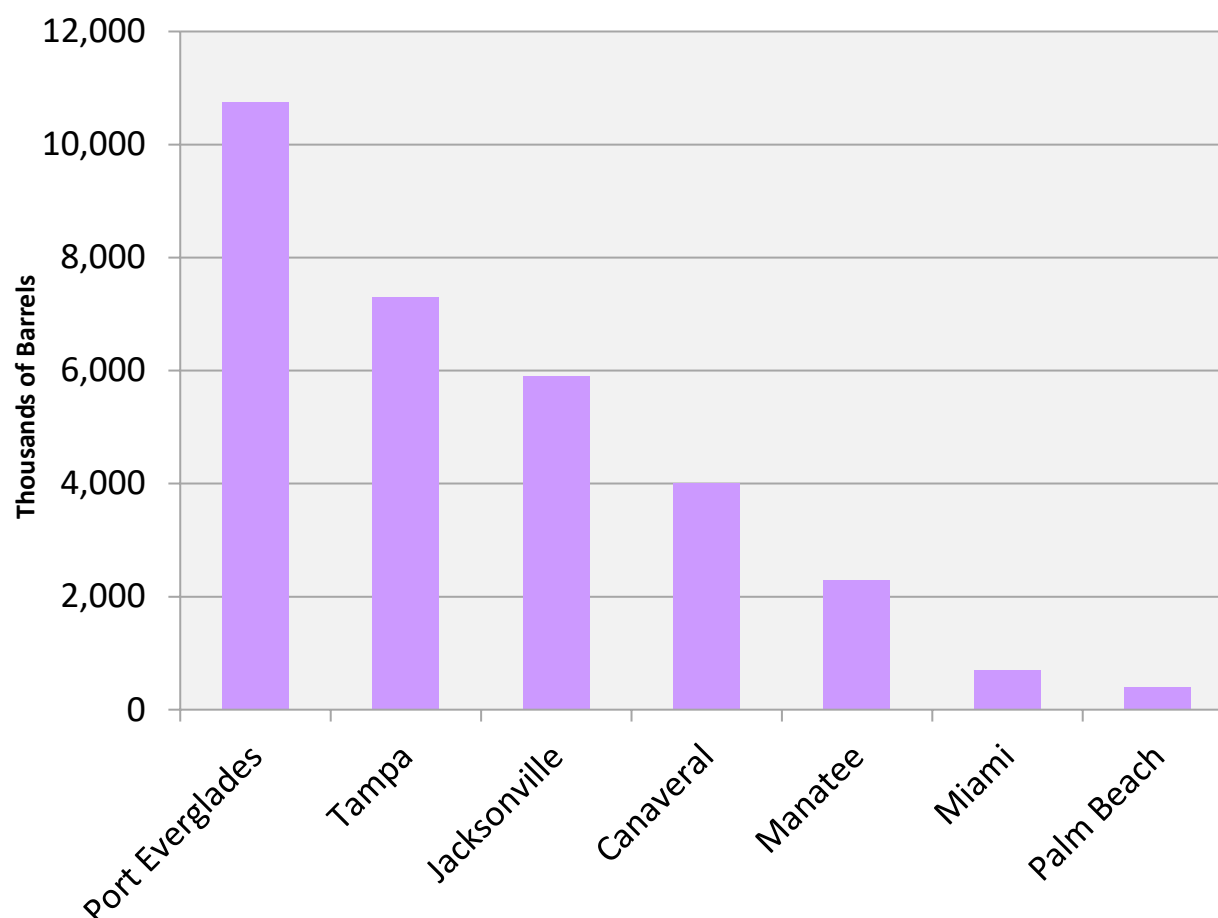
Figure 2.4.8: Competitor Port Supply Area Overlap*Source: B&A*

Figure 2.4.9: Total Waterborne Petroleum Products Received, 2004-2016*Source: USACE*

The addition of approximately 5.1 million barrels of storage capacity in 2009 represents an almost 24 percent increase over the capacity available in 2005. Faced with low product demand, due to the recession of 2009, most of the new capacity has been underutilized through 2018. Port Everglades saw a slight reduction in capacity in 2013. FPL removed 885,000 barrels of fuel oil capacity as part of its modernization project to utilize gas for power generation, in place of fuel oil. This change was reflected in the Port Everglades capacity estimates, for the purposes of this market assessment. The estimated storage capacity at each port is shown in Figure 2.4.10.

Figure 2.4.10: Estimated Storage Capacity, 2018*Source: Hatch*

2.4.5 Competitor Port Activity and Capabilities

Port Canaveral

Since its capacity upgrade, Port Canaveral has gained market share, and is increasing its role in the supply of petroleum products to the State of Florida. Port Canaveral is well-known as a significant cruise port, and has historically not received large amounts of light refined products. Volumes had been relatively steady until 2009, although at levels below the early part of the decade (see Table 2.4.4.). Volumes more than doubled after the capacity upgrade, with most of the growth due to increased gasoline movements. Since 2012, the port has experienced year-over-year growth, surpassing its 2003 peak in 2016. The total storage capacity at Port Canaveral's liquid-bulk facilities is currently around 4 million barrels.

Table 2.4.4: Port Canaveral Petroleum Products Received, (A Thousand Barrels per Day), 2008-2017*Source: Hatch*

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Gasoline	7	8	19	34	28	22	19	31	29	31
Distillate	4	5	9	11	12	12	14	15	15	16
Kerosene	-	-	1	1	-	3	-	-	13	16
Residual Fuel Oil	4	4	1	2	2	0	2	-	-	-
Asphalt	-	-	-	-	-	-	-	-	-	-
Total	15	17	30	48	42	38	36	46	57	64

With the shutdown of the Hovensa refinery, most of the new gasoline shipments into Port Canaveral were sourced from Europe and the U.S. Gulf Coast. Port Canaveral's primary competitive points will likely be along the more heavily populated coastline to the north and south, and potentially the nearby market of Orlando. The majority of the Canaveral expansion has affected the Jacksonville and Tampa markets, with negligible effects on Everglades' petroleum volumes.

Port of Palm Beach

The port of Palm Beach is located just to the North of Port Everglades. It primarily serves as a distribution center for cargo received by the larger ports, and is destined for the smaller ports in the Caribbean and Central America. In the past, Port of Palm Beach had a small petroleum operation focused on residual fuel oil for the nearby power plant, and for bunkering (see Table 2.4.5). With the conversion of FPL power plants to utilize historically low-priced natural gas, residual fuel oil and overall petroleum imports are negligible, and are expected to stay that way.

Port of Palm Beach has received small amounts of diesel fuel in recent years. The volume was expected to rise when their terminal was expanded in 2007. Vecenergy constructed a new 150,000 barrel diesel fuel terminal, and leased the storage to Valero. The terminal received its first cargo of diesel fuel in October 2007. With Valero expanding its refineries in Port Arthur, TX, and St. Charles, LA, to produce more fuels, it was thought that some of this volume would supply the new Palm Beach terminal. Strong diesel demand growth in Latin America, Mexico, and Europe

has since shifted U.S. diesel exports to those regions, and away from domestic ports. Additionally, Port of Palm Beach faces draft limitations on vessels that may call at the port. The entrance channel is only 33 feet deep, as are the deepest berths in the port. A study is currently underway by the USACE to deepen the entrance channel to 42 feet.

Table 2.4.5: Port of Palm Beach Petroleum Products Received (A Thousand Barrels per Day), 2008-2017

Source: Hatch

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Gasoline	1	0	0	0	2	0	1	1	0	0
Distillate	2	3	5	0	1	1	0	1	2	2
Kerosene	0	0	-	0	-	0	1	-	0	0
Residual Fuel Oil	9	5	5	2	0	0	0	0	0	0
Asphalt	0	0	1	1	1	0	0	0	1	2
Total	12	8	11	3	4	1	2	2	3	4

Port Tampa Bay and Port Manatee

Through 2017, Port Tampa Bay remains the largest port in Florida, in terms of petroleum product volume received (see Table 2.4.6), though by a slim margin. It has an advantage over Port Everglades in its proximity to the refineries on the Gulf Coast, resulting in lower transportation costs for domestically sourced fuels. Port Tampa Bay also has the ability to move petroleum products to the large and growing Orlando market, via the Central Florida pipeline, which further reduces transportation costs, as compared to trucking those volumes to Orlando. Volumes received by Port Tampa Bay had been growing steadily, but declined in 2006, as a result of falling demand induced by high fuel prices. Volumes of both gasoline and distillate have also fallen and remained flat since 2009, due to increased competition from Port Canaveral and lower foreign shipments (because of Caribbean refinery shutdowns).

Port Tampa Bay has less storage capacity than Port Everglades, which takes away some operational flexibility. This limitation results in higher utilization rates (inventory turns) and more frequent refined product deliveries, which could place

a limit on Port Tampa Bay's ability to meet demand increases in its service area. Port Tampa Bay leadership recognizes this potential limitation, noting as far back as 2008 that utilization rates were nearing the maximum for unscheduled vessel arrivals.

Table 2.4.6: Port Tampa Bay Petroleum Products Received (A Thousand Barrels per Day), 2008-2017

Source: Hatch

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Gasoline	237	197	221	214	228	215	227	225	198	196
Distillate	58	57	55	55	58	52	56	59	59	58
Kerosene	-	-	-	-	-	-	-	5	33	42
Residual Fuel Oil	2	0	2	2	3	1	3	8	3	2
Asphalt	0	6	5	6	6	7	6	6	8	8
Total	298	261	283	276	295	275	293	303	300	306

In 2012, Port Tampa Bay completed its Gateway Rail Project, in partnership with CSX Corporation and Kinder Morgan Energy Partners. This completion marked the first on-dock multipurpose unit train facility for ethanol in Florida. Also in 2012, Port Tampa Bay received \$22.5 million in state funds for the modernization and expansion of its primary liquid-bulk terminal complex. This refurbishment, completed in 2014 at a cost of approximately \$60 million, is comprised of three berths and manifolds, pipelines, and related facilities. The entrance channel to Port Tampa Bay ranges from 43-45 feet in depth, with an operating draft of 41 feet. As such, it is able to accommodate most of the product tankers that would be expected to make deliveries there.

Port Manatee has not typically received large volumes of light refined products. The petroleum terminal capabilities at Port Manatee are much smaller than at Port Tampa Bay, and are focused on residual fuel oil (for power plants or bunker fuel). In recent years, Port Manatee has seen fuel oil imports drop to nearly zero, after FPL substantially reduced demand for fuel oil, in light of low natural gas prices.

PortMiami

Like Port Canaveral, PortMiami is also well-known for its cruise operations. Prior to 2003, nearly all the petroleum volume that PortMiami received was residual fuel oil, but recently, it has also included more diesel fuel (see Table 2.4.7). PortMiami has not sustained its fuel oil imports over the past years, and now mainly receives a minor volume of diesel fuel.

Table 2.4.7: PortMiami Petroleum Products Received (A Thousand Barrels per Day), 2008-2017

Source: Hatch

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Gasoline	0	0	1	2	1	0	0	0	0	0
Distillate	6	10	11	11	9	9	9	6	8	9
Kerosene	0	0	0	-	-	0	0	0	0	0
Residual Fuel Oil	9	10	5	2	3	3	1	2	1	1
Asphalt	0	0	0	0	0	0	0	0	0	0
Total	16	21	17	14	12	12	10	8	9	10

JAXPORT

JAXPORT receives the third largest volume of petroleum products among Florida's ports. Total petroleum products moved through JAXPORT fell in 2001/2002, but rebounded to prior levels by 2003. Volume grew in 2004, but dropped again by 2006, as the impact of high fuel prices reduced demand. Volumes continued to fall to 2015, in the face of reduced demand and increasing competition from new capacity upgrades at Port Canaveral (see Table 2.4.8).

Table 2.4.8: JAXPORT Petroleum Products Received (A Thousand Barrels per Day), 2008-2017*Source: Hatch*

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Gasoline	59	50	45	46	50	48	51	53	62	61
Distillate	52	48	55	49	31	22	21	23	25	24
Kerosene	0	-	0	-	-	0	-	-	1	1
Residual Fuel Oil	17	11	14	13	11	8	7	4	3	2
Asphalt	0	1	2	1	2	2	2	1	0	0
Total	130	110	115	109	95	81	81	81	91	89

JAXPORT volumes are likely to be constrained at current levels, or face further competition from Port Canaveral. JAXPORT is located too far from Port Everglades to provide much direct competition. As the Port Canaveral expansion came online, it appears that some of the displaced JAXPORT volume pushed into areas currently served by Port Tampa Bay, reducing overall throughput.

2.4.6 Caribbean Refining Capacity

Hess Oil Virgin Islands built and began operating a 45,000-BPD refinery on the south shore of St. Croix in 1966. By 1974, the refinery had been expanded to 650,000-BPD, making it the largest refinery in the world. In 1998, the Hess subsidiary joined with PDVSA's Virgin Islands subsidiary to create Hovensa. In 2011, Hovensa's refining capacity was cut to 350,000-BPD, but the facility remained a major product supplier to the U.S., specifically the Atlantic Coast market, which claimed 85 percent of Hovensa's exports to the U.S. in 2011.

Although Hovensa was a major supplier to the U.S. market with the ability to source low-sulfur crude from Africa and some higher-sulfur crude from Venezuela, it lost money. In January 2012, Hess and PDVSA announced the shutdown of their U.S. Virgin Islands Hovensa refinery after suffering three-year losses of \$1.3 billion, due to lack of access to low-cost crude and natural gas seen in the continental United States. The company's chairman cited new refining capacity in emerging markets and the global economic slowdown as the reasons for the refinery's closure. The

primary disadvantage for Hovensa was its fuel source. U.S. refiners use low-cost natural gas for power, while Hovensa utilized fuel oil for power. As of 2018, BP and the Virgin Islands government are in negotiations to restart Hovensa's refinery operations. If this refinery were to reopen, the impact on Port Everglades throughput levels is expected to be insignificant. The rationale for reopening the refinery would be to process cheap low-sulfur crude from U.S. shale production and supply it to the global market.

2.4.7 Port Everglades Petroleum Product Volume Projections

Table 2.4.9 and Figure 2.4.10 illustrate the Port Everglades petroleum throughput forecast. Total throughput volumes are expected to grow from over 322,000 BPD in 2017 to nearly 355,000 BPD by 2038. Gasoline continues to be the leading product; however, due to more rapid growth in diesel and jet demand, the percentage of the throughput attributed to gasoline decreases during the forecast period – from 52 percent of the total in 2018 to 38 percent by 2038. Jet fuel throughput will see strong growth over the planning period, with the percentage of throughput increasing from 27 percent in 2018 to 41 percent in 2038. Historical data shown is for fiscal years, while projections are based on calendar year.

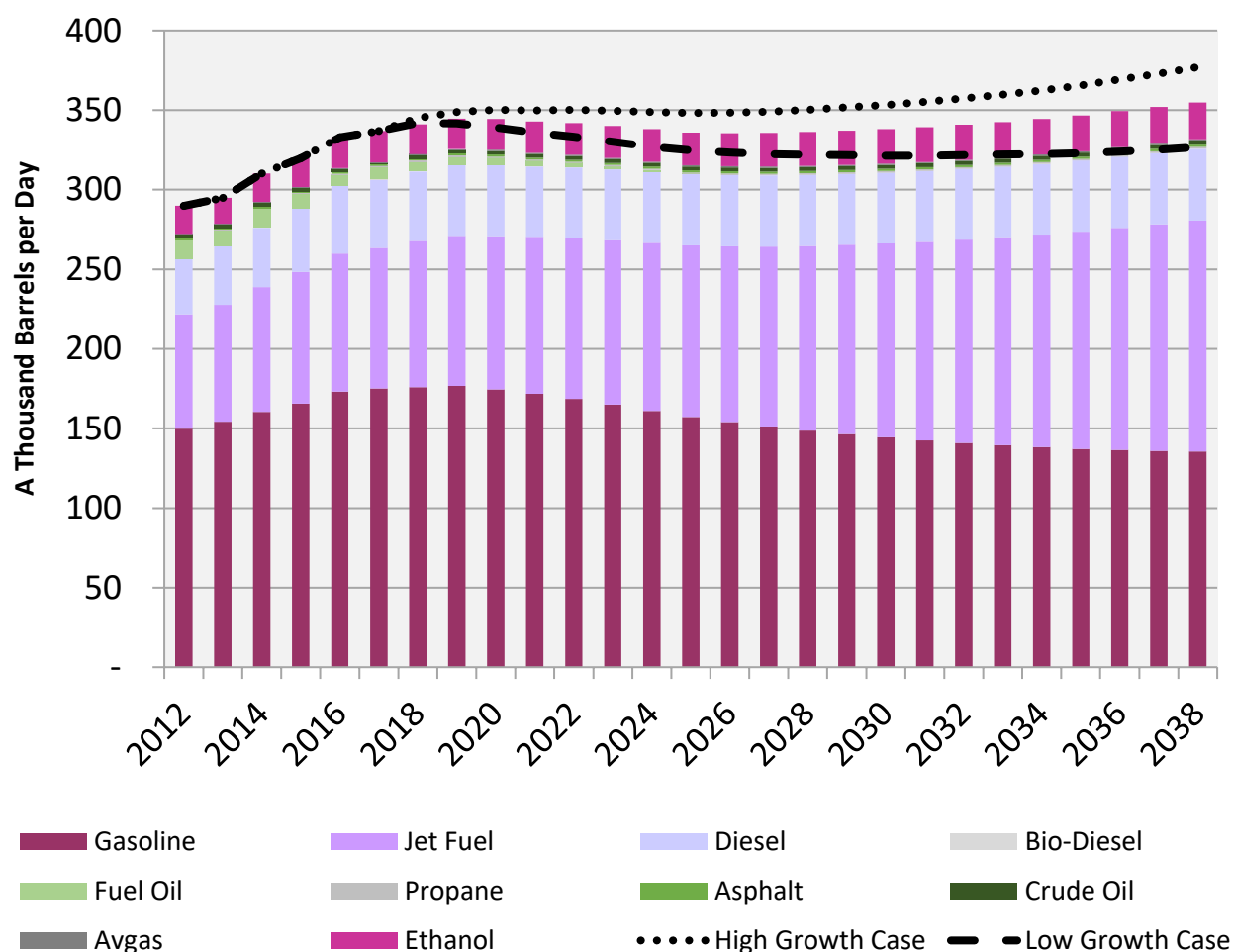
Table 2.4.9: Port Everglades Petroleum Throughput (A Thousand Barrels per Day), 2008-2017 and 2018-2038*

Source: Hatch

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Gasoline	170	158	155	151	150	154	160	165	173	175
Jet Fuel	72	68	75	76	72	73	78	83	87	88
Diesel	39	35	38	38	35	37	37	40	43	43
Fuel Oil	15	16	15	13	11	10	11	9	7	7
Asphalt	2	2	2	1	1	1	1	1	1	1
Crude Oil	2	2	2	2	3	2	2	2	2	1
Propane	2	1	1	1	0	0	1	0	1	1
Avgas	1	1	1	1	1	1	1	1	1	1
Bio-Diesel	1	0	0	-	0	0	-	-	-	-
Ethanol (Vessel)	7	15	16	15	18	16	18	18	19	20
Total	311	298	305	296	288	293	296	305	316	322

Year	2018	2019	2023	2028	2033	2038
Gasoline	176	177	165	149	140	135
Jet Fuel	92	94	103	116	131	145
Diesel	44	44	45	45	44	45
Fuel Oil	6	5	2	0	0	0
Asphalt	1	1	1	1	1	2
Crude Oil	2	2	2	2	2	2
Propane	1	1	1	1	1	1
Avgas	1	1	1	1	1	1
Bio-Diesel	0	0	0	0	0	0
Ethanol (Vessel)	19	19	20	21	22	23
Total	341	345	340	336	342	355

**Note: due to rounding, numbers may not total*

Figure 2.4.11: Port Everglades Liquid Bulk Throughput Projections, 2012-2038**Source: Hatch*

**Note: this is the same chart presented in Figure 2.4.2*

Gasoline

Gasoline projections are derived from a historical analysis of consumption on a per-capita basis, using the county population, and forecasts to county-level demand. Gasoline growth and population growth rate projections, as well as the demand per capita, are shown in Tables 2.4.10 and 2.4.11 for the U.S., PADD I, and Florida. For the U.S. as a whole, per-capita demand for gasoline was at about 10.4 barrels per person per year in 2017, which is expected to fall to 6.5 barrels per person per year by 2038. PADD I and Florida growth rates and per-capita demand for the same periods are shown for comparison.

Total U.S. demand for gasoline is expected to exceed 9.4 million BPD in 2018. Florida will lead all states in PADD I, with a gasoline demand volume of approximately 640,000 BPD this year.

Figure 2.4.12: Port Everglades Liquid Bulk Berths and Storage Facilities

Source: Sun Sentinel; Port Everglades



Table 2.4.10: U.S. Population and Gasoline Consumption Growth Rates, 2012-2038*Source: Hatch*

Year	United States			PADD I			Florida		
	% Population	% Gasoline	Demand per Capita	% Population	% Gasoline	Demand per Capita	% Population	% Gasoline	Demand per Capita
2012	0.75%	-0.81%	10.09	0.74%	-1.09%	9.62	1.28%	-0.19%	9.91
2013	0.71%	1.85%	10.21	0.66%	-1.62%	9.40	1.26%	2.24%	10.01
2014	0.76%	0.88%	10.22	0.70%	1.91%	9.51	1.60%	1.22%	9.97
2015	0.76%	2.88%	10.43	0.71%	3.07%	9.74	1.86%	5.20%	10.30
2016	0.74%	1.51%	10.52	0.69%	1.73%	9.84	1.91%	3.68%	10.48
2017	0.72%	0.02%	10.44	0.69%	1.17%	9.88	1.59%	0.89%	10.40
2018	0.65%	0.46%	10.42	1.99%	1.84%	9.87	7.19%	6.99%	10.38
2019	0.72%	-0.30%	10.32	0.81%	-0.21%	9.77	2.00%	0.97%	10.28
2020	0.71%	-1.99%	10.04	0.80%	-1.91%	9.51	2.01%	-0.73%	10.00
2021	0.70%	-2.27%	9.74	0.79%	-2.18%	9.23	2.02%	-0.99%	9.71
2022	0.69%	-2.47%	9.44	0.79%	-2.37%	8.94	2.04%	-1.16%	9.40
2023	0.68%	-2.66%	9.12	0.79%	-2.56%	8.64	2.05%	-1.34%	9.09
2024	0.67%	-2.90%	8.80	0.79%	-2.79%	8.33	2.07%	-1.56%	8.77
2025	0.66%	-2.94%	8.49	0.78%	-2.82%	8.03	2.09%	-1.57%	8.45
2026	0.65%	-2.44%	8.23	0.78%	-2.31%	7.79	2.07%	-1.06%	8.19

Table 2.4.11: Projected Gasoline Demand (A Thousand Barrels per Day), 2018-2038*Source: Hatch*

	2018	2019	2023	2028	2033	2038
U.S.	9,362	9,334	8,488	7,479	6,905	6,608
PADD I	3,341	3,334	3,043	2,699	2,485	2,385
Florida	640	646	619	585	570	570
12-County	227	228	213	192	180	175
Port Everglades Throughput	176	177	165	149	140	135

By 2038, total U.S. demand for gasoline is expected to decline to about 6.6 million BPD, but Florida's demand will increase fairly significantly, to just under 570,000

BPD. The 12-county market served by Port Everglades will consume over 227,000 BPD of gasoline in 2018, and this consumption is expected to remain relatively flat until 2020, before declining to 175,000 BPD by 2038. The decline after 2025 is due to new fuel-efficiency standards, a move to electric vehicles, and fleet turnover.

Figure 2.4.13: Electric Vehicle Charging Station in Broward County

Source: sun-sentinel.com



Port Everglades' historical throughput provides about 77 percent of this 12-county demand. Since Port Everglades saw no real effects on petroleum throughput from the Port Canaveral project, it can be assumed that the port will continue to supply around 77 percent of demand in the future.

Diesel

Diesel projections are based on a historical consumption analysis (like gasoline), placed on a per capita basis using the state population, and forecast to PADD-level demand. Diesel growth and population growth rate projections, as well as per capita demand, are shown in Tables 2.4.12 and 2.4.13 for the U.S., PADD I, and Florida.

For the U.S. as a whole, per capita demand for diesel is expected to remain fairly flat at about 4.5 barrels per person per year until 2020, after which time it will likely

fall to 3.8 barrels per person per year by 2038. PADD I and Florida growth rates and per capita demand for the same periods are shown for comparison.

Total U.S. demand for diesel will exceed 4.0 million B/D in 2018. By 2038, the total U.S. demand for diesel will slightly decrease to 3.8 million B/D and Florida will consume nearly 197,000 B/D.

The 12-county market served by Port Everglades will consume about 58,000 B/D of diesel fuel in 2018 and this consumption will grow to 61,000 B/D by 2038. The throughput of Port Everglades' historically provided about 75 percent of this demand.

Table 2.4.12: Projected Diesel Demand (A Thousand Barrels per Day), 2018-2038

Source: Hatch

	2018	2019	2023	2028	2033	2038
U.S.	4,038	4,082	4,003	3,921	3,833	3,844
PADD I	1,267	1,281	1,261	1,244	1,212	1,219
Florida	164	168	174	183	188	197
12-County	58	59	60	60	60	61
Port Everglades Throughput	44	44	45	45	44	45

Table 2.4.13: U.S. Population and Diesel Consumption Growth Rates, 2012-2038*Source: Hatch**United Padd 1 Flo*

Year	United States			PADD-1			Florida		
	% Population	% Gasoline	Demand per Capita	% Population	% Gasoline	Demand per Capita	% Population	% Gasoline	Demand per Capita
2012	0.75%	-4.05%	4.35	0.74%	-6.07%	3.38	1.28%	-3.25%	2.39
2013	0.71%	2.30%	4.42	0.66%	8.86%	3.65	1.26%	5.67%	2.49
2014	0.76%	5.49%	4.62	0.70%	5.34%	3.82	1.60%	1.91%	2.50
2015	0.76%	-1.04%	4.54	0.71%	-0.16%	3.79	1.86%	6.58%	2.61
2016	0.74%	-2.95%	4.38	0.69%	-5.24%	3.57	1.91%	1.18%	2.59
2017	0.72%	1.57%	4.41	0.69%	1.19%	3.58	1.59%	2.45%	2.62
2018	0.65%	2.54%	4.50	1.99%	6.44%	3.74	7.19%	9.20%	2.67
2019	0.72%	1.08%	4.51	0.81%	1.17%	3.75	2.00%	2.37%	2.68
2020	0.71%	0.33%	4.49	0.80%	0.42%	3.74	2.01%	1.63%	2.67
2021	0.70%	-2.04%	4.37	0.79%	-1.96%	3.64	2.02%	-0.76%	2.59
2022	0.69%	-0.06%	4.34	0.79%	0.03%	3.61	2.04%	1.27%	2.57
2023	0.68%	-0.17%	4.30	0.79%	-0.06%	3.58	2.05%	1.19%	2.55
2024	0.67%	-0.20%	4.27	0.79%	-0.09%	3.55	2.07%	1.18%	2.53
2025	0.66%	-0.40%	4.22	0.78%	-0.27%	3.51	2.09%	1.02%	2.50
2026	0.65%	-0.36%	4.18	0.78%	-0.23%	3.48	2.07%	1.05%	2.48
2027	0.63%	-0.53%	4.13	0.78%	-0.38%	3.44	2.06%	0.89%	2.45
2028	0.62%	-0.56%	4.08	0.78%	-0.41%	3.40	2.05%	0.85%	2.42
2029	0.60%	-0.57%	4.03	0.78%	-0.39%	3.36	2.04%	0.86%	2.39
2030	0.59%	-0.44%	3.99	0.78%	-0.26%	3.32	2.04%	0.99%	2.37
2031	0.57%	-0.44%	3.95	-0.16%	-1.17%	3.29	1.03%	0.01%	2.34
2032	0.56%	-0.43%	3.91	0.61%	-0.38%	3.26	1.59%	0.60%	2.32
2033	0.54%	-0.39%	3.88	0.59%	-0.34%	3.23	1.53%	0.59%	2.30
2034	0.52%	-0.16%	3.85	0.57%	-0.12%	3.20	1.47%	0.78%	2.28
2035	0.51%	0.01%	3.83	0.55%	0.05%	3.19	1.42%	0.91%	2.27
2036	0.49%	0.14%	3.82	0.54%	0.19%	3.18	1.36%	1.01%	2.26
2037	0.48%	0.10%	3.80	0.58%	0.21%	3.17	1.31%	0.93%	2.26
2038	0.47%	0.20%	3.79	0.51%	0.24%	3.16	1.27%	0.99%	2.25

Jet Fuel

Kerosene-type jet fuel projections are based on a historical analysis of consumption, and placed on a per-flight basis, using the FAA's airport operations summaries, and forecast to PADD-level demand.

As previously discussed, all other states in PADD I are allocated on PADD-level FAA airport operations data, and state-level FAA airport operations data. Kerosene-type

jet fuel growth and airport operations growth rate projections, as well as the demand per flight, are shown in Tables 2.4.14 and 2.4.15 for the U.S., PADD I, and Florida.

For the U.S. as a whole, per-flight demand for jet fuel is remaining flat, due to efficiency improvements for the passenger and cargo airline fleet, along with improved operational efficiencies. PADD I and Florida growth rates and per-flight demand for the same periods are shown for comparison in the respective tables.

Total U.S. demand for kerosene-type jet fuel will be nearly 1.7 million BPD in 2018. Florida is a large consumer of jet fuel in PADD I, with a demand volume of approximately 109,000 BPD in 2018. By 2038, demand is expected to grow over 40 percent to 154,000 BPD. Total U.S. demand for kerosene-type jet fuel will likely grow to almost 2.3 million BPD.

Table 2.4.14: Projected Jet Fuel Demand (A Thousand Barrels per Day), 2018-2038

Source: Hatch

	2018	2019	2023	2028	2033	2038
U.S.	1,679	1,706	1,799	1,940	2,103	2,262
PADD I	641	652	689	745	810	873
Florida	109	111	119	130	142	154
12-County	20	21	23	26	29	32
Port Everglades Throughput	92	94	103	116	130	145

Port Everglades provides 100 percent of the jet fuel demand at FLL, MIA, and PBI, and approximately 50 percent at RSW. To develop the forecast, historical Port Everglades throughput was compared to the airport operations for these airports. A relationship was established and applied to projected state demand, to forecast the Port Everglades demand.

Port Everglades' demand is projected to grow at an average of 2.3 percent annually from 2018 to 2038, and PADD I is projected to average 1.6 percent annual growth over the same period. The Port Everglades market will consume almost 92,000 BPD

of kerosene-type jet fuel in 2018. and this consumption is forecast to grow to over 145,000 BPD by 2038.

Figure 2.4.14: FLL, MIA and PBI Airports

Source: youtube.com; thenextmiami.com; airportimprovement.com



Table 2.4.15: U.S. Population and Jet Fuel Consumption Growth Rates, 2012-2038*Source: Hatch*

Year	United States			PADD-1			Florida		
	%-Population	%-Gasoline	Demand-per-Capita	%-Population	%-Gasoline	Demand-per-Capita	%-Population	%-Gasoline	Demand-per-Capita
2012	-0.98%	-1.89%	0.0083	-0.10%	-1.09%	0.0104	-0.35%	-7.15%	0.0069
2013	-1.50%	2.58%	0.0087	-2.33%	4.61%	0.0112	0.58%	-4.17%	0.0065
2014	-1.06%	2.51%	0.0090	-1.20%	-0.53%	0.0112	-0.61%	3.22%	0.0068
2015	0.09%	5.31%	0.0094	0.72%	1.24%	0.0113	3.77%	6.79%	0.0070
2016	-0.02%	4.26%	0.0098	0.12%	1.75%	0.0115	1.23%	8.68%	0.0075
2017	0.40%	4.21%	0.0102	0.25%	3.61%	0.0119	1.00%	4.84%	0.0078
2018	0.99%	-0.18%	0.0101	1.19%	6.51%	0.0125	1.11%	-0.06%	0.0077
2019	0.76%	1.59%	0.0102	0.85%	1.69%	0.0126	1.06%	1.89%	0.0078
2020	0.64%	1.12%	0.0102	0.69%	1.17%	0.0126	0.98%	1.46%	0.0078
2021	0.52%	1.56%	0.0103	0.55%	1.59%	0.0128	0.92%	1.97%	0.0079
2022	0.50%	1.45%	0.0104	0.53%	1.47%	0.0129	0.92%	1.87%	0.0080
2023	0.65%	1.20%	0.0105	0.71%	1.26%	0.0130	0.96%	1.51%	0.0080
2024	0.79%	1.39%	0.0106	0.85%	1.46%	0.0130	1.00%	1.61%	0.0080
2025	0.81%	1.44%	0.0106	0.88%	1.50%	0.0131	1.01%	1.63%	0.0081
2026	0.82%	1.47%	0.0107	0.89%	1.54%	0.0132	1.02%	1.67%	0.0081
2027	0.84%	1.56%	0.0108	0.91%	1.63%	0.0133	1.03%	1.76%	0.0082
2028	0.85%	1.78%	0.0109	0.91%	1.84%	0.0134	1.03%	1.96%	0.0083
2029	0.86%	1.75%	0.0110	0.93%	1.81%	0.0135	1.05%	1.93%	0.0084
2030	0.86%	1.64%	0.0110	0.92%	1.69%	0.0136	1.04%	1.82%	0.0084
2031	0.86%	1.59%	0.0111	0.92%	1.65%	0.0137	1.05%	1.79%	0.0085
2032	0.86%	1.63%	0.0112	0.91%	1.68%	0.0139	1.05%	1.83%	0.0085
2033	0.85%	1.53%	0.0113	0.90%	1.58%	0.0139	1.04%	1.73%	0.0086
2034	0.86%	1.51%	0.0114	0.91%	1.56%	0.0140	1.04%	1.70%	0.0087
2035	0.87%	1.50%	0.0114	0.92%	1.55%	0.0141	1.05%	1.68%	0.0087
2036	0.88%	1.49%	0.0115	0.93%	1.53%	0.0142	1.06%	1.66%	0.0088
2037	0.87%	1.39%	0.0116	0.91%	1.43%	0.0143	1.04%	1.56%	0.0088
2038	0.88%	1.42%	0.0116	0.92%	1.46%	0.0144	1.05%	1.59%	0.0089

Fuel Oil

FPL has reduced the use of oil to produce electricity by 98 percent from 2001-2016, moving from 40 million barrels per year to less than 1 million barrels statewide in 2016, via investments in natural gas power.

The trend since the early 1990s has been a steady increase in the amount of natural gas that is used by FPL to provide electricity, due in part to the introduction of highly efficient and cost-effective combined-cycle generating units, and the ready availability of natural gas. Of the FPL plants in the 12-county Port Everglades market (see Figure 2.4.15), only the Port Everglades Clean Energy Center and the Lauderdale power-generating plants were supplied with distillate and fuel oil moving through Port Everglades. Lauderdale no longer uses fuel oil in normal operation. Port Everglades has also seen fuel oil shipments drop to zero, due to natural gas switching; however, shipments of diesel continue to meet bunkering demand, and serve as emergency backup fuel for natural gas.

As described in Element 1 of the 2018 Update, FPL operates a power-generation facility on a 94-acre site in Port Everglades. In the past, FPL operated four steam boilers at this site that were capable of firing residual fuel oil, natural gas, or a combination of both. Of the four units, two were approximately 200 megawatts in size, and two others were approximately 400 megawatts in size.

The four steam units at the Port Everglades site were removed and replaced in 2013, with a new highly efficient combined cycle unit, which is capable of producing 1,250 MW. The new generating unit, called the Port Everglades Next Generation Clean Energy Center (PEEC), was commissioned in April 2016. The modernization of the FPL plant at Port Everglades retains the capability of receiving waterborne delivery of diesel as a backup fuel, with a maximum sulfur content of 0.0015 percent.

Other plants in the immediate area that previously consumed liquid fuel include Riviera, Martin, and Turkey Point. In the past, the fuel for these plants was supplied through Port of Palm Beach and Port *Miami*. Since 2009, fuel oil shipments have fallen to nearly zero, as FPL shifted to natural gas and renewable plants.

As shown in Table 2.4.16, the fuel oil requirements for FPL's plants have averaged slightly less than 2.1 million barrels per year (BPY), or 6,646 BPD in 2017. It is

expected to drop to 88,000 BPY by 2021, and by 2022, residual fuel oil demand for FPL is expected to be zero.

The Sabal Trail Transmission pipeline completed by Spectra Energy Corp. and the Florida Southeast Connection (NextEra Energy) provide natural gas to FPL's Martin Energy Center (see Figure 2.4.16). This pipeline supplies natural gas to the Martin Energy Center, which will maintain shipments into Port Everglades at levels similar to the present low volumes.

Figure 2.4.15: FPL Plants within Florida

Source: pbcec.blogspot.com

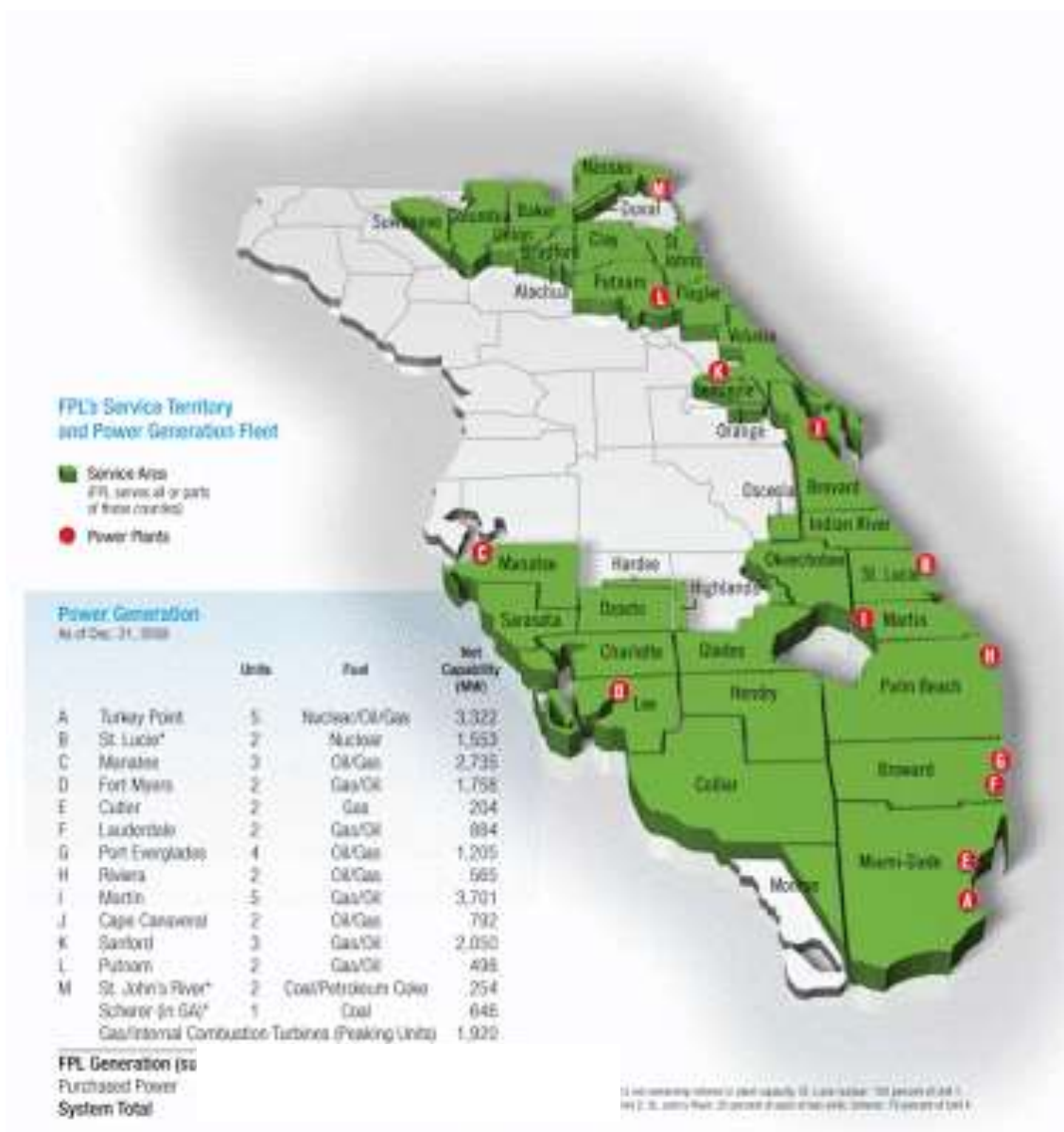


Table 2.4.16: FPL Fuel Usage*Source: FPL 10-Year Plan*

Fuel Requirements	Units	Actual 1/		Forecasted									
		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
(1) Nuclear	Trillion BTU	310	307	322	323	324	323	323	323	324	323	323	323
(2) Coal	1,000 TON	2,474	3,752	1,457	1,350	1,184	1,183	1,171	1,234	1,226	1,245	1,293	1,329
(3) Residual (FO6) - Total	1,000 BBL	764	2,081	88	49	2	9	0	2	2	3	5	8
(4) Steam	1,000 BBL	764	2,061	88	49	2	9	0	2	2	3	5	8
(5) Distillate (FO2) - Total	1,000 BBL	403	2,080	30	85	9	6	4	5	7	9	10	17
(6) Steam	1,000 BBL	116	12	0	0	0	0	0	0	0	0	0	0
(7) CC	1,000 BBL	79	954	11	0	0	0	0	0	0	0	0	0
(8) CT	1,000 BBL	208	1,114	19	85	9	6	4	5	7	9	10	17
(9) Natural Gas - Total	1,000 MCF	624,092	633,820	575,121	568,092	557,862	549,996	544,830	539,931	541,079	539,724	541,110	542,237
(10) Steam	1,000 MCF	28,743	42,916	19,790	11,725	4,144	4,580	3,152	3,479	2,992	2,461	2,996	3,646
(11) CC	1,000 MCF	592,178	584,414	552,904	551,894	552,800	544,236	541,185	535,640	537,620	536,878	537,670	537,959
(12) CT	1,000 MCF	3,170	6,490	2,427	4,473	918	1,180	493	812	467	385	444	632

Figure 2.4.16: Map of Potential FPL Natural Gas Pipeline*Source: wusfnews.wusf.usf.edu*

Bunker Requirements

Bunker operations are primarily served by the TransMontaigne North terminal, located at Port Everglades. Using the historical volumes of the major bunkering operator at the port, a bunker forecast was determined, based on linear extrapolation over the past seven operating years. Bunkering requirements at the port have decreased substantially during the past seven years. Additionally, emission controls are reducing the use of HFO to only ships that convert to scrubbers, since they must otherwise use low sulfur distillates. The majority of cruise vessels calling Port Everglades now use scrubbers, but the majority of cargo and other vessels calling likely don't.

Table 2.4.17 shows the forecast for fuel oil at Port Everglades, which declines as bunkering moves to other fuels. More information on the potential for LNG bunkering is provided in Section 2.8.

Table 2.4.17: Projected Fuel Oil Demand (A Thousand BPD), 2018-2038

Source: Hatch

	2018	2019	2023	2028	2033	2038
FPL Consumption	-	-	-	-	-	-
Bunkering/ Other	6	5	2	-	-	-
Total Throughput	6	5	2	-	-	-

Natural Gas Impacts

Natural gas will play a significant role in FPL's plans to meet its power generation requirements for the state, and the increasing availability of natural gas will exert market pressure on fuel oil requirements, as mentioned above. Natural gas demand in Florida is growing rapidly, driven primarily by new gas-fired generation units.

Liquified Petroleum Gas (LPG)

All LPG movements through Port Everglades have been via propane shipments made by Dynegy/Targa from their Venice plant in South Louisiana, which was destroyed in Hurricane Katrina in 2005. Much of Dynegy/Targa's market share has been taken by C-3, which brings their LPG through Tampa. The forecast for LPG at Port Everglades is based on historical propane throughput over the past 10 years.

Crude Oil

Crude oil is trucked into Port Everglades from wells in Collier County, and shipped out of the port to U.S. refineries. It is not a product consumed in South Florida. Crude oil throughput at Port Everglades has been forecasted based on historical throughput since 2011, and production forecasts allocated to the state. As far as an impact on the port's total throughput projections, the volumes of crude are not a significant factor. In terms of facility utilization and optimization, however, a declining throughput is important, since these volumes will become increasingly smaller, moving primarily by barge, and could reduce the port's operational efficiency.

Asphalt

Port Everglades' asphalt demand was forecasted based on per capita consumption and forecast population growth. The asphalt demand in the 12-county market is somewhat limited, the volumes are small, and most of the supply originates in the U.S. Gulf.

Avgas

Port Everglades' demand for Avgas, which is used primarily by older planes operating from general aviation fields, is a very small volume. Demand is forecasted to have a small increase from 2018 through 2038. In terms of impact on overall port throughput, only about 661 BPD went through Port Everglades in 2018, which equates to 0.2 percent of the total petroleum volume. By 2038, about 810 BPD are projected.

Ethanol

Florida mandated that all gasoline in the state will contain 10 percent ethanol by 2010, which required new tanks or tank conversions at Port Everglades, generally from gasoline service. The largest increase in throughput occurred between the years 2011 to 2017, where throughput increased at an average rate of 5 percent per year. A small increase in demand is expected to continue through the rest of the forecast period, at a growth rate of 1 percent per year from 2018-2038. Port Everglades throughput is inclusive of rail and vessel throughput for ethanol.

Since 2010, ethanol production capacity in the U.S. has expanded at a rapid pace, and displaced the ethanol volume moving into Port Everglades from the Caribbean and Latin America. Domestic shippers provide ethanol from Gulf Coast refining

centers, and in 2017, the majority of ethanol shipments came from domestic sources. In 2012, Motiva started bringing in about 10 percent of the port's ethanol via rail. By 2017, the trend had reversed, with almost 80 percent of Port Everglades' ethanol arriving by truck and rail, and the remainder by waterborne vessel (i.e. tanker and barge). This trend is expected to continue, although it will swing, depending on market prices for transportation of ethanol. During terminal operator interviews, it was noted that ethanol handling is more difficult through the port, as the pipe network requires flushing as well.

Butane is also being brought into the port in small quantities by truck and rail for blending with gasoline. Although butane is not mandate like ethanol, it provides an inexpensive blend, and should increase as butane prices remain low.

Biodiesel

Biodiesel is brought into Port Everglades to blend into the diesel pool. The port's throughput is currently about 0.1 percent of the 12-county market's total diesel demand. Biodiesel is currently received at Port Everglades from domestic sources, as the U.S. biodiesel production capacity has increased dramatically in the past few years. Five years ago, all biodiesel was brought into the port by barge or tanker, but now all biodiesel enters by rail or truck only. This trend is expected to continue, unless there is a swing in the market prices for transportation.

2.4.8 Liquid Bulk Stakeholder Interviews

Of the fifteen terminal contacts provided by Port Everglades, nine were interviewed as part of the 2018 Update. They include:

- Chevron
- ExxonMobil
- Motiva
- Vecenergy (Valero)
- Marathon (two terminals)
- Buckeye Terminals
- South Florida Petroleum Services
- Targa

Comments and views expressed by each of these Port Everglades customers, that are relevant to the 2018 Update, are summarized and aggregated below.

There are two different classes of terminals at the port – those owned/operated by major oil companies, and those that are third-party operated. The terminals owned by the major companies typically have a much more stable operation, with predictable throughput from their Gulf Coast refineries and dedicated vessels that operate on fairly set schedules. Truck rack operation mainly supplies their service stations. The third-party terminal operations are much more unpredictable, as they are at the mercy of their customer requirements. Throughput rates, vessel mix, and truck rack usage vary greatly, since they have a multiplicity of customers. Demurrage, truck rack congestion, and even operational effects from the USACE's Port Everglades harbor deepening and widening project will impact the customers much more than the third-party terminal operator, who is basically the manager of the customer's storage capacity.

Most of the terminal managers expect throughput at their facilities to remain flat overall for the next few years. Jet fuel deliveries are expected to increase with future passenger traffic growth at the region's international airports, especially FLL and MIA. There was a consensus that the trend of using ships, rather than barges, would continue, although no significant changes are expected. As a group, they also felt the ratio of volumes (domestically sourced volumes to foreign) would remain about the same. If the refinery restarts at HOVENSA or others in the Caribbean were to open up, it might make a short-term impact, but would likely be spot market transactions, rather than replacing products from domestic sources.

While most of the terminal operators have not seen an overall change in demurrage/wait times, they noted that Port Everglades needs to get vessels in and out more quickly. Traffic through the port seems to be very high at times, with long waits to get to the docks; at other times, traffic is very light, with no wait times. Most operators felt the port had a good program for berth utilization. Concerns were raised about the short-term impact of the Slip 1 redevelopment, and how it would affect berth availabilities.

For the most part, product movement out of the terminals via truck functions well, although the locations of certain exit gates can cause traffic congestion at times. The managers seem to take any congestion problems in stride, and see them as a

part of the overall Port operation. Gate congestion increases with the winter cruise-ship season. Some short-term issues have been experienced, with cement or aggregate dump truck traffic blocking truck lanes while they waited for access to the port.

Most of the terminal managers agreed that there is a trend or preference for bringing in larger vessels to reduce the transportation cost per barrel, and to maximize the product delivered per vessel call. The shared terminal operations at Port Everglades help, since the terminal operators can sell a portion of the ship load to another operator if their storage capacity is constrained.

The deepening and widening project is considered beneficial in the long term, though a few of the operators that do not expect their vessel sizes to increase feel that their operations will not change significantly when the project is implemented. Most did, however, express concern at a potential disruption in the dock operation during the Slip 1 widening project. Two alternative berths are currently planned, and will be made available when the current petroleum berths are taken out of service during construction.

The abilities of dock South Florida's dock manifolds to serve all operators from multiple berths, and provide terminal-to-terminal transfers, is seen as a competitive advantage for Port Everglades. Increasing transfer capabilities, especially between the north and south terminals, was desired by multiple operators. Increased connectivity is a goal of the Slip 1 redevelopment project, and additional transfer lines are planned.

2.4.9 Projected Port Everglades Petroleum Vessel Calls

A variety of U.S. and foreign-owned vessels of a wide range of sizes will continue to call at Port Everglades through 2038. These vessels will consist of oceangoing tankers and barges (integrated tug-barges, ITBs). The U.S.-owned vessels are subject to Jones Act requirements. This section summarizes the types of vessels and their size ranges, and provides a projection of the expected number of annual vessel calls, from 2018 through 2038.

To establish the basis of vessel calls for facility-planning purposes over the forecast period, the B&A team, led by Hatch, projects that the size characteristics of the four main vessel groups – foreign tankers, U.S. Jones Act tankers, petroleum barges, and

LPG barges – will remain largely similar to those of the present fleet of vessels that call Port Everglades between 2000 and 2018.

The projections of vessel calls provided herein are based on future throughput requirements. They do not, however, include port, berth, and terminal configuration and limitations (i.e. future dredging to increase the water depth in the channel and berths, to accept vessels with greater arrival drafts). The planning basis used to project the number of vessel calls does not preclude the possibility for Port Everglades to accommodate larger cargo sizes associated with deep-draft foreign tankers that may call on the port in the future.

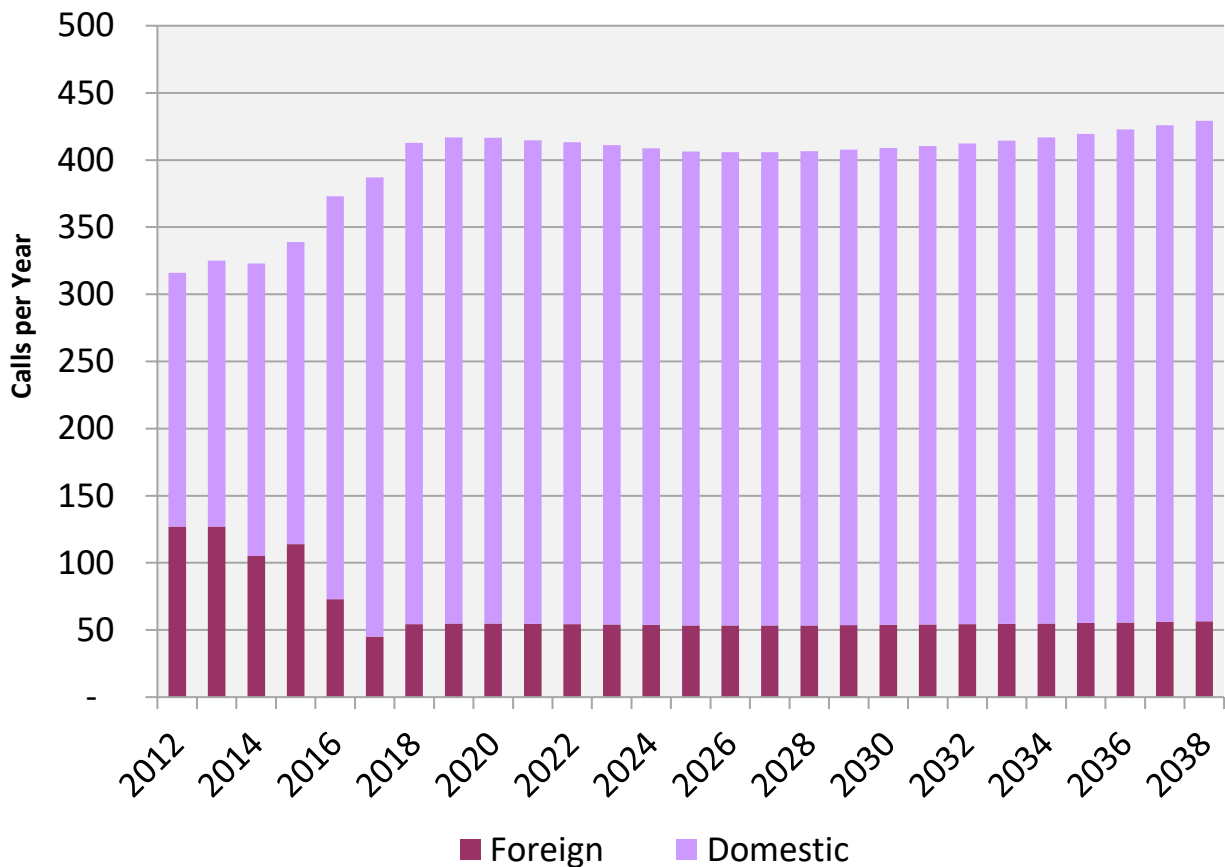
Tankers

In the earlier part of the century, foreign volumes increased significantly, from about 20 percent of total ship volume in 2003 to over 40 percent, as a result of the Oil Pollution Act of 1990 (OPA 90). The Exxon Valdez oil spill eventually led to OPA 90, which requires all tank vessels trading in the U.S. to have double hulls by 2015. OPA 90 also established phase-out dates for single-hulled vessels, and age limits for double-hulled tankers at 35 years. As a result, the capacity of the U.S. Jones Act tanker fleet declined, as several tankers were forced into retirement. Several new Jones Act tankers have been built, and announced a refined product service, which is expected to eventually offset most of the declines to the Jones Act fleet, due to OPA 90 regulations. Domestic tanker calls and volumes are projected to recover during the forecast period, resulting in a slight reduction of foreign vessel calls and volumes.

The tanker fleet calling on Port Everglades will be made up of tankers, mostly in the deadweight (DWT) size range of Handymax (30,000-50,000 tons), with a distribution of smaller and larger vessels similar to the present vessel fleet. The tanker fleet will continue to handle the following products:

- Asphalt
- Fuel oil (#6)
- Two grades of diesel fuel (ultra-low and low sulfur)
- Two grades of gasoline (regular and premium unleaded)
- Jet fuel
- Avgas
- Ethanol
- Biodiesel

The majority of the tankers (55 percent) will likely be used for a single type of cargo, with the remaining 45 percent likely to carry 2-3 different cargos (usually diesel, gasoline, and/or jet fuel) onboard. Biofuels and black products (asphalt and fuel oil) will be shipped as a single cargo, using dedicated vessels. Reduced product demand, the shutdown of the Hovensa refinery, and increasing competition from Latin America for domestically produced refined products have led to significant declines in tanker calls from 2007 to 2012. For the last five years, however, tanker calls have steadily increased to meet demand. To continue meeting growing product demand in the region served by Port Everglades, the number of domestic tanker calls is expected to increase at an annual average of 2.9 percent through 2020. Thereafter, in line with throughput, domestic tanker calls are expected to decrease between 2020 and 2026, at an average rate of 0.4 percent, before increasing through the rest of the forecast period, at 0.5 percent per year on average. See Figure 2.4.17.

Figure 2.4.17: Tanker Vessel Calls at Port Everglades, 2012-2038*Source: Hatch*

**Note: this is the same chart presented in Figure 2.4.2*

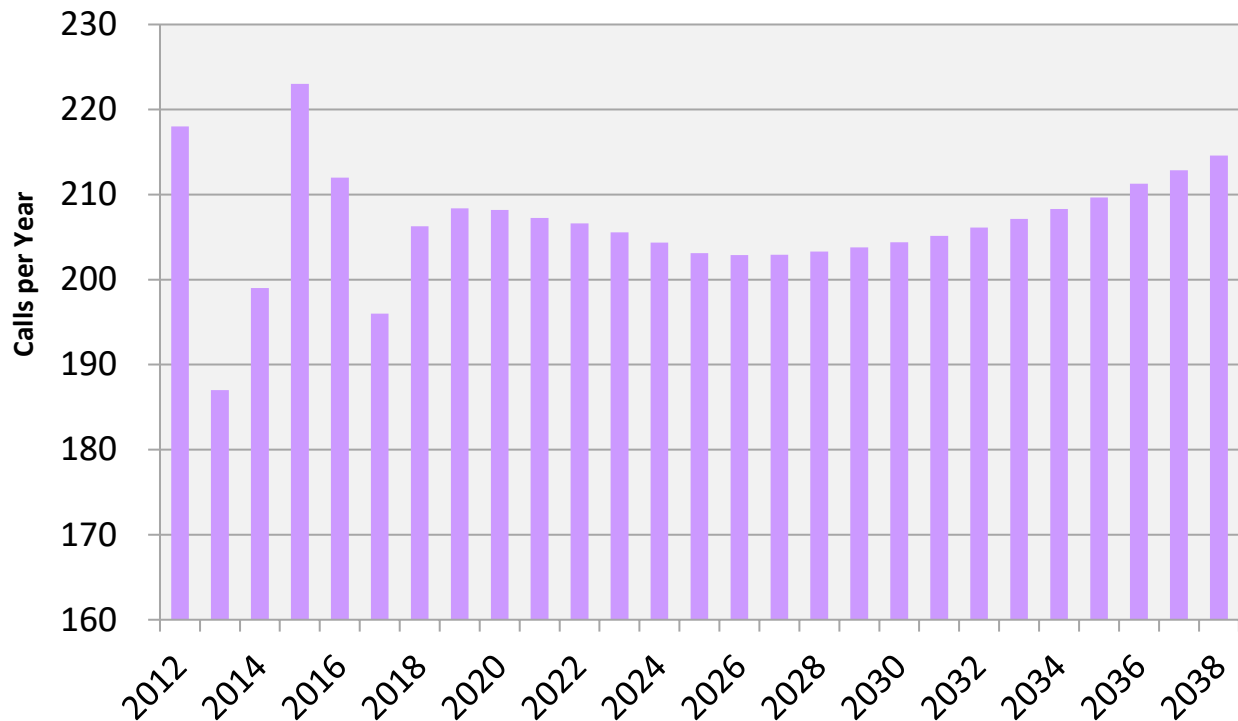
Barges

Barges are generally smaller in size, depth requirements, and unloading facilities, as compared to oceangoing tankers. These barges are, however, important for short-haul trips. These barges supply products from other U.S. ports, and also from the Bahamas. The barges expected to call Port Everglades during the forecast period are expected to range in size from 10,000 to 320,000 barrels, with an expected average size of 140,000 barrels. The barge fleet is used to handle the full slate of black and clean products. Total barge calls have declined in recent years, due to the increased use of larger volume oceangoing barges. Figure 2.4.18 illustrates the projected number of barge calls per year during the 20-year planning horizon. Barge calls are expected to increase from 196 in 2017 to around 239 by 2038. The increase in barge calls is primarily driven by the growing petroleum

product demand/throughput, and greater reliance on domestically sourced product.

Figure 2.4.18: Barge Calls at Port Everglades, 2012-2038

Source: Hatch



**Note: this is the same chart presented in Figure 2.4.3*

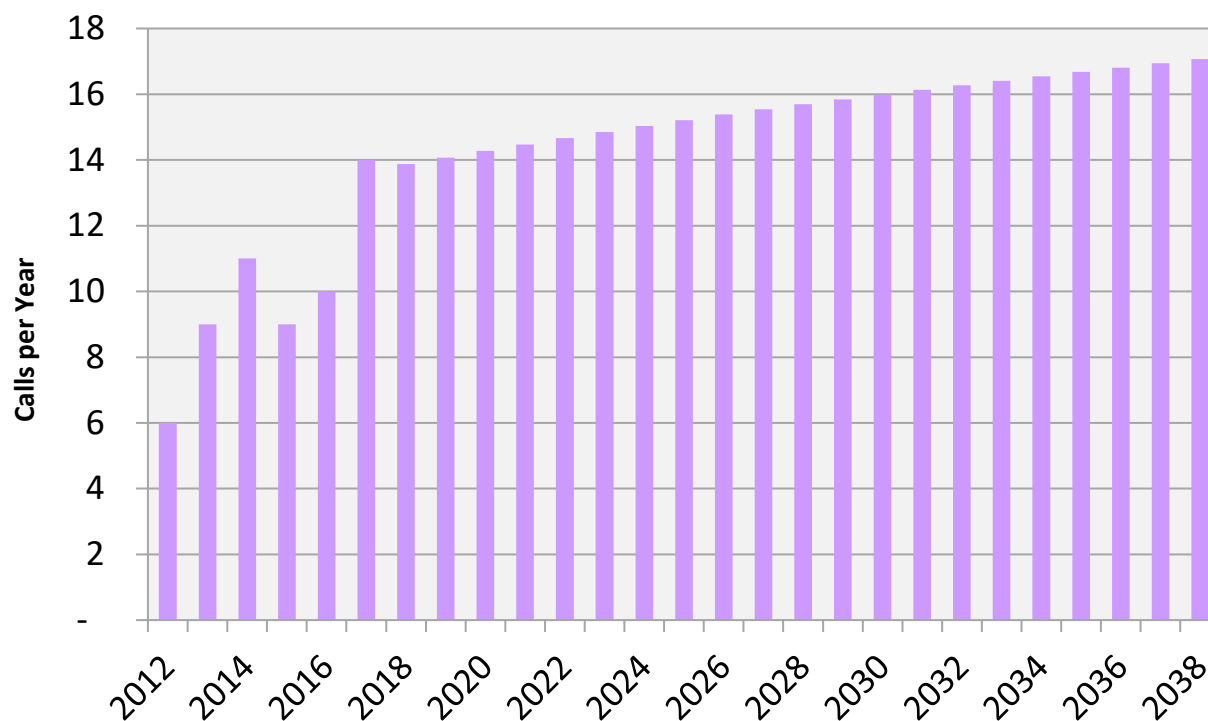
LPG Vessels

LPG demand in the Florida market, primarily for cooking and propane-powered emergency generators, makes the shipping and storage an important consideration for Port Everglades. However, LPG barges are smaller in size, compared to other petroleum product barges. LPG vessel calls to the port decreased by over 90 percent from 2005 to 2012, and have recovered only slightly over the last five years. Targa is the only operator bringing propane into the port. Since Hurricane Katrina destroyed their plant in Venice, LA, their supply and vessel calls have decreased significantly. Much of their market share has since been taken by C-3, through Port Tampa Bay, with truck and rail deliveries into South Florida, resulting in the dramatic decrease in barge calls in recent years. Demand resumed a growth trend from 2012 to 2014, then flattened. It is expected to continue as a flat trend through

the end of the forecast period. Figure 2.4.19 illustrates the projected number of annual calls for LPG movements at the port.

Figure 2.4.19: LPG Barge Calls at Port Everglades, 2012-2038

Source: Hatch



**Note: this is the same chart presented in Figure 2.4.4*

2.4.10 Nonpetroleum Liquid Bulk Market Assessment

Between FY2006 and FY2016, annual volumes of nonpetroleum liquid bulk cargo at Port Everglades, which consists mainly of tallow, was stable, ranging between 12,000 and 15,000 tons each year. In FY2017, the tonnage dropped drastically to 8,500 tons, the lowest annual volume during the past 11 years. For planning and future forecasting purposes, it has been assumed that nonpetroleum liquid-bulk volumes will be constant, continuing to average a level that is consistent with the 11-year annual average between FY2006 and FY2017: 13,275 tons per year.

2.5 Containerized Cargo Market Assessment

2.5.1 Historical Container Market

Loaded container volume, as measured by twenty-foot equivalent units (TEUs), handled at Port Everglades has shown very little growth since 2008. Between FY2008 and FY2009, total loaded TEUs declined by nearly 150,000 TEUs, reflecting the global recession. Since the low point of 2009, loaded TEUs have grown at an average annual rate of 4.1 percent.

Table 2.5.1: Port Everglades Loaded TEUs by Trade Lane, 2008-2017

Source: Port Everglades

Trade Lane	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2008 2017 CAGR	2009 2017 CAGR
Central America	268,166	206,455	216,355	253,481	254,297	291,273	319,913	276,056	272,974	308,454	1.6%	5.2%
Caribbean	215,716	178,978	164,498	165,840	179,777	187,135	202,289	261,892	258,399	249,193	1.6%	4.2%
South America WC	72,486	61,179	65,700	68,992	70,960	76,019	83,362	87,319	85,084	87,756	2.1%	4.6%
South America EC	54,877	41,835	40,119	42,215	38,210	34,530	39,602	53,386	57,821	62,720	1.5%	5.2%
Mediterranean	34,231	22,745	25,654	36,120	52,266	59,763	50,804	37,339	47,693	52,349	4.8%	11.0%
Northern Europe	2,387	2,202	12,651	17,888	15,582	15,589	27,169	22,106	16,931	20,287	26.8%	32.0%
Others	31,532	26,451	20,477	11,394	10,375	12,679	8,999	1,871	1,730	1,435	-29.1%	-30.5%
Indian Sub- Continent/Middle East	5,542	7,290	10,992	11,403	6,074	2,786	3,922	3,375	1,781	581	-22.2%	-27.1%
Northeast Asia	29,032	19,094	15,736	23,502	16,643	6,942	9,144	2,351	502	103	-46.6%	-47.9%
Southeast Asia	3,971	2,438	2,306	2,109	4,802	1,707	575	272	28	17	-45.5%	-46.3%
Total TEUs	717,940	568,667	574,489	632,943	648,984	688,422	745,777	745,967	742,943	782,896	1.0%	4.1%

Port Everglades' largest trade lanes are with Central America and the Caribbean. These trade lanes have grown 4-5 percent annually since the global recession, and have now surpassed their FY2008 levels.

Port Everglades has posted significant growth in the North Europe market since FY2008 as well, but loaded TEUs handled on this trade lane have actually declined by more than 7,000 TEUs since 2014. Asia represents the strongest potential trade lane for future growth at Port Everglades, but the port has experienced a collapse in trade with Asia, due to the discontinuation of a CSAV service several years ago that was not replaced. As a result, trade volumes with Northeast Asia have fallen from 29,032 loaded TEUs in FY2008 to 103 loaded TEUs in FY2017.

Overall, imported TEUs have shown stronger growth than exported TEUs, particularly in the Mediterranean and North Europe trade lanes (see Figure 2.5.2). From an export perspective, Port Everglades' container business has grown about 3 percent since FY2009, barely returning to 2008 levels (see Figure 2.5.3).

Table 2.5.2: Port Everglades Import TEUs by Trade Lane, 2008-2017

Source: Port Everglades

Trade Lane	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2008 2017 CAGR	2009 2017 CAGR
Central America	144,118	110,755	117,617	134,393	128,675	153,232	168,062	139,358	138,481	159,271	1.1%	4.7%
Caribbean	55,594	45,731	40,894	35,392	37,399	43,706	52,456	68,261	62,649	53,373	-0.5%	2.0%
Mediterranean	19,867	19,381	21,850	28,137	42,100	47,448	45,612	36,634	47,566	51,999	11.3%	13.1%
South America WC	36,122	25,879	24,582	23,873	23,651	28,434	32,845	36,071	37,803	41,488	1.6%	6.1%
South America EC	14,291	12,353	9,171	10,061	8,985	8,891	13,233	20,858	27,296	32,941	9.7%	13.0%
Northern Europe	500	975	10,437	15,298	14,146	14,747	23,130	19,042	14,902	17,113	48.1%	43.1%
Indian Sub- Continent/Middle East	31	167	310	317	445	402	66	69	50	174	21.0%	0.5%
Northeast Asia	22,479	10,352	8,144	9,855	818	1,736	947	195	160	97	-45.4%	-44.2%
Others	4,627	4,955	5,491	4,272	3,308	2,579	1,058	6	11	18	-46.2%	-50.6%
Southeast Asia	17	325	642	244	274	444	41	39	11	11	-5.0%	-34.5%
Total Import TEUs	297,647	230,872	239,136	261,841	259,801	301,619	337,452	320,531	328,929	356,484	2.0%	5.6%

Table 2.5.3: Port Everglades Export TEUs by Trade Lane, 2008-2017*Source: Port Everglades*

Trade Lane	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2008 2017 CAGR	2009 2017 CAGR
Caribbean	160,122	133,248	123,604	130,448	142,378	143,429	149,832	193,631	195,750	195,820	2.3%	4.9%
Central America	124,048	95,700	98,738	119,088	125,622	138,041	151,851	136,699	134,494	149,183	2.1%	5.7%
South America WC	36,363	35,300	41,119	45,119	47,309	47,586	50,517	51,248	47,281	46,268	2.7%	3.4%
South America EC	40,586	29,482	30,948	32,155	29,225	25,639	26,368	32,528	30,524	29,779	-3.4%	0.1%
Northern Europe	1,887	1,227	2,214	2,590	1,436	842	4,039	3,065	2,030	3,175	6.0%	12.6%
Others	26,905	21,496	14,986	7,122	7,067	10,100	7,941	1,865	1,719	1,418	-27.9%	-28.8%
Indian Sub- Continent/Middle East	5,511	7,124	10,683	11,086	5,628	2,384	3,855	3,306	1,731	407	-25.1%	-30.1%
Mediterranean	14,364	3,364	3,805	7,983	10,165	12,314	5,192	705	127	350	-33.8%	-24.6%
Northeast Asia	6,554	8,742	7,593	13,647	15,825	5,206	8,197	2,156	342	6	-53.8%	-59.6%
Southeast Asia	3,953	2,113	1,664	1,865	4,528	1,263	534	233	17	6	-51.6%	-52.2%
Total Export TEUs	420,293	337,795	335,353	371,101	389,183	386,803	408,325	425,436	414,014	426,412	0.2%	3.0%

2.5.2 Baseline Container Terminal Operations at Port Everglades

Port Everglades' major customers are shown in Table 2.5.4. As this table illustrates, the Port Everglades container business is relatively concentrated, with four terminal operators controlling 90 percent of all containerized cargo activity at the port, as of FY2017. These four operators are:

- Crowley Liner Services – the largest tenant at Port Everglades
- King Ocean Services
- Port Everglades Terminal (PET) – a joint venture with Mediterranean Shipping Company, S.A. (MSC)
- Florida International Terminal (FIT)

Table 2.5.4: Historical Port Everglades Container Volume by Terminal (TEUs), 2008-2017*Source: Port Everglades*

Operator	FY2012	FY2013	FY2014	FY2015	FY2016	FY2017
Chiquita Brands Company	54,726	61,302	63,932	3,707	0	0
Coleary Transport Company, Inc			1,591	1,407	12,943	10
Crowley Liner Services	257,686	263,416	310,334	334,987	318,257	366,676
Dole Fresh Fruits	12,511	14,188	9,738	3,307	0	0
Florida International Terminal	136,565	134,655	150,703	156,045	169,555	193,415
Florida Transportation Services	4	269	315	409	830	0
Hyde Shipping	36,607	40,185	41,022	61,215	71,984	68,615
King Ocean Services, Ltd	152,835	140,456	148,954	153,985	173,907	203,763
Port Everglades Terminal	121,344	117,601	145,546	209,114	198,579	201,889
Portus - PEV LLC	67,941	31,811	31,754	22,220	11,210	4,823
Sea Star Line	12,039	10,461	3,089	0	0	0
Seafreight Line	71,309	73,498	65,223	75,859	35,812	0
Sol Shipping Services, Inc	0	39,568	41,144	38,073	43,769	36,113
Balearia Caribbean Ltd		0	0	179	0	0
Unassigned	33	162	0	0	380	1,608
Total	923,600	927,572	1,013,344	1,060,507	1,037,226	1,076,912

What follows is a summary of information gathered through interviews with Port Everglades' five largest container terminal operators, according to volume.

Florida International Terminal (FIT)

- Leased acres
 - Main yard: 36.03
 - Supplemental Southport storage (grid): 17.5 acres (12.5 + 5.0)
- 2017 volume: 193,000 TEUs
- 2018 anticipated volume: 240,000-250,000 TEUs
- Services overview
 - South America, Central America, Europe
 - Lines served: Hapag-Lloyd, CMA CGM, MSC, Maersk/Sealand/Hamburg Sud, Chiquita (own vessels)
- ~600 moves per call, on average
- ~10 percent reefer
- During STNE construction will work Berth 30, then move to Berth 30X

Crowley Liner Services

- Leased acres: 78.00
- 2017 volume: 366,676 TEUs
- 2018 anticipated volume: undisclosed
- Services overview
 - 12 calls per week: twice daily every T/W/Th/F/S
 - 1 call every Su/M
- Northern zone (3 per week)
 - Guatemala, Honduras, Nicaragua, El Salvador, Cuba
 - 7-day rotation; 3 vessels
- Southern zone (1 per week)
 - Costa Rica, Panama
 - 14-day rotation; 2 vessels
- Dominican Republic/Haiti (2 per week)
 - 7-day rotation
- Jamaica (1 per week)
 - Montego Bay, Kingston Wharves
 - 7-day rotation

- Caribbean islands (1 per week)
 - St. Thomas, St. Croix, Trinidad, St. Vincent, Barbados
 - 14-day rotation;
- Two vessel sizes: 1,300 TEUs (650 LOA) and 900 TEUs (460 LOA)
- All volume handled at Port Everglades is lift-on/lift-off (Lo-Lo)

Port Everglades Terminal (PET/MSC)

- Leased Acres: 39.18
- 2017 volume: 201,889 TEUs
- 2018 anticipated volume: undisclosed
- Services overview
 - 6-7 calls per week
- 2M - Mediterranean (8,200 TEU vessel)
- ECSA (4,500 TEU vessel)
- Caucedo Feeder
- Europe

King Ocean Services/Sun Terminals

- Leased Acres
 - Southport: 33.84
 - Midport: 7.31
- 2017 volume: 203,763 TEUs
- 2018 volume: undisclosed
- Services overview
 - Weekly service to Eastern Caribbean, South and Central America
 - 1,750 TEU vessels
 - ~350-400 moves (on/off) per call on average
- Midport calls handled by Host Terminals
 - 70 percent loaded; 30 percent empty
 - Dwell times: maximum 3-4 days
 - 20 percent live gate moves
 - 10 percent move by rail

Hyde Shipping

- Leased acres: 6.97 (Midport)
- 2017 volume: 68,615 TEUs
- Services overview
 - Belize (2 per week)
 - Cayman Islands (2 per week)
 - Honduras (1 per week)
 - Mexico (1 per week)
- 1 call every M/T/F
- 1-2 calls W; 2 calls Th
- Wednesday 1-2 calls, Thursday 2 calls
- ~500 moves (on/off) per call on average
- Strip day 1; reload day 2
- 40 percent live gate moves
- Imports from Mexico and Honduras: ~15 percent loaded

Interviews with each of the terminal operators identified above revealed a common thread of issues, primarily berth and STS crane capacity/availability constraints, as well as traffic congestion within and surrounding the terminals. There is also a general sentiment among Port Everglades container terminal operators that these issues must be addressed – not only in order for the containerized cargo business to grow at Port Everglades, but also to prevent carriers from leaving Port Everglades for other Florida and South Atlantic ports.

Berth availability and proximity to relevant container yard (CY) areas was identified as one of the major constraints prevent business growth at Port Everglades. Currently, berths are assigned by the port's harbormaster. Each terminal operator in Southport claims "preferential berthing." As a result, some vessels are shifted from the berth to anchorage in the middle of a call, to allow for another vessel to berth – which disrupts the production of the vessel load/discharge operations, increases costs as the vessel incurs shifting charges such as pilotage, towing and line handling, and causes disruptions in schedule integrity for the vessel operator.

The ILA-affiliated terminals have indicated that the non-ILA operators spend more time at berth waiting for "live gate moves," thus increasing berth occupancy at berths that are used by ILA, nonunion, and teamster ship gangs. In some cases, the

non-ILA, nonunion operated vessels are required to leave a specific berth, be replaced by an ILA operated gang for ship-to-shore operations, and be returned after the ILA-operated vessel leaves port. In other situations, a specific vessel may be involved in a vessel sharing agreement (VSA) with another carrier. In this instance, when the VSA is between a nonunion and union-served carrier, a union gang will unload/load the containers for the carrier affiliated with union labor. Then they will remain at the same berth, and a nonunion gang will be deployed to the vessel to complete its loading/unloading. During cruise season, the berth situation is exacerbated, particularly for the smaller carriers operating at Midport, as well as Southport.

Crane and berth capacity are typically mentioned in tandem. The Port Everglades terminal operators interviewed indicated the need for additional STS cranes per berth, in order to “turn” vessels more efficiently. The limited size of the existing cranes is a known issue, which is due to the current need for low-profile cranes to comply with the air space constraints imposed by the FAA (as a result of the proximity of FLL’s flight paths to Port Everglades). Port Everglades has already placed its first order for three new super post-Panamax STS cranes, and has the option to purchase three additional cranes of the same design. The current cranes in service in Southport have both height and outreach limitations that restrict the size of vessels, which can be used at Port Everglades. These restrictions have also limited Port Everglades’ ability to handle larger vessels in its existing trade lanes, and has effectively removed Port Everglades from consideration for direct calls in the Asia trade lane, where vessel size is growing at an increasing rate. Beginning in 2017, ports up and down the Atlantic Coast started to see vessels deployed, with capacities up to 14,000 TEUs. Larger vessels require larger STS cranes, and more than two cranes per berth, in order to turn the vessel efficiently and guarantee service integrity.

Navigational issues at Port Everglades are also prevalent. While plans for deepening have been approved by the USACE, the deepening has yet to begin. The USACE project will alleviate the restrictive channel depth of the port, but the channel width is also a critical issue, and may prevent the deployment of larger vessels to Port Everglades by carriers involved in the Asia trade lane, particularly in the near term. On days when a larger cruise vessel is at Berth 25 or 26, a post-Panamax vessel may not be able to pass the cruise vessel to access the Southport terminals,

subject to the pilots' discretion. If Port Everglades hopes to compete for direct calls in trade lanes where larger post-Panamax vessels are deployed, it is necessary to address all of the above-mentioned navigational constraints, namely:

- Channel depth and width
- Turning basin expanded and STNE project completed
- Channel widened at Berths 25 and 26

In addition, more than one berth capable of serving post-Panamax vessels (i.e. in excess of 1,200 linear feet) is needed, as well as a minimum of three cranes per berth, for a post-Panamax vessel operation.

Terminal adjacency is also an issue at Port Everglades. Since berths are not associated with a specific terminal/container yard, and since the berth associated with a container yard operation varies, based on berth assignments made by the Port Everglades harbor master, there is often a need to dray containers from an initial point of rest to a given container yard. Terminal operators have reported that the cost to dray a container from one part of the port to another (i.e. from Midport to Southport) can be as high as \$300-\$350/move.

In some cases within Southport, since McIntosh Road has a one-way circulation pattern, the dray requires exiting the McIntosh Road gate northbound, only to immediately circle back around and re-enter the McIntosh Road gate southbound, in order to access a different terminal within Southport. Overall, the congestion that occurs on McIntosh Road is becoming a paramount issue for Southport terminal operators. The relocation of King Ocean (both to their temporary footprint during STNE construction, and to their ultimate footprint) may create even more issues. A detailed traffic circulation study is a near-term necessity.

Cruise operations exacerbate many of the issues noted above, and have a particular impact on the smaller container operations in the Midport area of Port Everglades. The sharing of berths between cruise and cargo at Midport was cited as a hindrance to growing the smaller island services, as the cost of moving vessels off a berth to accommodate cruise operations (and the further assignment of berths farther from the container yards) adds significant costs to Port Everglades operations. Several carriers expressed the potential to deploy services elsewhere if berthing, crane and traffic circulation issues are not remedied in the near-term.

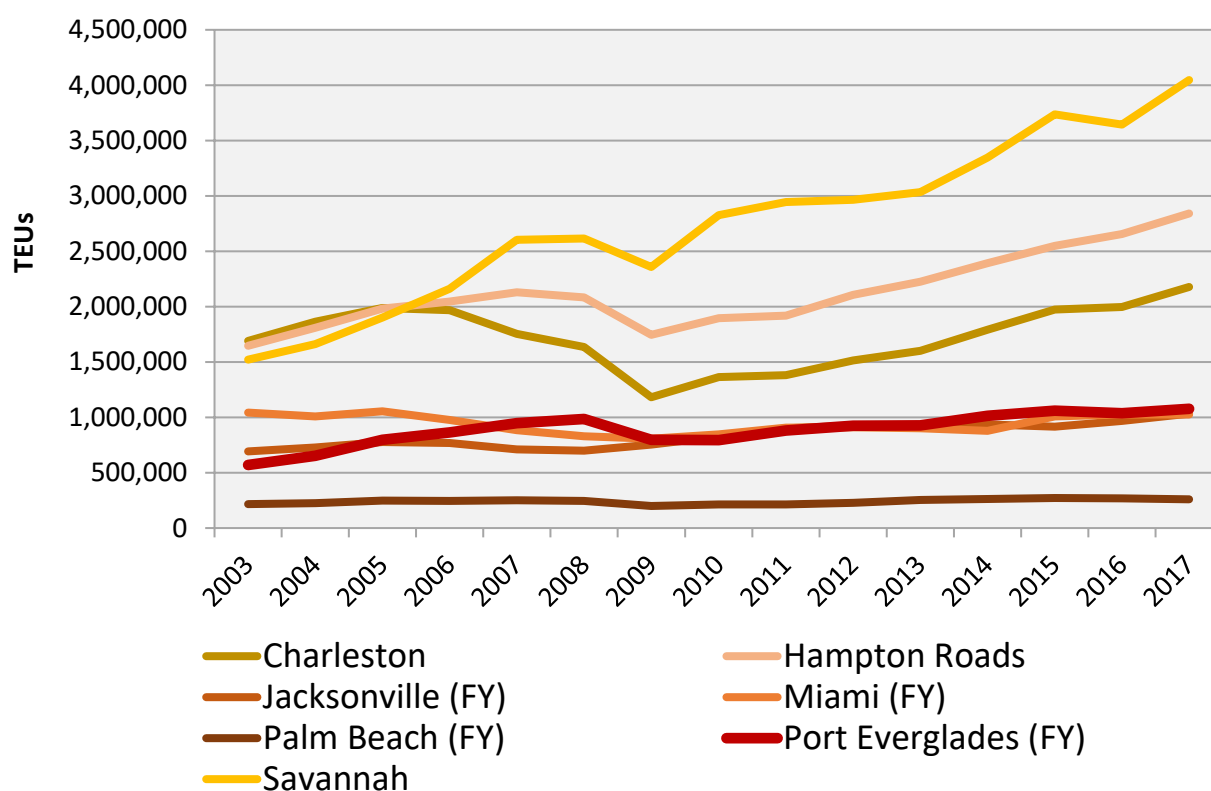
2.5.3 Port Everglades Competitive Container Market Position

Port Everglades is located in the South Atlantic port range of the U.S. Within this port range, Port Everglades ranks first among the major container ports in Florida, in terms of TEUs, but is trailed by less than 100,000 TEUs by both JAXPORT and PortMiami.

In terms of the major container ports in the South Atlantic, Port Everglades ranks fourth overall. As Figure 2.5.1 shows, the ports of Savannah, Norfolk, and Charleston handle a significantly greater volume of TEUs, compared to Port Everglades.⁹

Figure 2.5.1: Historical TEUs Handled at U.S. South Atlantic Ports, 2003-2017

Source: American Association of Port Authorities (includes domestic trade with Puerto Rico)



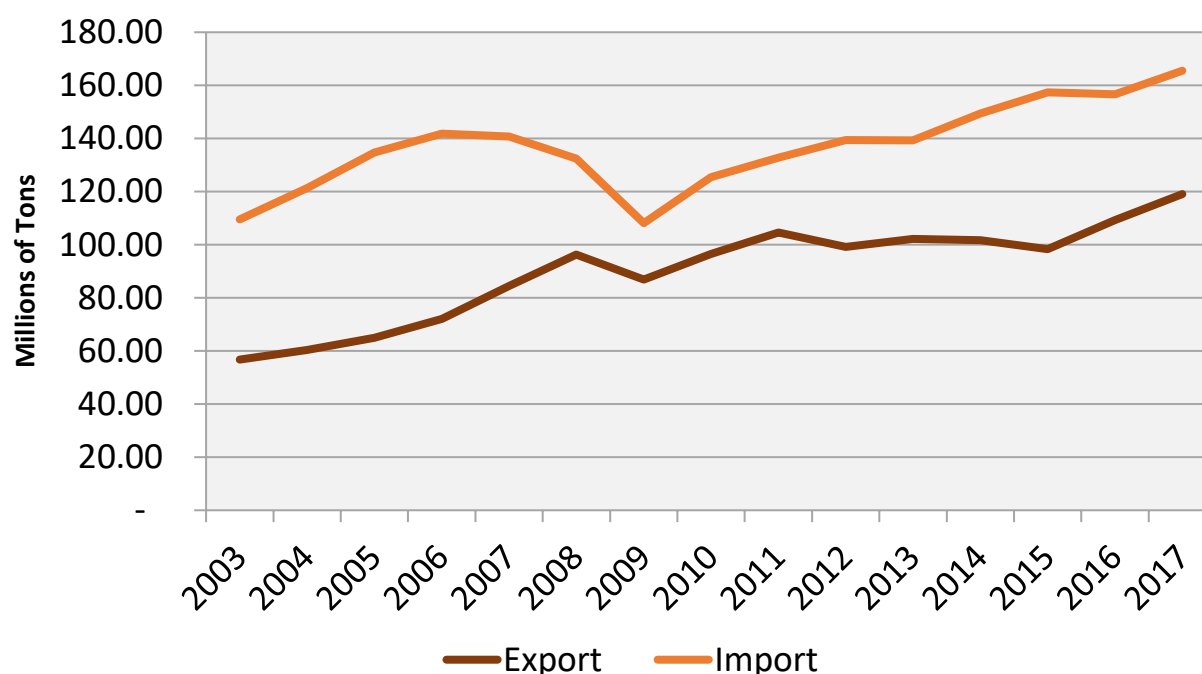
⁹ The competitive position of Port Everglades with respect to other ports is based on an analysis of USA Trade OnLine tonnage data developed by the U.S. Census Bureau. This database is used for cross-port comparisons since it provides a standardized reporting format for each port. There is however a nearly 2 million ton difference in the tonnage reported by Port Everglades and that reported by the U.S. Census Bureau.

The container terminals at Port Everglades compete with ports and terminals located along the South Atlantic coast, including Savannah and Charleston, as well as PortMiami, JAXPORT, and Port of Palm Beach. Overall, historical growth of international containerized cargo in the U.S. has averaged a 3.9 percent compound annual growth rate (CAGR) since 2003.

Import growth has averaged 3.0 percent per year, compared to 5.4 percent per year for exported containerized cargo over the same 14-year period. Since 2009 (the peak of the global recession), overall containerized tonnage has grown at an annual rate of 4.7 percent, with imports growing at a rate of 5.3 percent annually, and exports growing at a rate of 3.9 percent annually. See Figure 2.5.2.

Figure 2.5.2: Historical Growth in U.S. International Containerized Cargo, 2003-2017

Source: USA Trade Online



2.5.4 International Containerized Cargo Market – Imports

The U.S. West Coast port range consists of the Pacific Southwest (PSW) ports of Los Angeles and Long Beach; the Pacific Northwest (PNW) ports of Seattle/Tacoma (now known as the Northwest Seaport Alliance, or NSA) and Portland; and the port of Oakland in Northern California (NOCAL). The North Atlantic (N. ATL) ports consist

of ports from Boston to Baltimore, including the port Authority of New York and New Jersey. The South Atlantic (S. ATL) ports consist of ports from Norfolk to Miami. Gulf Coast (GULF) ports include ports from Port Manatee (FL) to Brownsville (TX).

As shown in Figures 2.5.3 and 2.5.4, the West Coast port range has gradually lost market share to the other regions, as its share of total imported containerized cargo has fallen from nearly 44 percent in 2003 to about 40 percent in 2017. This loss of West Coast market share reflects the impact of West Coast labor issues in both 2002 and late 2014/early 2015, as well as the opening of the new Panama Canal locks in mid-2016, which allowed ships with capacities up to 14,000 TEUs to transit. In contrast, and not coincidentally, the imported containerized cargo market share of the Atlantic Coast ports (including both N. ATL and S. ATL) has grown from about 40 percent in 2003 to nearly 49 percent in 2017.

Figure 2.5.3: Historical U.S. Containerized Cargo Imports by Port Range, 2003-2017

Source: USA Trade Online

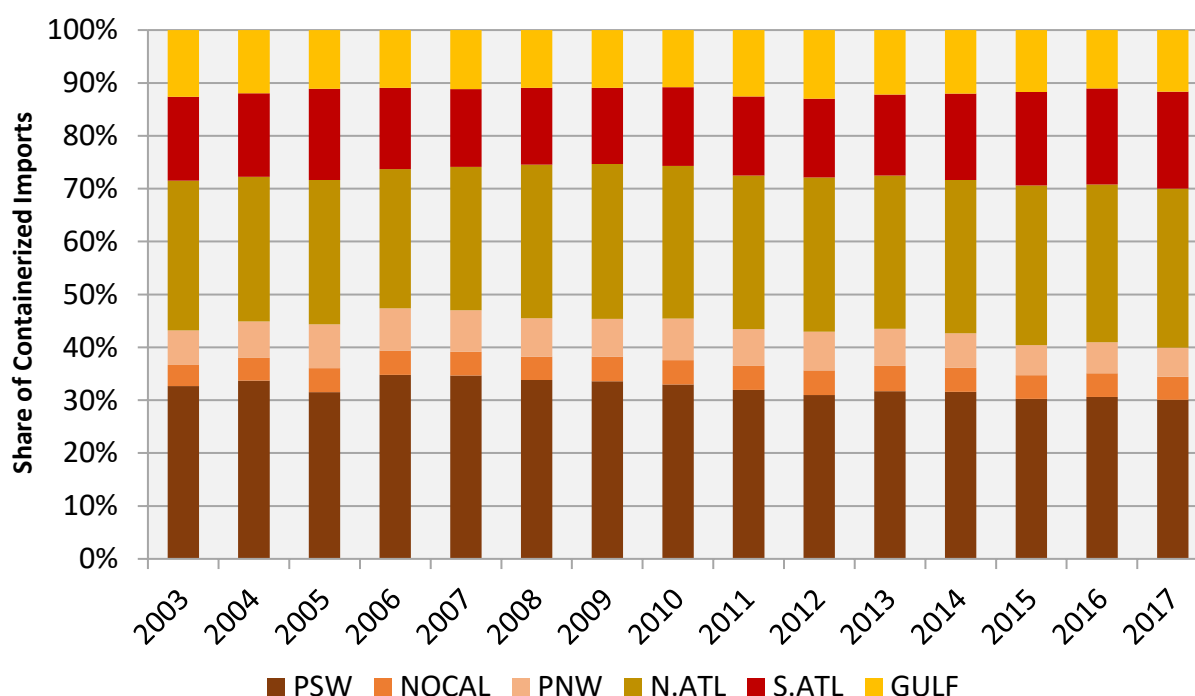


Figure 2.5.4: U.S. Containerized Import Cargo from Asia by Port Range, 2003-2017

Source: USA Trade Online

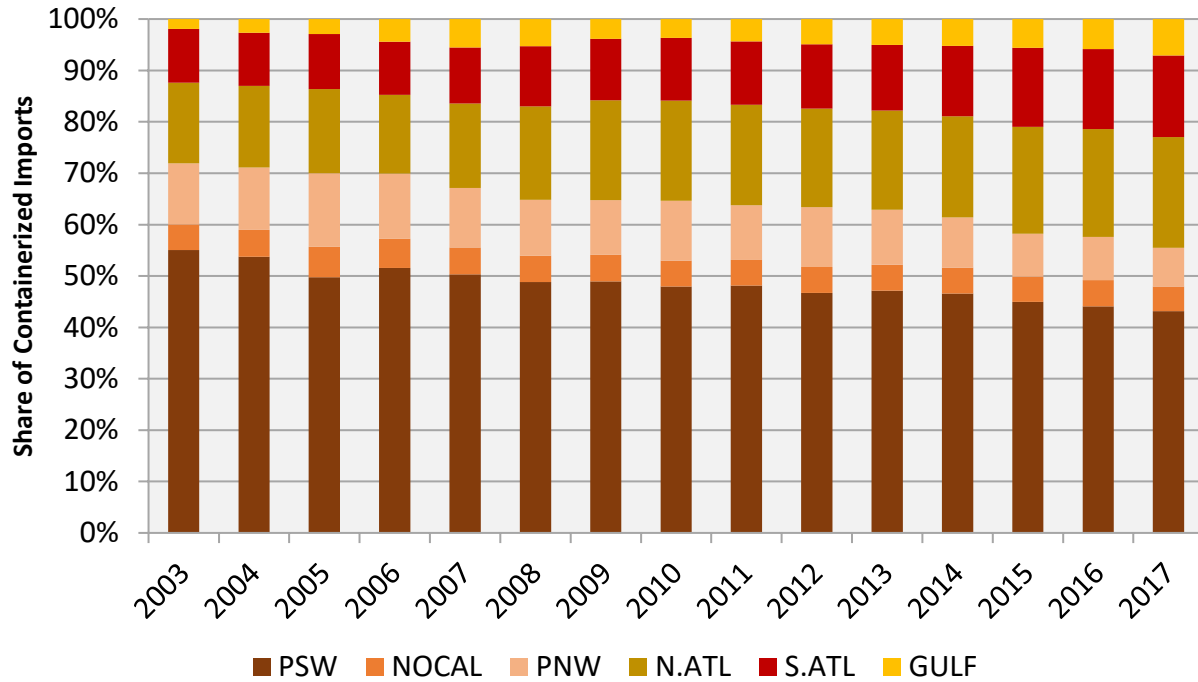


Table 2.5.5: U.S. Containerized Import Tonnage by Port, 2003-2017*Source: USA Trade Online*

Port	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	CAGR-03-17
LA/Long Beach	34,916,936	39,961,509	41,499,238	48,283,193	47,685,932	43,659,279	35,232,198	40,562,041	41,692,663	42,357,005	43,484,412	46,293,802	46,609,045	46,881,082	48,898,825	2.4%
New York/NJ	17,120,118	18,436,391	20,937,511	20,976,470	22,042,178	22,555,174	19,451,660	21,931,549	23,960,017	24,542,930	24,538,905	25,856,143	28,253,709	26,699,425	28,178,325	3.6%
Savannah, GA	4,864,068	5,334,491	6,491,513	6,515,686	7,593,366	7,541,391	6,007,022	7,382,009	7,728,162	8,052,694	8,507,966	9,921,874	11,364,206	11,901,915	12,803,124	7.2%
Houston, TX	6,299,348	6,910,938	7,548,568	7,792,393	7,402,004	6,640,455	5,419,957	6,520,144	7,795,079	8,790,889	8,313,745	8,778,298	9,499,687	9,089,155	10,865,401	4.0%
Norfolk/Newport News	6,438,530	6,117,095	6,589,125	7,341,425	6,891,266	6,692,127	5,171,847	5,720,507	5,817,420	6,596,781	7,060,091	7,668,400	8,300,014	8,906,845	9,541,278	2.8%
Charleston, SC	5,708,897	6,355,764	7,472,675	6,634,146	6,294,290	5,698,396	3,932,562	4,659,068	5,198,475	5,360,036	5,251,309	6,177,163	7,129,474	7,065,808	8,288,967	2.7%
Oakland, CA	3,778,956	4,308,307	5,278,707	5,854,515	5,721,871	5,266,613	4,606,610	5,264,557	5,332,502	5,626,495	5,838,694	6,268,050	6,260,787	6,403,818	6,598,488	4.1%
Baltimore, MD	2,627,924	3,618,542	4,028,493	3,468,951	3,345,020	3,226,672	2,614,751	3,442,592	3,652,011	3,843,282	3,664,929	4,015,688	4,536,160	4,553,032	5,131,414	4.9%
Tacoma, WA	3,308,250	3,698,875	4,599,682	4,405,514	4,092,935	3,862,688	2,667,008	2,775,590	2,836,036	3,811,861	4,444,337	5,142,596	5,347,007	5,623,539	4,653,063	2.5%
Seattle, WA	3,123,635	3,985,897	5,261,225	5,132,582	5,422,818	4,471,940	4,091,397	6,084,127	5,378,309	5,358,058	4,186,254	3,493,073	3,363,154	3,423,023	4,252,352	2.2%
Miami, FL	3,326,244	3,686,316	3,784,769	3,710,028	2,830,248	2,478,719	2,154,958	2,275,382	2,396,127	2,426,719	2,511,021	2,659,548	3,244,348	3,266,442	3,351,148	0.1%
Philadelphia, PA	1,845,681	2,027,240	2,072,825	2,542,251	2,191,622	1,796,150	1,477,171	1,596,217	1,905,703	2,031,144	2,216,821	2,581,446	2,998,419	3,101,766	3,259,928	4.1%
Port Everglades, FL	1,848,069	1,989,100	2,843,009	2,487,123	2,530,331	2,013,572	1,723,281	1,957,605	2,035,365	2,163,099	2,442,739	2,851,737	2,901,182	3,135,908	3,127,573	3.8%
New Orleans, LA	1,625,734	2,213,383	1,622,954	2,253,286	2,054,745	2,119,029	2,236,126	2,451,563	2,764,849	2,663,720	2,766,194	3,686,465	3,398,060	2,872,176	2,669,022	3.6%
Jacksonville, FL	694,294	624,075	1,163,703	1,120,964	515,101	488,058	647,168	714,664	1,015,164	1,339,945	1,194,844	1,330,543	1,604,390	1,709,215	1,772,201	6.9%
Mobile, AL	516,786	1,011,213	873,792	837,414	1,203,656	1,173,670	1,077,425	989,136	1,397,148	1,701,886	1,423,765	998,539	1,255,788	1,285,529	1,455,092	7.7%
Wilmington, DE	826,127	872,375	756,024	801,596	866,480	932,803	844,652	1,002,234	1,007,394	1,236,458	1,170,926	1,157,353	1,314,740	1,336,843	1,167,159	2.5%
Boston, MA	852,613	681,222	841,642	805,585	1,084,118	1,278,856	834,924	742,825	1,343,027	1,471,508	833,446	1,014,453	1,111,561	990,430	1,060,734	1.6%
Gulfport, MS	964,906	1,064,785	916,285	751,397	980,220	874,646	767,280	858,117	805,847	814,001	771,255	1,035,651	919,069	983,140	890,694	-0.6%
All Other Ports	8,789,506	8,423,546	10,078,399	10,068,018	9,948,409	9,603,542	7,166,753	8,453,949	8,722,060	9,268,767	8,704,702	8,442,209	7,937,593	7,439,085	7,545,117	-1.1%
Total	109,476,622	121,321,064	134,660,138	141,782,541	140,696,610	132,373,779	108,124,752	125,383,877	132,783,359	139,457,279	139,326,355	149,373,030	157,348,393	156,668,174	165,509,905	3.0%

The gradual erosion of containerized import market share on the West Coast since 2002 reflects the fact that beneficial cargo owners (BCOs) have increased the use of other port ranges to handle imported containers moving from the Pacific Rim into the U.S. This diversification strategy is evident when the share of imported cargo from Asia moving via the various port ranges is reviewed. As shown in Figure 2.5.4, the share of containerized import tonnage from Asia moving via the West Coast ports has fallen from about 72 percent in 2003 to about 55 percent in 2017, while the combined share of the South Atlantic and North Atlantic ports has increased from 26 percent in 2003 to 38 percent in 2017. Table 2.5.5 shows that Port Everglades has posted a 3.8 percent growth rate in imports, compared to 3.0 percent growth overall. However, within the South Atlantic port range, Port of Savannah has grown at an average rate of 7.2 percent per year, while containerized cargo volume at JAXPORT grew by 6.9 percent during the same 14 years period. Containerized cargo imports at Port of Charleston increased by 2.7 percent. Port *Miami* grew by less than 1 percent between 2003 and 2017.¹⁰

Looking at the growth rate of these same ports since 2009, the lowest point following the global recession, Port of Savannah grew at an average rate of 9.9 percent per year, Port of Charleston at a rate of 9.7 percent per year, JAXPORT at a rate of 13.4 percent per year, and Port *Miami* at rate of 5.7 percent per year. In comparison, Port Everglades grew at a rate of 7.7 percent per year.

Asia is clearly the international market with the most potential for future growth, which relates to containerized imports. In addition, Northeast Asia, which consists of China, Japan and South Korea, Southeast Asia, and Southwest Asia, combined to encompass a geographic area stretching from Vietnam all the way to Pakistan; this combination has shown the strongest growth as source markets for U.S. imports. In addition, imported containers from the Middle East have also shown significant growth over the past 14 year period, though this market remains extremely small, compared to Asia (see Table 2.5.6).

None of the markets referenced above are currently well-served by Port Everglades. Trade with South America – both the East and West coasts – has been

¹⁰ USA Trade OnLine reports 3,127,573 metric tons (3,447,523 short tons) of imported containerized cargo for 2017 vs 3,837,073 short tons reported by Port Everglades.

growing, while trade with the Mediterranean, due to the new services introduced by MSC, has also shown strong growth.

Table 2.5.6: U.S. Containerized Import Tonnage by Trade Lane, 2003-2017

Source: USA Trade Online

Trade Lane	2003	2006	2009	2012	2015	2017	CAGR 2003 2017
China	33,860,810	56,557,694	43,263,014	52,525,484	61,444,236	65,339,903	4.8%
North Europe	15,430,894	17,544,696	13,659,326	19,174,137	19,187,200	20,936,405	2.2%
Southeast Asia	8,804,905	11,014,595	9,819,172	12,142,064	14,773,052	16,949,640	4.8%
Mediterranean	9,623,688	11,406,509	7,360,431	9,739,164	12,640,892	13,336,633	2.4%
Japan/Korea	7,945,623	9,906,486	6,517,658	10,667,608	9,837,975	10,127,962	1.7%
South America EC	9,035,601	11,329,607	6,823,880	6,989,297	8,328,190	8,602,472	-0.4%
Southwest Asia	3,440,553	4,973,582	4,030,501	5,796,797	7,223,368	8,461,313	6.6%
Central America	7,493,652	6,664,426	5,515,141	6,757,754	8,495,987	7,607,378	0.1%
South America WC	3,493,496	4,370,673	4,234,635	4,526,170	5,717,599	5,028,694	2.6%
Australia/NZ	2,429,756	2,772,853	2,135,003	2,438,933	2,968,525	2,327,991	-0.3%
Africa	2,253,236	1,590,960	1,482,756	2,606,860	1,759,178	2,113,045	-0.5%
Middle East	671,194	645,052	376,772	1,247,417	2,277,082	1,880,271	7.6%
Canada	3,336,699	1,397,856	1,112,930	1,691,397	886,104	1,359,352	-6.2%
Caribbean	1,558,073	1,443,802	1,654,877	2,947,545	1,527,575	1,065,241	-2.7%
All Others	98,441	163,751	138,656	206,654	281,430	373,604	10.0%
Total	109,476,622	141,782,541	108,124,752	139,457,279	157,348,393	165,509,905	3.0%

Here is the key takeaway from this macro-level overview of U.S. and regional containerized import activity: Since 2009, Port Everglades has lagged behind other South Atlantic ports, from JAXPORT through Charleston, in terms of annual growth. Port Everglades has also dramatically underperformed, compared to its competitors, in the large and fast-growing trade lanes of Northeast and Southeast Asia. Port Everglades has performed better than its competitors within the South Atlantic Port Range in Mediterranean trade. See Table 2.5.7.

Table 2.5.7: Port Everglades Containerized Import Tonnage by Trade Lane, 2003-2017*Source: USA Trade Online*

Trade Lane	2003	2006	2009	2012	2015	2017	CAGR 2003 2017
Central America	683,361	999,031	694,524	853,229	992,064	896,531	2.0%
Mediterranean	47,011	211,090	236,169	477,963	544,778	658,227	20.7%
South America EC	257,215	449,670	291,141	226,703	505,323	624,468	6.5%
South America WC	141,002	186,659	141,422	167,273	300,884	365,683	7.0%
North Europe	330,356	101,221	103,805	158,686	152,506	229,441	-2.6%
Caribbean	152,078	122,660	109,544	126,559	203,067	214,378	2.5%
Southwest Asia	2,376	2,980	7,634	33,047	54,245	55,546	25.2%
Australia/NZ	2,782	3,018	11,304	14,357	16,629	32,499	19.2%
China	107,122	343,462	99,771	79,926	97,870	30,288	-8.6%
Africa	125	20,427	13,298	7,254	6,969	8,186	34.8%
Southeast Asia	6,569	25,289	7,517	11,608	17,202	4,539	-2.6%
Middle East	33,999	859	2,449	2,218	1,973	2,303	-17.5%
Japan/Korea	10,330	20,304	4,580	4,077	6,823	2,072	-10.8%
Canada	71,709	410	93	125	847	2,034	-22.5%
All Others	2,033	43	30	74	1	1,379	-2.7%
Total	1,848,069	2,487,123	1,723,281	2,163,099	2,901,182	3,127,573	3.8%

2.5.5 International Containerized Cargo Market – Exports

Since 2003, U.S. international containerized export tonnage has grown by an average of 5.4 percent annually – with the Gulf Coast ports showing the strongest growth at 6.1 percent, followed by 5.9 percent annual growth at the Atlantic Coast ports, and 4.7 percent annual growth at West Coast ports. The strong growth in international containerized exports via the Gulf Coast ports resulted in an increase in export market share for those ports, from 17 percent in 2003 to 19 percent in 2017. West Coast ports' export share fell from 44 percent in 2003 to 40 percent in

2017, while Atlantic Coast ports' share of international containerized exports grew from 40 percent in 2013 to 42 percent in 2017. See Figure 2.5.5.

Figure 2.5.5: Historical U.S. Containerized Cargo Exports by Port Range, 2003-2017

Source: USA Trade Online

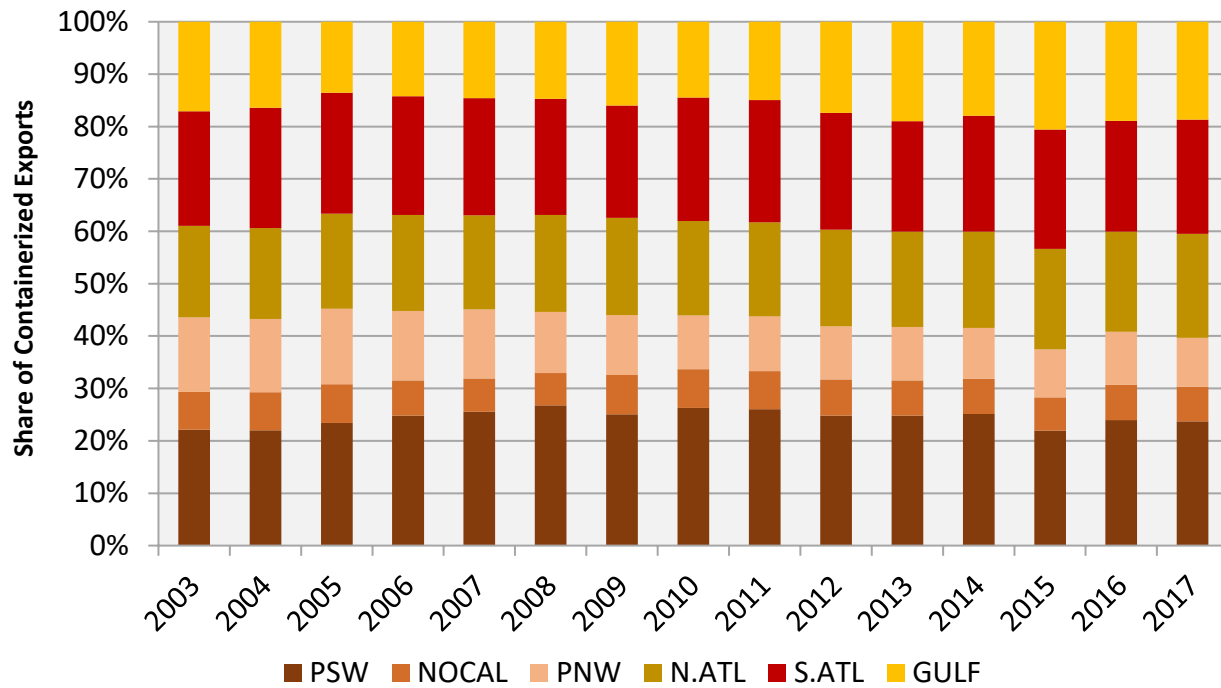


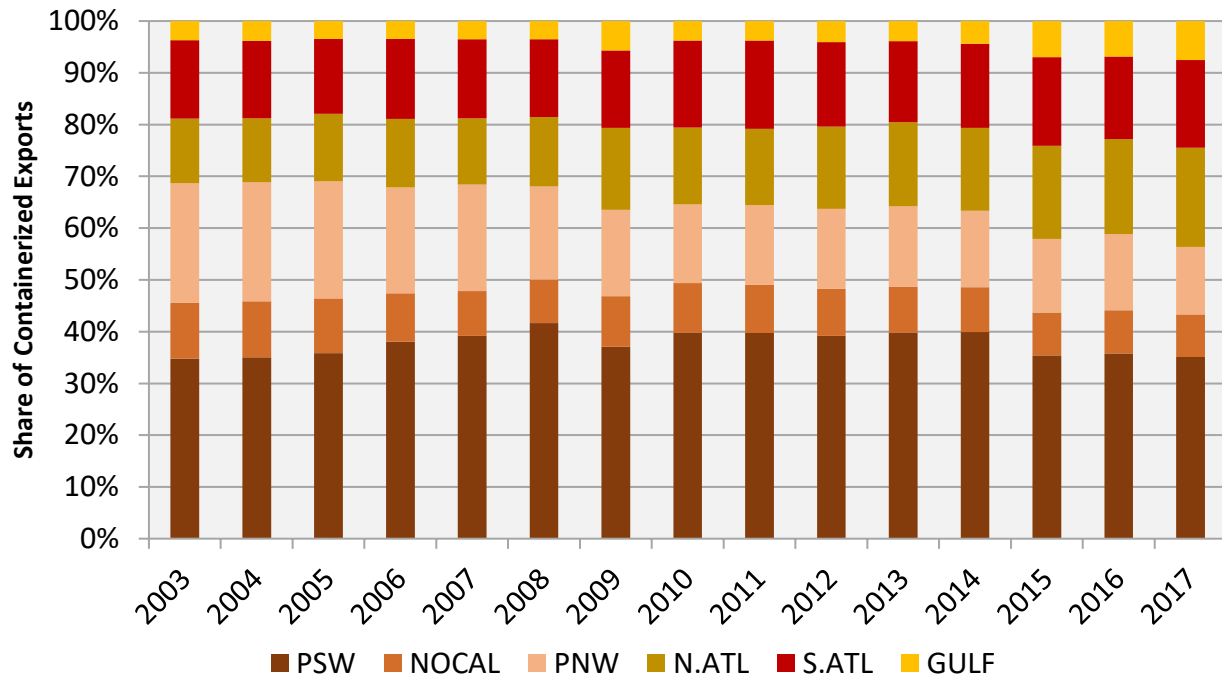
Figure 2.5.6: U.S. Containerized Export Cargo to Asia by Port Range, 2003-2017*Source: USA Trade Online*

Table 2.5.8: U.S. Containerized Export Tonnage by Port, 2003-2017*Source: USA Trade Online*

Port	2003a	2004a	2005a	2006a	2007a	2008a	2009a	2010a	2011a	2012a	2013a	2014a	2015a	2016a	2017a	CAAGR 03-17
LA/Long Beach	12,458,590t	13,177,609t	13,143,258t	17,874,388t	21,546,871t	25,893,058t	21,730,800t	25,285,104t	27,191,564t	24,547,817t	25,298,807t	25,485,898t	23,476,083t	26,109,920t	28,110,718t	6.0%
Houston, TX	5,695,197t	5,913,358t	5,844,448t	8,886,223t	8,354,357t	8,823,727t	9,579,654t	9,354,727t	9,912,511t	10,929,537t	12,518,625t	10,222,793t	11,248,212t	11,247,781t	12,460,448t	5.8%
Savannah, GA	5,403,611t	5,981,543t	6,796,423t	7,772,245t	9,389,412t	11,062,707t	9,436,729t	12,065,145t	13,019,573t	11,357,003t	10,831,897t	11,306,155t	10,870,479t	10,915,919t	12,348,012t	6.1%
New York/NJ	4,880,339t	5,084,688t	5,837,123t	6,808,648t	7,891,541t	9,118,468t	8,166,934t	9,589,688t	10,344,268t	9,352,846t	8,745,189t	8,368,561t	8,563,103t	9,523,104t	10,598,902t	5.7%
Norfolk/Newport News	3,338,058t	3,557,188t	3,942,747t	4,249,835t	4,789,152t	5,675,505t	5,222,405t	5,297,429t	5,562,563t	6,099,149t	6,894,710t	7,288,179t	7,213,266t	7,644,235t	8,545,432t	6.9%
Oakland, CA	4,031,751t	4,296,172t	4,643,607t	4,665,149t	5,104,099t	5,574,675t	6,223,051t	6,631,509t	7,070,334t	6,603,202t	6,586,433t	6,419,126t	5,933,709t	7,117,860t	7,421,290t	4.5%
Charleston, SC	3,973,948t	4,406,735t	4,564,358t	4,550,638t	4,974,865t	5,084,864t	3,729,841t	4,669,889t	4,852,055t	4,672,121t	4,648,820t	5,064,093t	5,435,849t	5,751,988t	6,597,729t	3.7%
Tacoma, WA	2,886,032t	2,969,861t	3,812,665t	3,965,825t	4,697,438t	4,975,891t	4,063,893t	3,519,638t	3,834,594t	4,308,368t	4,926,214t	5,164,574t	4,957,845t	6,426,575t	5,995,024t	5.4%
Seattle, WA	3,178,639t	3,724,084t	4,481,812t	3,577,606t	4,559,977t	4,458,100t	4,454,521t	5,340,561t	5,931,475t	4,888,521t	4,457,367t	3,968,949t	3,645,178t	3,921,896t	4,599,858t	2.7%
New Orleans, LA	1,671,626t	1,843,985t	1,416,223t	1,539,425t	1,915,481t	1,881,888t	1,903,247t	2,235,708t	2,674,465t	2,583,827t	2,441,396t	2,898,187t	3,284,215t	3,471,938t	3,742,802t	5.9%
Baltimore, MD	850,543t	925,199t	970,021t	1,056,461t	1,220,803t	1,420,879t	1,700,976t	1,333,888t	1,483,958t	1,437,824t	1,503,241t	1,440,932t	1,439,326t	1,959,548t	2,278,793t	7.2%
Miami, FL	1,379,671t	1,508,261t	1,420,255t	1,436,379t	1,668,340t	1,773,749t	1,889,302t	2,061,598t	2,172,163t	2,071,192t	1,857,454t	1,804,547t	1,791,576t	2,105,729t	2,248,838t	3.6%
Port Everglades, FL	681,870t	795,861t	967,818t	1,081,996t	1,213,412t	1,459,307t	1,318,556t	1,424,087t	1,584,119t	1,609,821t	1,593,263t	1,661,908t	2,048,066t	1,760,310t	1,943,379t	7.8%
Mobile, AL	446,712t	680,390t	430,488t	367,488t	269,448t	405,872t	655,880t	758,910t	885,440t	1,061,300t	1,411,871t	1,499,133t	1,271,324t	1,398,897t	1,593,271t	9.5%
Freeport, TX	334,088t	217,176t	205,072t	218,122t	243,141t	292,009t	181,623t	181,885t	219,555t	234,631t	201,953t	444,383t	1,026,486t	1,280,965t	1,277,604t	10.1%
Wilmington, NC	185,676t	185,175t	234,340t	363,908t	431,717t	701,529t	839,769t	940,687t	1,029,620t	793,066t	989,223t	955,236t	887,983t	936,362t	1,112,741t	13.6%
Jacksonville, FL	422,213t	549,192t	516,376t	583,979t	577,193t	663,321t	746,062t	1,035,325t	1,283,919t	1,126,619t	1,081,637t	1,061,710t	875,610t	1,004,449t	1,082,477t	7.0%
Boston, MA	218,028t	294,580t	362,772t	316,633t	338,034t	315,830t	414,888t	319,271t	434,247t	422,188t	465,363t	475,209t	488,089t	704,094t	840,711t	10.3%
Gulfport, MS	439,018t	479,025t	392,769t	395,448t	404,023t	412,684t	340,846t	459,962t	491,404t	423,603t	458,727t	412,568t	348,909t	438,891t	678,581t	3.2%
All Other Ports	4,254,347t	3,737,215t	2,923,684t	3,945,468t	4,854,260t	5,327,319t	4,219,748t	3,950,085t	4,699,893t	4,703,502t	5,261,917t	5,985,221t	5,646,742t	5,605,649t	5,591,187t	2.0%
Total	56,740,156t	60,326,437t	64,907,762t	72,055,925t	84,443,543t	96,221,960t	86,888,576t	96,461,035t	104,647,719t	99,223,634t	102,154,928t	101,687,556t	98,279,831t	109,326,208t	119,065,955t	5.4%

The loss of export market share by West Coast ports reflects growth in all-water services between Asia and the U.S. East and Gulf Coast ports (since 2002, as previously discussed). Figure 2.5.6 presents market share changes by port range. The share of West Coast port exports to Asia declined from nearly 70 percent in 2003 to about 57 percent in 2017. Port Everglades' international containerized export volume grew by 7.8 percent annually during the same 14 years, compared to an overall growth rate of U.S. exports of 5.4 percent. Port of Wilmington (NC) experienced the highest rate of growth in international containerized exports since 2003 (13.6 percent), driven mainly by exports to China and North Europe.¹¹

¹¹ USA Trade Online reports 1,943,539 metric tons (2,142,363 short tons) of exported containerized cargo for 2017 vs 3,389,361 short tons reported by Port Everglades. This substantial discrepancy is under review by Port Everglades.

Table 2.5.9: U.S. Containerized Export Tonnage by Trade Lane, 2003-2017*Source: USA Trade Online*

	2003	2006	2009	2012	2015	2017	CAGR 2003 2017
China	14,175,870	22,050,462	27,796,380	30,049,694	28,183,816	36,828,999	7.1%
Southeast Asia	4,706,958	5,634,904	9,150,003	9,478,419	10,326,127	14,568,444	8.4%
Japan/Korea	11,876,319	13,698,909	12,747,303	13,721,974	12,620,728	14,211,184	1.3%
North Europe	8,178,397	9,341,361	8,494,258	10,626,707	11,072,921	12,364,742	3.0%
Southwest Asia	1,342,350	1,705,969	4,012,493	4,441,803	4,480,432	7,330,961	12.9%
Mediterranean	4,622,126	4,982,324	5,714,615	6,172,406	5,643,926	6,613,062	2.6%
South America EC	2,941,021	4,063,199	4,554,670	6,740,226	7,166,569	5,876,829	5.1%
Central America	2,925,668	3,160,286	3,132,483	4,799,871	5,021,123	5,445,115	4.5%
Middle East	1,083,213	1,334,568	2,631,189	2,984,968	3,334,735	4,086,283	9.9%
South America WC	1,044,362	1,344,486	2,140,947	3,219,082	3,261,984	3,404,967	8.8%
Caribbean	1,748,808	2,160,501	2,370,187	2,482,595	2,696,476	3,035,929	4.0%
Africa	793,618	1,048,166	2,462,257	2,179,881	2,317,716	2,847,765	9.6%
Australia/NZ	1,204,173	1,432,516	1,574,631	2,207,544	2,044,618	2,332,387	4.8%
All Others	97,206	98,048	106,999	118,373	108,467	119,159	1.5%
Canada	66	226	160	94	193	131	5.0%
Total	56,740,156	72,055,925	86,888,576	99,223,634	98,279,831	119,065,955	5.4%

With respect to key growing trade lanes for exported containerized cargo, Southwest Asia, Southeast Asia, and Northeast Asia (specifically China) represent the strongest growth markets for export tonnage. See Table 2.5.9. The West Coasts of South America, the Middle East, and Africa represent smaller, but also growing, export markets. Growth in containerized exports at Port Everglades has been driven by the growth in exports to the East and West Coasts of South America, the Caribbean, North Europe, and Southwest Asia. Despite the strong growth in imports from the Mediterranean, Port Everglades has not shown the same level of growth in export tonnage as that market has.

Table 2.5.10: Port Everglades Containerized Export Tonnage by Trade Lane, 2003-2017*Source: USA Trade Online*

	2003	2006	2009	2012	2015	2017	CAGR 2003 2017
Caribbean	182,521	295,647	353,945	363,392	584,734	740,579	10.5%
Central America	350,721	477,264	402,261	493,639	515,590	662,278	4.6%
South America EC	63,242	166,299	217,999	300,436	713,766	285,305	11.4%
South America WC	35,816	72,205	113,911	150,605	163,552	189,810	12.7%
North Europe	6,769	14,131	7,204	13,933	12,625	37,616	13.0%
Southwest Asia	166	1,899	70,681	45,690	37,409	17,381	39.4%
Southeast Asia	339	509	25,221	64,462	2,976	2,450	15.2%
Australia/NZ	61	339	817	1,124	2,275	2,449	30.2%
Mediterranean	3,160	6,781	18,673	25,760	2,959	1,891	-3.6%
Japan/Korea	13,569	3,110	10,383	3,975	1,381	1,614	-14.1%
Africa	1,765	2,738	3,105	4,044	2,787	971	-4.2%
Middle East	434	3,076	4,333	8,109	2,260	553	1.7%
China	20,656	37,898	89,991	134,118	5,593	347	-25.3%
All Others	1,651	98	32	33	138	296	-11.6%
Canada	0	0	0	0	0	0	N/A
Total	680,870	1,081,996	1,318,556	1,609,321	2,048,046	1,943,539	7.8%

This competitive analysis of the international container market underscores the fact that Port Everglades has performed well in north-south trade with the East and West Coasts of South America, the Caribbean, and Central America, and in the transatlantic trade with the Mediterranean (imports) and North Europe (exports). Port Everglades has also seen growth in two-way trade with Southwest Asia, thanks to relay cargo from that region handled by ocean carriers active in the Mediterranean trade. Port Everglades has not achieved meaningful participation in two of the world's largest and fastest-growing markets, however, namely China and Southeast Asia. Other South Atlantic ports with which Port Everglades competes

directly for trade with these regions – Port of Savannah, Port of Charleston, JAXPORT, and Port *Miami* – have been more successful in this regard.

2.5.6 Port Selection and Hinterland Access

In order to continue to grow in step with the broader market and tap into the substantial economic growth occurring across the Pacific Rim (among other regions), Port Everglades must identify competitive logistics channels and remove constraints to growth. This continuation includes ensuring that port infrastructure can adequately and efficiently handle the vessel types and sizes that are expected to be deployed in the major trade lanes, relevant to the South Atlantic port range during the coming 20 years. It also means that Port Everglades must actively engage in addressing the numerous challenges that its terminal operators face, as previously discussed. Beyond these measures, Port Everglades must assess ways to serve both its core and extended hinterland markets more cost-effectively than competing ports, such as Port of Savannah, JAXPORT and Port *Miami*.

An analysis of Port Everglades' potential container market starts with an understanding of how the container shipping industry is evolving, how the port's core and extended hinterland markets are currently served, and why beneficial cargo owners (BCOs) and other shippers are choosing to use other South Atlantic ports to meet their Florida distribution needs, particularly for Northeast, Southeast, and Southwest Asia origin and destination cargo.

The expansion of the Panama Canal, which was completed in June 2016, provides the capacity of the canal's lock chambers to handle container ships up to about 14,000 TEUs. Prior to the expansion, the maximum size of vessel that could transit the locks was about 5,000 TEUs. The impact of the larger Panama Canal is already impacting the size of the vessels moving through the canal. Table 2.5.11 shows the average size of the container ships moving to and from Asia through the Panama Canal to the ports of Jacksonville, Charleston, Miami, and Savannah, which are the ports in the South Atlantic range that have experienced the strongest growth in Asia cargo over the past several years.

Table 2.5.11: Average Size (TEUs) of Vessels Deployed through Panama Canal in the Asia Trade Lane - Select South Atlantic Ports*Source: PIERs; Martin Associates*

PORT	AVERAGE SIZE OF CONTAINER SHIP 2012 (TEUs)	AVERAGE SIZE OF CONTAINER SHIP 2017 (TEUs)
Port of Charleston	4,885	8,401
Port of Savannah	5,106	8,366
PortMIAMI	4,650	6,974
JAXPORT	5,002	6,566
Port Tampa Bay	2,448	4,748
Port Everglades	4,235	4,189

The average size (TEU capacity) of container vessels calling South Atlantic ports on all-water services to/from Asia via the Panama Canal in 2017 was 6,541 TEUs. For Charleston and Savannah, the average was about 8,400 TEUs. For PortMiami and JAXPORT, the average was approximately 6,800 TEUs. In all cases, there has been a significant increase in average vessel size since 2012. For Port Everglades, the average size of vessels transiting the Panama Canal has actually declined since 2012. This is contrary to the trend across the entire rest of the region, and clearly reflects Port Everglades' lack of participation in the Asia trade.

The reason for the rapid increase in container vessel size in most markets around the world has been well-documented, and is primarily the result of ocean carrier efforts to reduce slot costs while growing market share. As vessel sizes increase, deeper channels, larger turning basins, super-post Panamax cranes, and efficient terminal operations will become increasingly vital at the ports that handle all-water services to/from Asia. In addition, as larger ships cascade from one trade lane to another, there will be constant growth in the size of vessels deployed on all trade routes. For example, the largest container vessels – those in the 18,000 TEU and above category – are currently deployed in the Asia-Europe trade, as the economies of the largest container vessels are best realized on the longest trade

routes with minimal port calls. As these ships in the 18,000 TEU range continue to be deployed in Asia-Europe services, smaller vessels (i.e. 12,000-14,000 TEUs) are displaced and redeployed into routes such as the transpacific, which offers the second longest sailing distance with minimal port calls. These newly deployed vessels on the transpacific trade (from the Asia-Europe trade) displace the vessels in that trade (i.e. 8,000-10,000 TEUs), and are redeployed to the all-water Asia-U.S. East Coast/Gulf Coast trade via the Panama Canal.

A summary of the orderbook for container vessels as of February 2018 is presented in Table 2.5.12. This summary highlights the growing average size of vessels across the global container fleet. Of the 413 vessels on order, as of February 2018, 37 percent have capacities of 10,000 TEUs or greater. The balance of vessels on order (57 percent) are feeder vessels, ranging in capacity from several hundred TEUs up to 2,999 TEUs. These latter ships will be deployed on feeder services within Asia and Europe, as well as in the Caribbean trade.

Table 2.5.12: World Cellular Containership Fleet as of February 2018

Source: Drewry; Martin Associates

Drewry Classification	Size Range (TEUs)	Active			On Order		
		Ships	000 TEUs	Average Age (years)	Ships	000 TEUs	% Active Fleet
ULCV	18,000+	73	1,410	1.9	56	1,143	81%
VLCV - Neo over-Panamax	13,000-18,000 (>49m beam)	148	2,139	4.0	5	70	3%
VLCV - Maxi neo-Panamax	12,500-14,500 (>49m beam)	97	1,279	5.4	40	563	44%
Large neo-Panamax	10,000-12,500	134	1,432	5.1	52	587	41%
Small neo-Panamax	5,300-10,000	930	7,026	9.6	2	19	0%
Classic Panamax & wide-beam	3,000-5,300	906	3,844	10.6	22	83	2%
Large feeders	2,000-3,000	626	1,586	12.6	104	266	17%
Small feeders	100-2,000	2,276	2,380	14.7	132	159	7%
Total		5,190	21,096	11.9	413	2,891	14%

The drafts of vessels in excess of 8,000 TEUs range from 45 feet to just over 50 feet. Typically, channel depths to handle such vessels require at least two feet, in addition to the draft of the vessel, to ensure safe transit to berth. This data suggests that a channel depth of 47 feet and greater will be needed to handle the fully laden vessels that will dominate the future container fleet.¹² Vessel length overall (LOA) is another critical factor in terminal and berth planning, since larger vessels occupy more linear capacity than smaller vessels, regardless of the number of containers actually moved across the wharf. The LOA range for the majority of new vessels on order is between 900 and 1,230 feet.¹³

Last but not least, the width (beam) of the majority of vessels on order is between 130 feet and 170 feet. This vessel dimension is at least as important for Port Everglades' planning purposes as draft and LOA, since Port Everglades' Southport Access Channel is relatively narrow, making navigation complicated by the frequent presence of post-Panamax cruise vessels berthed along the western edge of the Southport Access Channel.

To date, Port *Miami* has successfully been deepened to 50 feet. The port of Charleston has begun (February 2018), deepening their channel to a depth of 52 feet. The port of Savannah expects to complete the deepening (to 49 feet) of the 18.5-mile outer harbor – and Savannah River (to 47 feet), to allow vessels up to 14,000 TEUs to call their Garden City Terminal as early as 2019. The deepening to 47 feet of the St. Johns River that serves JAXPORT's container terminals is now underway, and plans are in place for a 2021 completion. The Port Everglades deepening and widening project has been authorized, but it is not expected to be completed until 2023 or beyond, pending funding.¹⁴

In addition to navigational improvements, state of the art container cranes (i.e. 22 across and 9 above deck, 7 in the hatch) and terminals are required to make Port Everglades more competitive. Highway and rail connections are also essential for handling the growing size of container vessels. Investments in super post-Panamax cranes are already underway, as documented in Element 1 of this Update. The Florida East Coast Railway (FEC) Intermodal Container Transfer Facility (ICTF) within

¹² For example, Hyundai Merchant Marine (HMM) has announced plans to build twelve 23,000 TEU vessels (2020), and another eight 14,000 TEU vessels (2021) – Freightwaves, June 5, 2018.

¹³ Source: Clarkson Research, January, 2016 Cellular Containership Fleet Report

¹⁴ Federal funds have not yet been appropriated for this project.

Southport provides near-dock double stack rail access to and beyond Jacksonville's Bowden yard. This facility is used by Crowley and other carriers, who move textiles from Central America destined for importers in the Carolinas, as well as perishable cargos.

2.5.7 Port Everglades Import Market Potential

The geographic distribution of population density, and the location of distribution centers within the states of Florida and Georgia, are key to establishing the cost-effective hinterland that can reasonably be expected to be served by Port Everglades. Figure 2.5.7 shows the concentration of population by county in the states of Florida and Georgia. Population density within these two states is concentrated in the tri-county region of South Florida (along the I-4 Corridor region, from Tampa through Orlando to Volusia County) and Lee County and the Northeastern Florida region (surrounding Jacksonville and extending South along I-95). In Georgia, the population density is heavily concentrated in the Atlanta region.

Figure 2.5.7: Distribution of Population within Florida and Georgia by County

Source: U.S. Census Bureau

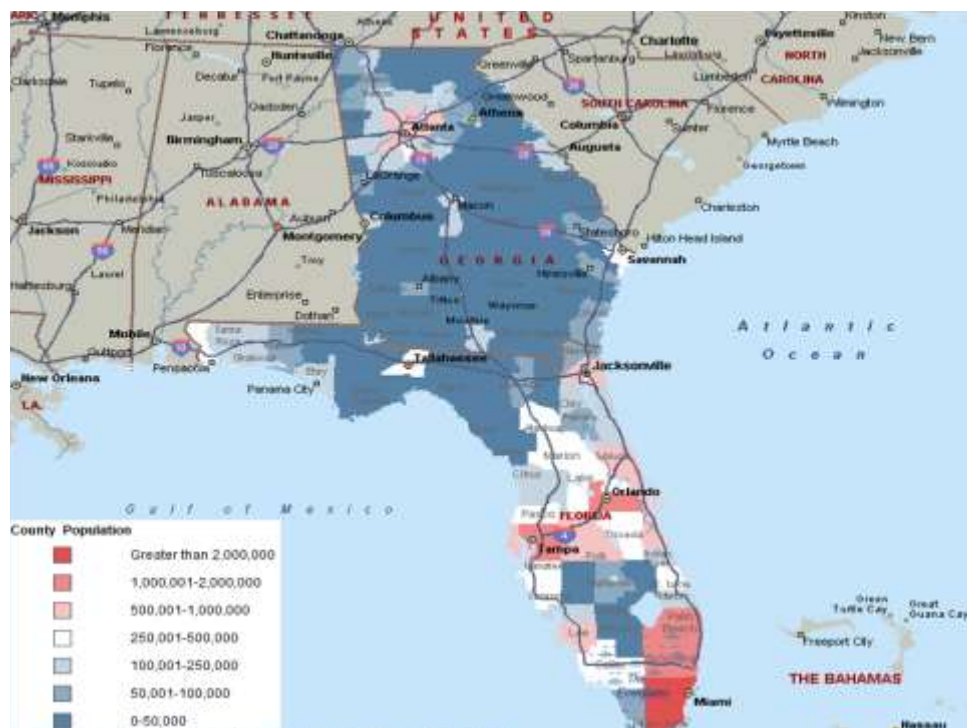
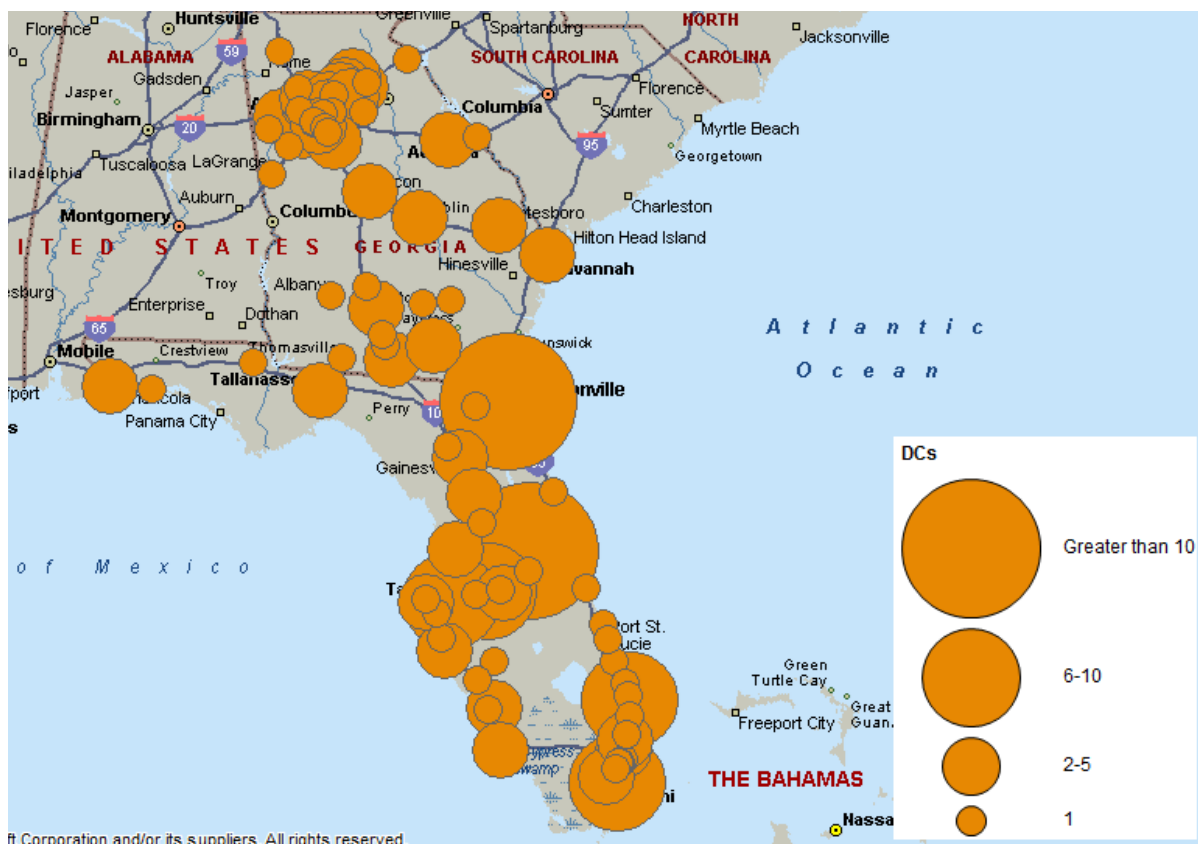


Figure 2.5.8 shows the location of distribution centers throughout Florida and Georgia. Within Florida, distribution centers are clustered in the population centers, namely South Florida, the I-4 Corridor, and greater Jacksonville. Within Georgia, most distribution centers are located in the region between Savannah and Atlanta, as well as Southeastern Georgia.

Figure 2.5.8: Location of Distribution Facilities in Florida and Georgia

Source: Retail Chain Store Guide



The location of distribution centers is a critical factor in attracting cargo, particularly consumer goods such as furniture, apparel, electronics, toys, and perishables, and the location of distribution centers, in proximity to a given port, is critical to attracting ocean carrier services. Port-centric locations are becoming more important as a means of attracting ocean carrier services, because a key cost component to an ocean carrier is the ability to control empty containers, and minimize the cost of repositioning these containers from the consumption points back to the seaport, with no revenue-bearing cargo. In addition, carriers are continuing to price “port-to-port” moves more frequently than “point-to-point”

moves. For port-to-port moves, the ocean carrier is responsible for the cost of moving the cargo from the foreign port to the U.S. port, including the terminal and stevedoring charges. The BCO is responsible for the inland transportation part of the move. For point-to-point moves, the ocean carrier is responsible for the inland cost portion, as well as the cost of the ocean transportation and terminal and stevedoring operations. With the greater emphasis on port-to-port pricing, BCOs are incentivized to develop import distribution centers closer to ports, and to population centers, thereby minimizing the inland costs associated with transporting imported goods from the port, either to a regional distribution center for further distribution or directly to the ultimate consumer (i.e. retail outlet or direct delivery).

This latter method, serving the end consumer directly from the distribution center/fulfillment center, is very advantageous to the growth of e-commerce, since the distribution center serves as both an import distribution center and a fulfillment center for online orders. Once international goods arrive at a distribution center, marine containers are unloaded, and their contents are either warehoused, sent directly to fulfill local orders, or transloaded into domestic trailers (typically 53 feet in length) for delivery to one or more regional distribution center(s). In cases where the distribution center also serves as a fulfillment center supporting e-commerce and last-mile delivery (often within 24 hours), the imported containers are unloaded, and often, the cargo is reloaded into less than truckload lots for direct delivery to consumers. The location of fulfillment centers in densely populated regions both facilitates the ability to meet 24-hour or same-day order delivery requirements, and is critical to handling e-commerce returns, given the fact that 30 percent of all e-commerce products are returned, compared to 8.9 percent for purchases from brick-and-mortar stores.¹⁵

Whether serving as an import center located in proximity to the port or as a fulfillment center, the near-port location of distribution centers reduces the drayage cost between the port of discharge and the distribution center, and provides the ocean carrier with greater control of marine container equipment, since this equipment is not required to leave the local market. From a shipper perspective, transloading ocean containers at near-port facilities into larger 53-foot

¹⁵ Source: <https://www.abivin.com/single-post/2018/04/12/5-fundamental-ways-to-reduce-Last-mile-Delivery-Costs>

domestic trailers for inland distribution is trending, because many imports, particularly electronics, apparel, and toys from Asia typically “cube out” a container before “weighing out.” This tactic results from the fact that imports are generally light but bulky, and require a container with more volume for efficient inland transportation. Using a 53-foot container, rather than a standard 40-foot marine container, for inland transportation provides a lower cost per ton than using a smaller 40-foot container.

With the escalation in trucking costs due to rising fuel prices, strictly enforced driving hours due to the mandatory electronic logging devices (ELD) now installed on all trucks, and truck driver shortages, the minimization of trucking costs is a vital factor and key competitive advantage for BCOs. Thus, the ability to operate a distribution facility in close proximity to a seaport within a significant consumer market is one of the major factors driving ocean-carrier port selection. As shown in Figure 2.5.8, Port Everglades is also surrounded by a large local concentration of distribution center development, with the I-4 Corridor and its population of more than 5.5 million consumers within approximately a half-day’s drive.¹⁶

Given these distribution center dynamics, Port Everglades is well-positioned to capitalize on the development of additional distribution-center square footage within South Florida, focusing on minimization of total logistics costs to the BCO. These total logistics costs include ocean carrier charges, drayage costs from the port to the distribution center(s), costs for distribution center development and operation, and drayage costs from the distribution center(s) to the end consumer population centers (particularly within the tri-county region and along the I-4 Corridor). The pending construction of the new Port Everglades International Logistics Center (ILC) will maintain its Foreign-Trade Zone status, and is a perfect example of the type of on-port, interstate highway (I-595) and rail (FEC ICTF) adjacent distribution capacity that is becoming increasingly attractive for facilitating these logistics.

The proximity of the port of Savannah, JAXPORT, and PortMiami to Port Everglades, as well as the fact that each of these competing ports either can or soon will be able to serve fully laden 8,000 TEU and greater container vessels regularly, due to completed and soon-to-be completed harbor deepening projects, means that

¹⁶ Source: factfinder.census.gov

ocean-shipping freight rates to these ports from Asia already are, or soon will be, equalized to those of Port Everglades. For example, Martin Associates' voyage costing model estimates that the ocean carrier cost for an 8,500 TEU vessel deployed between Shanghai and the South Atlantic ports provides a 28 percent per TEU slot cost savings, over the use of a 4,800 TEU vessel on the same routing (from \$581 per slot to \$420 slot for an 8,500 TEU vessel). In a recent whitepaper from the U.S. Merchant Marine Academy titled *Economies of Scale in Container Ship Costs*, Midshipman William Murray provides a detailed analysis of the cost savings, due to the use of larger vessels. The report findings indicate that the use of a 10,000 TEU vessel vs. a 5,000 TEU vessel results in a reduction of daily operating costs from about \$2.10 per TEU (for a 5,000 TEU ship) to about \$1.40 per TEU, for the use of a 10,000 TEU vessel. This difference represents a 33 percent cost savings. If the channel at Port Everglades is not widened and deepened to 48 feet as per the current USACE project, then ocean shipping costs from Asia to Port Everglades will be about 25-35 percent greater on a per-container basis than to its principal competitor ports.

Based on the Shanghai Containerized Freight Index (SCFI), which reports average container shipping rates from Shanghai to the East Coast of the U.S., the most recent ocean freight rate for a voyage from Shanghai to the East Coast was \$2,271 per 40-foot container. If this rate, as well as terminal charges (including stevedoring) at Port Everglades, Port of Savannah, JAXPORT, and PortMiami, are roughly comparable (i.e. \$235 per container to \$260 per container) then the hinterland for which Port Everglades is competitive, particularly relative to import cargo from China – the largest single export market for consumer goods to the U.S. – depends almost entirely on the cost of delivering a given container to a given point of consumption (i.e. distribution center/major population center).

To determine the cost-effective hinterland within Florida for Port Everglades, vis-à-vis that of JAXPORT and PortMiami, the distance between each of these ports and key Florida counties was computed. Based on these distances, Martin Associates' truck cost model was calibrated with 2018 daily, and hourly operating cost data developed from interviews with major trucking companies serving the South Atlantic port markets, as well as the most recent truck operating cost data

presented in the American Transportation Research Institute (ATRI) report titled: *An Analysis of the Operational Costs of Trucking, 2017*.¹⁷

To arrive at the final estimate, it was assumed that there is a one-hour queuing, drop, and retrieval time at each of the container terminals, compared to a one-hour delivery time. The average operating speed of trucks was also assumed to be 40 miles per hour across the board for all long-haul deliveries. Using these assumptions, the cost-effective hinterland for Port Everglades was determined. See Figure 2.5.9.

The cost-effective hinterland shown for South Florida is shared nearly equally between Port Everglades and Port *Miami*, as the trucking cost per box differential between the two ports is within about \$60. Not surprisingly, the two South Florida ports can most cost-effectively serve the South Florida market, extending North to approximately St. Petersburg and Fort Pierce.¹⁸ This hinterland represents roughly 40 percent of the Florida population, and it is assumed that Port Everglades and Port *Miami* can and will continue to hold a 50 percent share of this market, provided the infrastructure and operational challenges previously referenced are remedied by Port Everglades.

¹⁷ Available online at: atri-online.org

¹⁸ Port Everglades' ability to compete in the Asia market is dependent upon harbor deepening and widening in addition to of capital infrastructure improvements mentioned previously.

Figure 2.5.9: Cost-Effective Hinterland for Port Everglades*Source: Martin Associates*

2.5.8 Port Everglades Import Market Potential

Journal of Commerce (JOC) PIERS data provide a starting point to identify current importers and exporters located in the State of Florida and the ocean carriers and ports they use. While this database has limitations, in terms of identifying the ultimate origin/destination of the importer or exporter by city and state, it provides a guide about competitive positioning of the Florida ports to serve their in-state shipper customers. Table 2.5.13 presents the share of imports destined for Florida that are moved via Port Everglades, compared to that of competing ports, both within and outside of Florida.

Table 2.5.13: Florida Imports by Trade Lane by Port, 2017*Source: PIERS; Martin Associates*

Trade Lane	Miami	Port Everglades	Jacksonville	Los Angeles	Savannah	Long Beach	New York	Houston	Charleston	Other FL Ports	Other Non FL Ports	Total	Share through FL
China	79,562	974	38,030	37,724	17,254	37,382	11,178	3,533	2,968	8,204	27,352	264,160	48.0%
C America	28,705	66,825	848	5,067	3,800	1,659	1,349	9,712	495	19,681	26,972	165,112	70.3%
S America	10,056	49,293	3,898	3,593	2,479	2,757	11,430	12,790	5,556	160	39,368	141,378	44.8%
SE Asia	17,842	214	25,100	9,174	8,077	4,400	3,291	3,633	3,429	2,689	8,303	86,152	53.2%
Caribbean	17,739	17,191	42,439	14	56	4	695	209	55	778	3,161	82,341	94.9%
Med	16,262	24,588	488	749	6,177	1,376	9,372	4,440	787	582	5,779	70,599	59.4%
N Europe	14,509	6,933	820	335	10,060	392	5,296	1,919	2,355	346	4,364	47,330	47.8%
Japan/Korea	6,397	40	1,351	3,535	941	1,975	675	162	217	224	2,074	17,591	45.5%
SW Asia	2,883	1,615	349	614	4,490	200	1,832	314	824	40	1,263	14,423	33.9%
Australia/NZ	494	1,447	195	15	346	203	44	32	13	1	971	3,763	56.8%
Middle East	764	146	207	15	1,039	15	156	337	46	4	624	3,354	33.4%
Africa	226	320	46	6	174	8	814	341	328	6	225	2,494	24.0%
Canada	143	17	0	0	4	0	0	0	0	17	96	277	63.7%
All Others	0	4	0	15	2	1	13	0	0	20	20	75	31.9%
Total	195,582	169,606	113,771	60,857	54,900	50,373	46,146	37,421	17,074	32,750	120,570	899,048	56.9%
Percent	21.8%	18.9%	12.7%	6.8%	6.1%	5.6%	5.1%	4.2%	1.9%	3.6%	13.4%	100.0%	

Based on PIERS data, about 387,340 loaded import TEUs moved into Florida via non-Florida ports in 2017.¹⁹ Overall, Port Everglades handled 18.9 percent of these imports – behind PortMiami (21.8 percent) – but well above JAXPORT (12.7 percent). As illustrated by the trade lane distribution, Port Everglades' leading markets for imports that are consumed in Florida are Central America, South America, and the Mediterranean. The Florida ports last year collectively handled 70 percent of containers imported into Florida from Central America, and 60 percent of containers imported into Florida from the Mediterranean. Port Everglades is the dominant Florida port in both of these markets. All Florida ports combined handled less than 50 percent of Florida imports from South America and

¹⁹ Locations provided for shippers/consignees within the PIERS database may represent headquarters locations, not actual origins/destination of the cargo. Efforts have been made to control for this potential reporting error.

China in 2017. These two trade lanes therefore offer significant growth potential for Port Everglades.

Cold Chain Logistics

A large portion of the 45,920 TEUs imported into other non-Florida ports from South America consist of containerized grapes and berries originating in Chile and other areas of South America that move into the U.S. via the Delaware River ports of Wilmington, Philadelphia, and Gloucester City, and are then trucked down to Florida for consumption. Federal regulations designed to protect the nation's citrus industry have long barred certain imports from entering ports in Southern U.S. states, due to the risk of invasive pests that could thrive and damage the citrus industries in these warmer southern climates. Until very recently, only ports north of the 39th parallel could receive products subject to the "cold treatment" requirements mandated for these pests. A pilot program was initiated in October 2013 to allow Port Everglades and PortMiami to import blueberries and grapes from Peru and Uruguay.

The ability to relax or repeal additional regulations that apply to similar products in this trade lane is another clear opportunity to increase future Port Everglades container volume and grow market shares. Current inquiries at Port Everglades regarding the establishment of a cold chain logistics complex underscore the importance of the perishables market, particularly at South Atlantic ports. Port Everglades is already a leader in this niche, and the 2014 construction of the near-dock FEC ICTF provides a real opportunity to extend the port's hinterland specific to perishables, not merely further into the I-4 corridor, but beyond the state line. By definition, perishables have a limited shelf life and lose value every day that they are not in markets or otherwise available for purchase by consumers. The potential for Port Everglades to increase speed-to-market for perishable products by transloading them on-port, into either refrigerated 53 foot domestic trailers or refrigerated railcars, so that they reach their final point of consumption more quickly, adds real value for shippers. The FEC's scheduled rail service all the way from Port Everglades to Jacksonville, with CSX and NS connections continuing from there to points throughout the Eastern U.S., could allow shippers of perishables to access key markets in the South Atlantic and beyond more quickly and at lower costs than accessing these same markets via a northern port (i.e. Wilmington) then trucking the product south.

With respect to the demand for cold storage facilities, there is growing interest in the development of temperature-controlled warehouse and transload facilities. This demand is driven by the identified potential to capture an increasing share of the South American fruit, such as grapes and melons, that have previously been restricted from entering Florida ports, as described previously. However, they have new treatment methods for pest control, as well as the increased containerization of these commodities, so South Atlantic ports are positioning for this potential market. In addition, the potential for Florida exports of citrus to Europe, plus the ability to capture railed frozen products from the Midwest destined to Europe via Florida ports provides a further opportunity for the development of temperature-controlled facilities with direct rail and port access.

In addition, there is a growing interest in the synergies between air cargo perishables, particularly seafood, and cold storage facilities within the port's hinterland. In most cases, the demand for cold storage/temperature controlled warehouses is specific to facilities that can provide transload/cross dock operations, where the imported perishable cargo moving via container is stripped at the port, then transferred to domestic truck or rail for distribution. Similarly, perishables for export, such as meat and fish, are reloaded from over the road truck or rail into marine containers at the temperature controlled/refrigerated warehouse.

With respect to the imported perishables including the potential market of grapes and melons, as well as bananas, seafood, and other citrus, on-dock rail served facilities and truck cross dock operations provide direct distribution to the regional distribution centers of major grocery chains and retail outlets serving the central and South Florida markets. Port Everglades is well positioned to increase its share in the perishables/cold chain market due to:

- Ability to serve the high population density of markets of Southern Florida and the I-4 market
- Lack of on terminal/near terminal space at other South Florida ports
- The current service offered by carriers on the South American West Coast and Central American trade lanes

- Ability to maximize warehouse space by serving both import and export markets and providing local distribution for domestic perishables
- On-dock access to the FEC ICTF for the receipt of perishables from the Midwest for both export and domestic consumption

The ability of Port Everglades to grow this market represents a real, near-term opportunity, and is underscored by the demand for on-dock temperature-controlled space by private sector developers. Rigorous analysis is underway at Port Everglades, as of the writing of this 2018 Update, to evaluate the merits from a financial and operating perspective of such private sector investment.

Asia Trade

In terms of competition for Asia cargo, the West Coast ports of Los Angeles and Long Beach handle 75,106 loaded TEUs of imports destined for Florida from China, while Port of Savannah handles 17,254 loaded TEUs from China that are consumed in Florida. Together, these three ports supply 92,360 TEUs of Chinese imports to the Florida market. Looking beyond China to the very large overall Asia market (China, Southeast Asia and Southwest Asia), the ports of Los Angeles and Long Beach handle 93,519 loaded TEUs of Florida import cargo. The opportunity to divert some or all of this cargo away from Southern California to Port Everglades, by shifting it from a long-haul intermodal move to a direct all-water service into South Florida, is not out of reach. The 25,944 TEUs of Florida imports from Asia currently imported via Port of Savannah and the 14,669 TEUs imported into terminals at the port of New York and New Jersey (PANYNJ) in the Asia trade lane represent a similar opportunity.

Based on this analysis of imports moving into Florida via ports other than Port Everglades, a total of 325,178 loaded TEUs represents the total potential additional import market size for which Port Everglades could be competitive. Applying the 40 percent market capture rate for the South Florida ports previously discussed, and factoring in the roughly 50-50 split of this market that currently exists between Port Everglades and PortMiami, the likely size of the additional import market for which Port Everglades can cost-effectively compete is 65,035 (loaded) TEUs. The majority of this opportunity exists on the Asia trade lane, which represents a total potential market capture of 186,759 annual loaded TEUs, followed by 78,175 TEUs moving into Florida from South America via non-Florida ports, 26,554 TEUs from

the Mediterranean, and 24,503 loaded TEUs imported into Florida from Europe. The Caribbean and Central American markets are not included, since the Florida ports already control a significant share of the imports moving into Florida from these markets. The total potential market for Port Everglades, based on PIERS data, is summarized in Table 2.5.14.

Table 2.5.14: Total Potential Import Market Represented by Imports into Florida from Non-Florida Ports (Loaded TEUs)

Source: PIERS; Martin Associates

Trade Lane	Los Angeles	Savannah	Long Beach	New York	Houston	Charleston	Other Non Florida Ports	Total
Asia	47,247	25,944	46,272	14,669	8,997	6,712	36,917	186,759
Europe		10,060		5,296	1,919	2,355	4,364	23,994
Mediterranean		6,177		9,372	4,440	787	5,779	26,554
South America		2,479		11,430	12,790	5,556	45,920	78,175
Other Lanes*		2,506		1,703	871	605	4,010	9,695
Total Market Potential	47,247	47,167	46,272	42,470	29,018	16,014	96,989	325,178

*Excludes Caribbean and Central American Trade Lanes

One complication with PIERS is that, as a result of the increasing use of transloading discussed above, the cargo that is removed from a marine container, then reloaded into a 53-foot domestic container, is no longer considered international cargo from a U.S. Customs perspective, since the cargo is cleared for entry prior to the transload operation. The PIERS database does not include this domestic move. Therefore, with a greater degree of transloading, the PIERS data will have a tendency to understate the amount of imported containerized cargo moving into a region or state, since it is arriving at its final destination via a domestic move. A similar situation occurs for cargo that moves from the port of discharge directly

into an import distribution center, where it is repackaged, then moved on to the regional distribution center or a retail outlet.

The 2014 *Analysis of Global Opportunities and Challenges Report* prepared for the Florida Ports Council identified 252,009 TEUs moving into Florida from distribution centers in Georgia.²⁰ Allocating 40 percent of this potential to the South Florida ports, based on the population that can be cost-effectively served via Port Everglades and PortMiami, and dividing this number in half to represent the respective 50 percent share of each of these ports, an additional 50,402 TEUs of potential cargo for Port Everglades is estimated. The same 2014 report cited that 370,960 TEUs that moved into Florida via intermodal rail from non-Florida port areas and key locations of distribution centers handling international cargo. Applying the same 40 percent South Florida population share and the 50 percent port factor yields an additional 74,192 TEUs of potential cargo that could be handled via Port Everglades.

In summary, using a combination of PIERS data, warehouse truck data, and intermodal domestic rail data, the overall potential incremental import container market for Port Everglades is estimated at 189,629 loaded TEUs, and breaks down as follows:

- 65,035 loaded international TEUs moving into Port Everglades' cost-effective hinterland via non-Florida ports, particularly Port of Savannah and Los Angeles/Long Beach.
- 50,402 loaded TEUs moving into Port Everglades' cost-effective hinterland by truck from import distribution centers located in Atlanta and Savannah.
- 74,192 TEUs of domestic intermodal rail cargo moving from key international import centers in Los Angeles/Long Beach, Dallas/Fort Worth, and Chicago.

In order to compete more effectively for Asia-origin import cargo, Port Everglades must demonstrate to shippers that its value proposition is greater than that of West Coast ports. Martin Associates developed a logistics cost analysis, using the Martin

²⁰ Source: *Analysis of Opportunities and Challenges for Florida Ports*, December 2014, Florida Seaport Transportation & Economic Development Council, Martin Associates, in association with Sandler, Travis and Rosenberg, P.A., Nancy Leikauf and Associates, LLC

Associates' Voyage Costing Model, to compare vessel voyage cost, marine terminal costs, and inland costs to move cargo from Asia to Florida via two routes:

- Intermodally via the ports of Los Angeles and Long Beach
- All-water service through the Panama Canal via Port Everglades

Orlando was selected as the representative Florida consumption point. Table 2.5.15 indicates that routing Asia import cargo via Port Everglades provides a \$350 per 40-foot container cost savings over the West Coast intermodal routing.

Table 2.5.15: Intermodal vs. All-Water Logistics Costs, Asia Imports to Orlando, FL²¹

Source: Martin Associates (based on USA Trade Online data)

Logistics Costs from Shanghai	Voyage Cost	Terminal Charges	Inland Cost	Total Cost/FEU
Los Angeles/Long Beach	\$850	\$450	\$1,800	\$3,100
Port Everglades	\$1,800	\$250	\$700	\$2,750

The inland cost for the intermodal move from Los Angeles/Long Beach is based on a combination of intermodal rates obtained from Intek Freight and Logistics, Inc., as well as confidential rail contract rates with ocean carriers provided to Martin Associates. The trucking costs are based on the hourly trucking costs described previously. Marine terminal rates are averages based on information provided to Martin Associates by ocean carriers and terminal operators at the respective ports. Inventory-carrying costs from Asia to Orlando via West Coast intermodal are approximately \$1,423 per container; via South Florida, the costs are roughly \$1,499 per container. In other words, the rail and transload costs on the West Coast largely offset the proximity advantage of West Coast ports to Asia, even when transit time is factored in. Only cargos that are extremely time-sensitive (i.e. fashion) are therefore likely to be impacted by the transit time differential for the Florida market.

It is critical to note that this logistics cost analysis assumes completion of the Port Everglades channel widening and deepening (to 48 feet) projects and installation

²¹ Assumes USACE channel deepening (to 48 feet) and widening project occurs as planned.

of an adequate number of super post-Panamax STS cranes to support a 12,000+ TEU vessel operation.

2.5.9 Port Everglades Export Market Potential

Port Everglades can also potentially increase its participation in the containerized cargo export market by identify containers originating in Florida that are exported via non-Florida ports. Table 2.5.16 shows the share of exports originating in Florida by trade lane, and the share of the exports moving via Florida and non-Florida ports.

Nearly 75 percent of the export containers originating in Florida use Florida ports. The Caribbean is the leading market for exported containers originating in-state, and more than 90 percent of these containers move via Florida ports. The second largest export trade lane for containers originating in Florida is Central America, at 75 percent. Port Everglades, and to a lesser extent, Port *Miami*, are the dominant Florida ports in this trade, reflecting the strong north-south services portfolio at Port Everglades, as well as the Seaboard Marine operations at Port *Miami*. Port Houston, New York/New Jersey, Port of Savannah, and Port of Charleston are the key non-Florida ports used for Florida exports to South America.

Table 2.5.16: Florida Exports by Trade Lane by Port, 2017

Source: PIERs; Martin Associates

Trade Lane	Port Everglades	Miami	Jacksonville	West Palm Beach	Houston	New York	Savannah	Charleston	Baltimore	Other FL Ports	Other Non FL Ports	Total	Share through FL
Caribbean	129,703	67,668	164,928	85,769	5,319	9,812	4,077	1,705	866	2,302	16,445	488,593	92.2%
C America	101,466	68,834	1,428	56	10,789	9,982	5,924	2,130	847	4,829	29,711	235,996	74.8%
S America	72,681	22,016	3,145	685	19,367	14,143	8,277	16,021	10,273	95	11,155	177,859	55.4%
N Europe	2,658	6,673	29	70	3,220	5,486	6,697	7,515	291	1,846	2,803	37,289	30.2%
China	8	2,881	4,680	0	7,382	963	3,726	636	217	384	5,367	26,244	30.3%
Med	266	5,804	27	2	5,623	3,178	3,459	425	404	39	1,657	20,883	29.4%
Middle East	30	2,377	79	0	1,184	1,743	6,772	341	57	0	1,380	13,963	17.8%
Africa	69	922	192	0	1,309	990	2,302	429	65	2	524	6,805	17.4%
Japan/Korea	0	2,215	1,021	0	191	248	1,099	186	0	10	505	5,475	59.3%

Trade Lane	Port Everglades	Miami	Jacksonville	West Palm Beach	Houston	New York	Savannah	Charleston	Baltimore	Other FL Ports	Other Non FL Ports	Total	Share through FL
SW Asia	15	636	176	0	745	1,652	711	349	112	0	906	5,300	15.6%
SE Asia	3	1,845	905	0	340	270	784	352	63	13	710	5,284	52.3%
Australia/NZ	1,897	973	38	48	25	170	271	478	39	0	140	4,079	72.5%
All Others	376	667	0	371	74	156	157	27	0	0	47	1,875	75.4%
Canada	9	2	0	133	5	9	24	0	0	0	2	184	78.3%
Total	309,180	183,513	176,647	87,135	55,572	48,803	44,281	30,593	13,231	9,520	71,351	1,029,829	74.4%
Percent	30.0%	17.8%	17.2%	8.5%	5.4%	4.7%	4.3%	3.0%	1.3%	0.9%	6.9%	100.0%	

The use of Houston and New York to serve Florida exporters may reflect the headquarters location of exporters (shipping to South America, as well as the other trade lanes) that are located in Florida, rather than the actual origin point of the export cargos, which is a known limitation of PIERS data, as already disclosed.

The relatively high share of exports from Florida handled in New York and Houston could also reflect the level of South American services at both of these non-Florida ports. Table 2.5.17 provides a summary of the loaded export TEUs that move from Florida to international destinations via ports other than those in Florida. The Caribbean and Central America markets are not included, since the majority of these exports are already being moved via Florida ports that are focused on the north-south trade.

With respect to Port Everglades, the most likely opportunity to increase exports is to capture more of the Florida origin cargo moving through the ports of Houston, Savannah, and Charleston to South America, as well as to the Mediterranean Europe.

Table 2.5.17: Total Potential Export Market Represented by Florida Exports via Non-Florida Ports (Loaded TEUs)*Source: PIERs; Martin Associates*

Trade Lane	Houston	New York	Savannah	Charleston	Baltimore	Other Non Florida Ports	Total
South America	19,367	14,143	8,277	16,021	10,273	11,155	79,236
Europe	3,220	5,486	6,697	7,515	291	2,803	26,013
Asia	8,467	2,885	5,221	1,336	391	6,982	25,282
Mediterranean	5,623	3,178	3,459	425	404	1,657	14,747
Other Lanes	1,413	1,325	2,755	934	104	712	7,243
Total	38,089	27,018	26,409	26,231	11,463	23,310	152,520

**Excludes Caribbean and Central American Trade Lanes*

In summary, the most realistic potential export market for PEV to penetrate is the 52,640 TEUs originating in Florida, and exported through the ports of Savannah and Charleston. Applying a 50 percent market share to this potential to account for the competitive dynamics between Port Everglades and Port *Miami*, the actual export potential for Port Everglades is likely around 26,320 TEUs.

2.5.10 Empty Factors

In addition to the potential loaded import and export container volumes identified above, it is worth noting that import moves generate empty containers that need to be loaded back to vessels. Additional ocean carrier services that would result from the penetration of the potential import markets identified for Port Everglades in the preceding analysis would therefore directly facilitate additional export opportunities, by virtue of providing more export cargo capacity in key trade lanes. These results could both lower export costs and open the door to the diversion of

certain export cargos away from non-Florida ports, such as Port of Savannah, and other Florida ports to Port Everglades.

Generally speaking, for each new import TEU captured by Port Everglades, a new outbound TEU is generated. The potential 189,629 TEUs of loaded import volume thus actually represents about 379,258 TEUs of total potential market to Port Everglades. The 26,320 loaded export TEU potential is in addition to the TEUs generated by the imports, but could in fact be incorporated in those 379,258 TEUs supported by the export market. From a conservative standpoint, then, the total current cost-effective potential market identified for Port Everglades is about 380,000 TEUs. This potential market is the basis of the range of future Port Everglades container projection scenarios presented in the following section.

2.5.11 Container Market Projections

The future market potential for containerized cargo at Port Everglades will be driven by several key factors. Import trade will be driven by:

- Organic growth in local consumption, driven by population
- The ability of Port Everglades to compete with other South Atlantic ports and West Coast ports to capture additional discretionary containerized imports not already moving through Florida ports

Export trade, which has been dominated by exports to Central America, South America, and the Caribbean, will depend primarily upon the projected growth in the trade partner countries' economies within those markets. Any addition of import services at Port Everglades will also play a role by increasing export capacity and foreign port coverage.

It should be emphasized that the cargo projections in this 2018 Update are unconstrained projections, in that they are demand-driven. These unconstrained projections represent the markets in which Port Everglades can participate. The degree of success in the capture of the markets will depend on marketing efforts, as well as current and future terminal operations, and future facility investments that will be evaluated in Element 3 of the 2018 Update.

The future projection methodology for containerized cargo consists of a three-step process.

First, projections were developed for the current container market served by Port Everglades. For the Baseline import projections, no new market penetration is assumed, meaning all future import trade flows are only based on organic growth of the regional consumption market, as represented by population growth within the State of Florida. For the baseline export container projections, the Gross Domestic Products (GDPs) of current trade partner countries was used to project containerized export volume.

Second, a set of container projections – all of which are unconstrained – was developed, based on the two scenarios that allow Port Everglades to penetrate the identified potential import market.

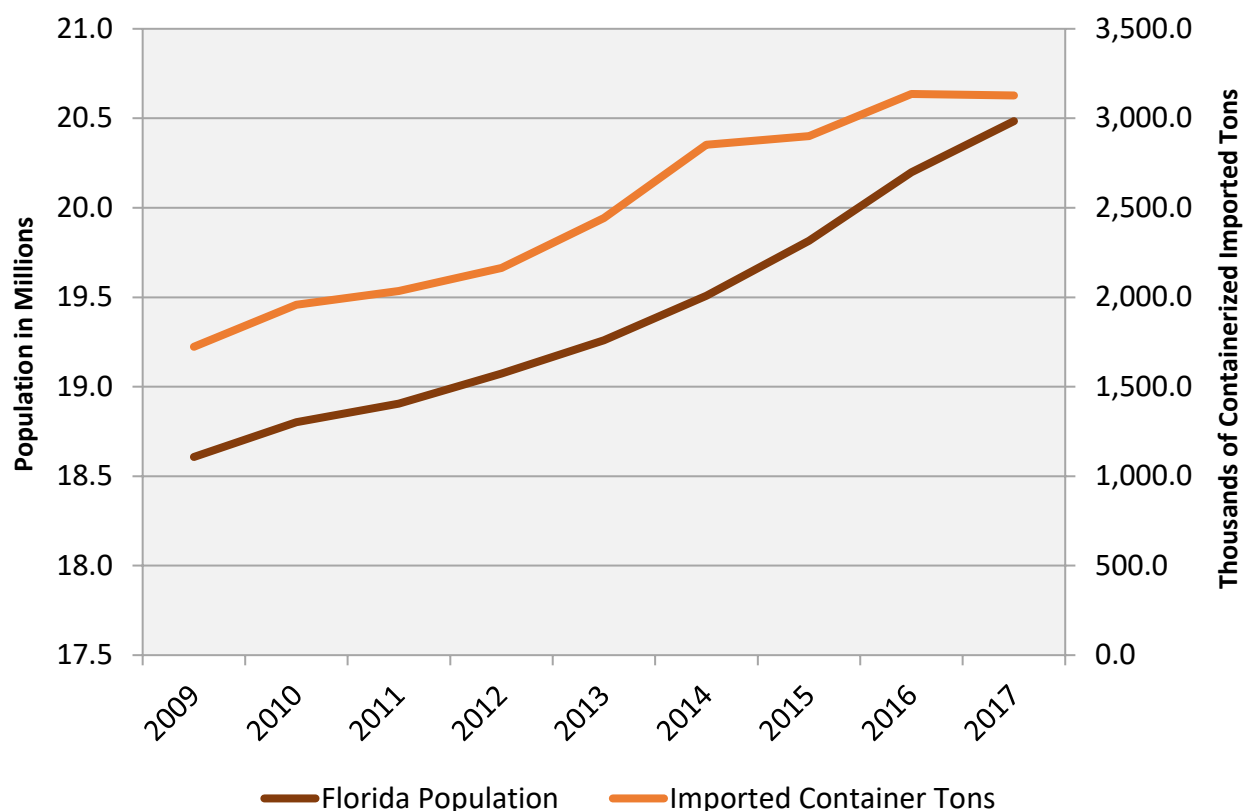
Third, a low scenario was developed assuming indefinite continuation of status quo conditions related to:

- Channel depth and width (i.e. no USACE project)
- Berth and crane capacity
- Terminal operations (i.e. the challenges identified in Section 2.5.2 are not remedied)
- Traffic

To develop the baseline, or organic projection for containerized imports, Martin Associates developed a regression model between imported containerized tonnage at Port Everglades and Florida's population. Figure 2.5.10 shows imported containerized tonnage and population levels in Florida between 2009 and 2017. The data presented in Figure 2.5.10 were used to develop a regression model between Florida population and imported containerized cargo tonnage at PEV, assuming no additional capture of imported containerized cargo now moving into Florida from other ports. Overall, the regression model explains 92.8 percent of the growth in containerized import tonnage handled at Port Everglades since 2009. Projected population data for the State of Florida was obtained from the Florida Demographic Estimating Conference, December 2017, and UF, BEBR, Florida Population Studies, Volume 51, Bulletin 180, January 2018, medium county projections.

Table 2.5.10: Port Everglades Containerized Import Tonnage vs. Florida Population

Source: Martin Associates



Using the regression model and the State of Florida population projections, the baseline organic import container tonnage projections were developed. When the model was used to estimate the historical levels of containerized import tonnage at Port Everglades between 2009 and 2017, and compared with actuals, the average difference in the predicted vs. actual values was just 0.4 percent (see Table 2.5.18).

The projected baseline import TEUs for the 20-year planning horizon covered by the 2018 Update of the Port Everglades Master/Vision Plan are shown by fiscal year in five-year increments in Table 2.5.19, with FY2018 serving as the baseline year. These projections represent a 4.1 percent CAGR, which is significantly lower than the 5.6 percent CAGR recorded in loaded import TEUs between 2009 and 2017. Empty containers are included in these numbers.

Table 2.5.18: Estimated vs. Actual Containerized Import Tonnage, 2009-2017*Source: Martin Associates*

Year	Estimated Import Tonnage	Actual Import Tonnage	Difference Estimated/Actual
2009	1,843,677	1,723,281	107.0%
2010	1,998,704	1,957,605	102.1%
2011	2,081,641	2,035,365	102.3%
2012	2,217,046	2,163,099	102.5%
2013	2,365,039	2,442,739	96.8%
2014	2,563,167	2,851,737	89.9%
2015	2,809,269	2,901,182	96.8%
2016	3,115,850	3,135,908	99.4%
2017	3,344,096	3,127,573	<u>106.9%</u>
Average Variance			100.4%

Table 2.5.19: Baseline Import Projections (TEUs), 2018-2038*Source: Martin Associates*

Year	2018	2019	2023	2028	2033	2038
Baseline Import TEUs	581,051	622,960	784,924	962,105	1,112,731	1,246,421

To project the baseline export TEUs, Martin Associates first developed the distribution of exports by trade lane/country, then applied projected growth rates of the receiving countries' GDPs, as developed by Martin Associates from country-specific GDP projections from the International Monetary Fund, World Economic Outlook, 2016 (revised May 24, 2018). The GDP projections by country (and associated trade lane) were used to project loaded exports from 2019 to 2030. Due to uncertainty as to long term country specific performances, from 2030 to 2038, exports across all countries were projected to grow at 2.5 percent annually. Table

2.5.20 presents the projected baseline export TEUs for Port Everglades for the same 20-year period (2019-2038). Overall, total export TEUs are projected to grow at an annual rate of 3.5 percent over the period, which compares to about 3 percent annual growth from 2009-2017. As with imports, empty containers are included in these numbers, and all years are fiscal.

Table 2.5.20: Baseline Export Projections (TEUs), 2018-2038

Source: Martin Associates

Year	2018	2019	2023	2028	2033	2038
Baseline Export TEUs	567,940	591,943	698,763	860,445	1,022,116	1,184,913

Table 2.5.21 presents the total Baseline container projections (imports + exports) for Port Everglades through FY2038. The combined Baseline projections call for 3.6 percent average annual growth, which compares to a 4.1 percent overall annual growth rate between 2009 and 2017. Empty containers are included, and were calculated using a static overall empty-to-loaded TEU factor of 27.3 percent, based on the actual FY2017 ratio.

Table 2.5.21: Overall (Import+ Export) Baseline Projections (TEUs), 2018-2038

Source: Martin Associates

Year	2018	2019	2023	2028	2033	2038
Baseline Total TEUs	1,148,991	1,214,904	1,483,688	1,822,549	2,134,847	2,431,334

As previously stated, this combined containerized cargo baseline projection assumes that Port Everglades does not capture any additional market share. The baseline projections also assume that Port Everglades will not lose any existing ocean carrier services due to known challenges related to berth and crane availability and size/capacity, terminal operating practices, traffic and/or channel depth, and width restrictions.

Beyond the baseline projections, two scenarios were developed for Port Everglades' capture rate related to additional potential import and export market share. The first scenario – Baseline + Medium – assumes that Port Everglades can penetrate 25 percent of the approximately 380,000 TEU potential market identified

in Sections 2.5.8 and 2.5.9. It is further assumed that Port Everglades will gain the 25 percent market share over a five-year period, adding about 19,000 TEUs per year, until it reaches a 25 percent penetration rate. It is additionally assumed that the potential market of 95,000 TEUs grows at the same annual rate as baseline container TEU import throughput at Port Everglades. After the five-year incremental addition of potential market, the total TEUs at Port Everglades will grow at the same average annual rate developed for the baseline projections.

This scenario reflects Port Everglades' ability to capitalize on the potential perishables market now being served via non-Florida ports. Like the baseline projections, this scenario also assumes that Port Everglades will not lose any existing ocean carrier services, due to known challenges related to berth and crane availability and size/capacity, terminal operating practices, traffic and/or channel depth, and width restrictions. This scenario further assumes that Port Everglades is successful in the Asia trade lanes, due to its improved infrastructure and operating environment. Table 2.5.22 shows the projected new market capture potential for Port Everglades, under this Baseline + Medium Scenario, together with the baseline projections. Empties are included in the numbers, and all years are fiscal years.

Table 2.5.22: Baseline + Medium New Market Capture Projections (TEUs), 2018-2038

Source: Martin Associates

Year	2018	2019	2023	2028	2033	2038
Baseline Total TEUs	1,148,991	1,214,904	1,483,688	1,822,549	2,134,847	2,431,334
New TEUs (Medium)	-	19,000	111,458	182,117	210,629	235,935
Total TEUs	1,148,991	1,233,904	1,595,145	2,004,666	2,345,476	2,667,269

The same methodology was used to estimate the projected containerized volume potential (TEUs) under a second scenario – or Baseline + Aggressive Scenario – with the exception that a 50 percent capture rate is used, rather than a 25 percent capture rate, related to the approximately 380,000 TEU market potential over the next five years, beginning in FY2019. Table 2.5.23 shows the projected new market

capture potential for Port Everglades under this Baseline + Aggressive scenario, together with the Baseline projections. Empties are included in the numbers.

Table 2.5.23: Baseline + Aggressive New Market Capture Projections (TEUs), 2018-2038

Source: Martin Associates

Year	2018	2019	2023	2028	2033	2038
Baseline Total TEUs	1,148,991	1,214,904	1,483,688	1,822,549	2,134,847	2,431,334
New TEUs (Aggressive)	-	38,000	222,915	342,022	395,569	443,095
Total TEUs	1,148,991	1,252,904	1,706,603	2,164,572	2,530,416	2,874,429

Under the Baseline + Medium scenario, containers are projected to grow at a CAGR of 4.1 percent between FY2018 and FY2038. Meanwhile, under the Baseline + Aggressive scenario, container throughput is projected to grow at an annual rate of 4.3 percent per year between 2018 and 2038. For comparison, between 2009 and 2017, total U.S. container traffic grew at a rate of 4.7 percent annually. As noted at the beginning of Section 2.5, interviews with current Port Everglades terminal operators and associated ocean carriers revealed several major issues that are impacting the potential to grow business at Port Everglades. These issues have been identified and documented throughout this section, which include:

- Berth and crane availability and size/capacity
- Terminal operating practices
- Traffic congestion in and around the port, especially on McIntosh Road
- Channel depth and width restrictions, especially the need to accommodate passage of post-Panamax container vessels of up to 14,000 TEUs capacity to Southport, while post-Panamax cruise ships of up to 180,000 GRTs are berthed at T25 and/or T26 and/or T29.
- Berthing, operational and traffic-related conflicts between cruise and cargo operations in Midport.

Should these issues not be addressed and remedied, there is real near-term and long-term potential to lose ocean carrier services at Port Everglades, both in the

north-south trade lane, and in the transatlantic (North Europe/Mediterranean). Based on discussions with ocean carriers and terminal operators, a realistic scenario is the loss of a 14-day Central America/South America service and a weekly transatlantic service. This potential loss of services would result in a loss of 234,000 total TEUs, assuming 1,500 TEUs are discharged, and 1,500 TEUs are loaded during each call. In this low scenario, total TEUs at Port Everglades are projected to decline, and not return to 2017 levels, even by the end of the 20-year projection period. Empty containers are included.

Table 2.5.24: Low Scenario Projections (TEUs), 2018-2038

Source: Martin Associates

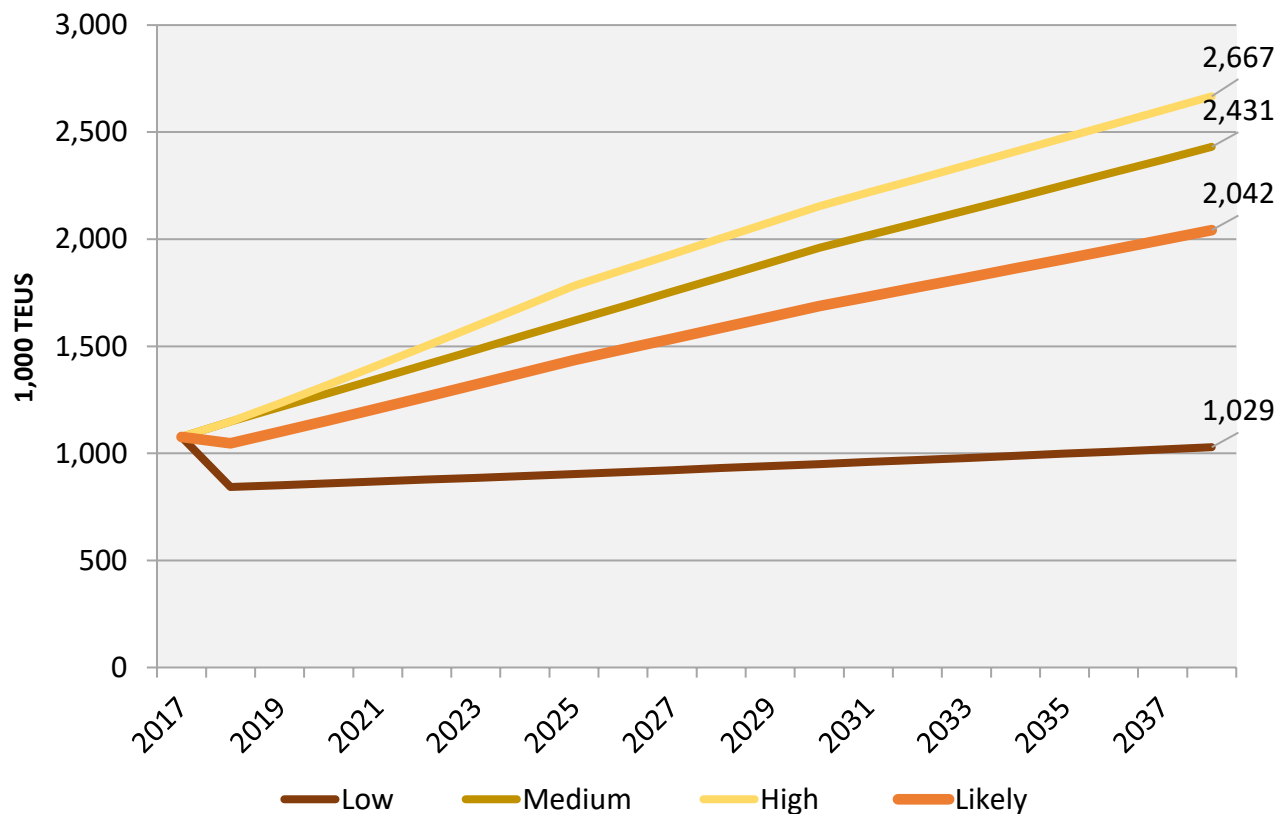
Year	2018	2019	2023	2028	2033	2038
Total TEUs (Low)	842,913	851,342	885,910	931,100	978,596	1,028,514

Based on the scenarios outlined above, unconstrained Low, Medium, High, and Likely containerized cargo projections are presented in Figure 2.5.11. Given that these projections are unconstrained, their primary value lies in providing Port Everglades with a range of future market demand for containerized cargo facilities, which can serve as a tool to determine size and capacity/operating capability required for future port facilities, to be competitive in each scenario. These projections also shed light on potential market-strategy development (i.e. perishables), and establish a basis for physical layout and operational modifications that may be recommended during Phase 2, as part of Element 3 of the 2018 Update.

The baseline projection – relabeled *Medium* in Figure 2.5.11 – consists of the projected imports based on Florida population growth, and trading partner GDP growth rates for exports. It assumes no new market penetration of potential markets, and no loss of service due to operational issues. The *Low* Projection reflects the potential loss of ocean carrier service, due to current infrastructure and operational issues at Port Everglades, and serves as the “without USACE deepening and widening project” scenario. The *High* projection in Figure 2.5.11 is the same as the *Baseline + Medium* projection shown in Table 2.5.22. The *Baseline + Aggressive* scenario shown in Table 2.5.23 has not been used in the final cargo projections for

this 2018 Update, due to the fact that tenant interviews suggest that the ability for Port Everglades to compete in the Asian cargo market for direct all-water services will be limited, even after the deepening and widening project, as well as the turning basin extension, due to the crane height restrictions imposed by the FLL flight path. Long-term crane height restrictions, and the need for crane dimensions to handle 9 containers on deck and 7 in the hatch, will therefore effectively limit Port Everglades in perpetuity in its ability to compete for direct all-water services from Asia. This limitation represents a missed potential opportunity vis-à-vis other ports, but does not mean that Port Everglades cannot or will not continue to grow, given the other markets that Port Everglades can, does, and potentially could serve.

The *Likely* scenario shown in Figure 2.5.11 reflects an average between the *Low*, *Baseline*, and *Baseline + Medium* projections, and reflects several years of zero or negative growth resulting from unavoidable Southport construction and tenant relocation impacts associated with the STNE project. Under the *Likely* projection, unconstrained container volume will reach 2.0 million TEUs by 2038. This projection represents the target for planning capacity investment and improving terminal operations, synergies, and internal traffic flows. The projected 2.0 million TEUs can be compared to the container projections developed by the USACE in its *Final Feasibility Report and Environmental Impact Statement*, Port Everglades Harbor Navigation Study, Broward County. In this report, the USACE projected 10.5 million metric tons of containerized cargo by 2040. Converting the 10.5 million tons to TEUs, using an average of 6.7 tons per TEU, as reported by Port Everglades in 2017, yields about 1.6 million TEUS, projected by the USACE in 2040.

Figure 2.5.11: Summary of Containerized Cargo Projections (TEUs), 2018-2038*Source: Martin Associates*

2.5.12 ICTF Projections

As previously discussed, the near-dock FEC ICTF at Port Everglades is a tremendous asset to the port for a variety of reasons. Since opening in 2014, the FEC ICTF at Port Everglades has handled more international cargo than domestic cargo every single year. In FY2017, the most recent 12-month data available, the ICTF handled 63,142 international moves (113,656 TEUs), compared to 50,030 domestic moves. This represents 14.5 percent of Port Everglades' FY2017 loaded container throughput and 10.6 percent of total throughput. The principal reason that intermodal volume moving via the ICTF at Port Everglades is not higher relates to the size and geographic extent of Port Everglades' current hinterland. The time to market and cost-per-unit advantages of intermodal rail vs. over-the-road trucking typically do not manifest within 250 miles of a port, for either imports or exports. Since the vast majority of containerized imports and exports that currently move through Port Everglades have a point of origin or final point of consumption within

South or Central Florida, rail is not competitive with trucking, from either a time or cost perspective.

Looking to the future, while the High container forecast presented above calls for Port Everglades to grow its percent capture of Florida origin and destination cargo vs. the baseline forecast by 25 percent, neither the Likely, Medium, or High projection anticipates substantial new penetration of out-of-state markets by Port Everglades for dry cargo. For perishable cargo, there is potential to grow out-of-state market shares, and rail could play a key role in that. In FY2017, 18.7 percent of total Port Everglades loaded volume (TEUs) consisted of perishables, making Port Everglades Florida's top port for perishables and the fifth most important container port in the U.S. for perishables by volume. If Port Everglades continues to play such a key role in the perishables supply chain in the future, then there is reason to believe that intermodal rail could help the port to reach new out-of-state markets, certainly for perishable imports, but also potentially for perishable exports, such as frozen (or chilled) meat and poultry from the U.S. Midwest.

Table 2.5.25 presents annualized data for each projection shown in Figure 2.5.11, along with corresponding rail volume projections in TEUs. The Low projection reflects a corresponding reduction in rail moves due to Port Everglades' overall loss of market share, as assumed in that projection. The Medium projection assumes status quo (FY2017) rail percentages remain static for the 20-year period as a result of no new market capture. The Likely and High projections each increase rail moves over time as a percent of total volume to account for potential growth in perishable import distribution to Northern Florida, and potentially also to other states, as well as growth in perishable exports sourced in other states and moving to Port Everglades via rail. The Likely projection assumes 1.0 percent growth in rail market share over 20 years, compared to FY2017. Meanwhile, the High projection assumes 2.0 percent growth in market share over 20 years, compared to the FY2017 baseline (10.6 percent). It is important to note that no commodity-specific forecast is included in this 2018 Update. In other words, assumptions about perishables growth are general.

Table 2.5.25: Annualized Throughput Projections (TEUs) - Likely Projection, 2018-2038*Source: Martin Associates; B&A*

Year	Total TEUs (Low)	ICTF TEUs (Low)	Total TEUs (Likely)	ICTF TEUs (Likely)	Total TEUs (Medium)	ICTF TEUs (Medium)	Total TEUs (High)	ICTF TEUs (High)
2017	1,076,913	113,656	1,076,913	113,656	1,076,913	113,656	1,076,913	113,656
2018	842,913	88,960	1,046,965	113,656	1,148,991	121,814	1,148,991	122,366
2019	851,342	89,849	1,100,050	113,656	1,214,904	129,385	1,233,904	132,593
2020	859,856	90,748	1,154,494	113,656	1,281,545	137,097	1,322,082	143,338
2021	868,454	91,655	1,209,639	113,656	1,348,628	144,921	1,411,836	154,424
2022	877,139	92,572	1,265,388	113,656	1,416,067	152,848	1,502,958	165,834
2023	885,910	93,497	1,321,581	130,923	1,483,688	160,859	1,595,145	177,537
2024	894,769	94,432	1,378,137	136,302	1,551,428	168,948	1,688,216	189,516
2025	903,717	95,377	1,434,949	141,720	1,619,187	177,104	1,781,945	201,749
2026	912,754	96,331	1,485,360	146,126	1,686,928	185,323	1,856,399	211,961
2027	921,882	97,294	1,535,703	150,522	1,754,655	193,606	1,930,572	222,283
2028	931,100	98,267	1,586,105	154,918	1,822,549	201,972	2,004,666	232,738
2029	940,411	99,249	1,636,784	159,333	1,890,912	210,455	2,079,028	243,368
2030	949,815	100,242	1,687,875	163,779	1,959,936	219,078	2,153,874	254,197
2031	959,314	101,244	1,731,717	167,650	2,018,100	226,549	2,217,736	263,863
2032	968,907	102,257	1,775,648	171,528	2,076,416	234,092	2,281,620	273,654
2033	978,596	103,279	1,819,640	175,408	2,134,847	241,704	2,345,476	283,564
2034	988,382	104,312	1,863,773	179,300	2,193,504	249,398	2,409,432	293,609
2035	998,266	105,355	1,908,093	183,205	2,252,452	257,181	2,473,560	303,798
2036	1,008,248	106,409	1,952,647	187,129	2,311,759	265,062	2,537,935	314,141
2037	1,018,331	107,473	1,997,363	191,065	2,371,325	273,030	2,602,434	324,623
2038	1,028,514	108,548	2,042,372	195,023	2,431,334	281,107	2,667,269	335,271
CAGR (2018-2038)	1.0%	1.0%	3.2%	3.2%	3.6%	4.1%	4.1%	4.9%

2.6 Non-Containerized Cargo Market Assessment

The overall global bulk market is still in recovery from a global perspective, as compared to peak periods prior to the great recession. Currently, the worldwide orderbook for non-containerized cargo vessels is 9.7 percent of the active fleet, with 79.0 million Dead Weight Tons (DWT) scheduled to be delivered by 2021. The balance of demand and capacity moving forward is critical. Some owners are cautious to not overspend and commit to newbuild orders. Other factors, such as a potential trade war with China, are also holding some owners to a more conservative approach. Scrapping of old vessels is not as prevalent, due to relatively healthy charter markets. In addition, slow steaming has been discussed as not only being environmentally savvy, but also necessary to maintain balance of supply and demand.

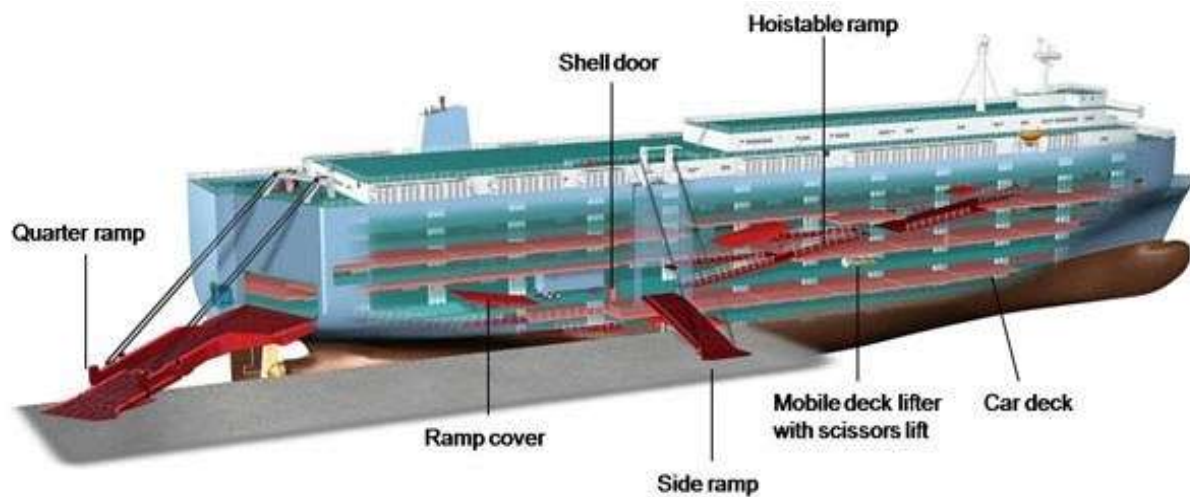
Non-containerized cargo at Port Everglades can be classified into five primary categories:

- Automobiles
- Break-bulk cargo (primarily steel coils and rebar)
- Dry bulk cargo (primarily cement)
- Other roll-on/roll-off (ro-ro) cargo and yachts
- Nonpetroleum liquid bulk cargo (see Section 2.4)

2.6.1 Automobile Market Assessment

Port Everglades has historically handled a small volume of used vehicles for export to the Caribbean, Central America, and South America. However, new import and export automobiles that have historically moved via the ports of Brunswick, GA, and JAXPORT have recently begun moving via Port Everglades instead. These automobiles are currently being handled at an approximately nine acre facility in Midport. Berth 29 is used for most vessel discharge and loading activity.

On the import side, these vehicles are brought in from Mexico. Exports are being railed from production facilities in the Southeastern U.S. The vessels handling these automobiles are equipped with ro-ro quarter ramps, as opposed to stern ramps, which means they can call various berths without the need for a custom-designed ro-ro berth. See Figure 2.6.1.

Figure 2.6.1: Example Ro-Ro Vessel with Quarter Ramp*Source: quora.com*

A dedicated berth for automobile imports and exports with direct access to an upland storage yard and processing facility is typically preferable for the operator, since it lowers handling costs and reduces damage rates by minimizing the time and distance the automobile must move between the processing facility/storage yard and the berth. The current operation at Port Everglades is challenged by the fact that the export vehicles must be driven from the FEC ICTF in Southport to the storage/processing facility in Midport, a distance of approximately 1.5 miles. The ability to handle non-automobile ro-ro cargo at Port Everglades, such as larger agricultural and mining equipment, is limited by the existing berth and storage yard configuration, but also by port infrastructure (floor weight) at the current Midport facility.

Overall U.S. automobile import business has continued to recover from the global recession of 2008-2009, as shown in Figure 2.6.2. Volumes have rebounded from the 40 percent drop in 2009, reaching a record high in 2017. Automobile imports at other East Coast ports, including JAXPORT, Port of Baltimore, and Port of New York/New Jersey (NY/NJ) are nearly tied in terms of import automobile tonnage.²² Newark holds a very slight advantage, followed by Baltimore and JAXPORT. Imports

²² Automobile tonnage is used in port comparisons to control for differences in reporting of automobile cargo. Some ports include light trucks and used cars or previously owned vehicles (POVs) in their statistics, while others do not. USA Trade Online data are used for port to port comparisons, and the unit of measure is tonnage.

at the port of Brunswick, GA, have declined steadily since 2015, with JAXPORT taking market shares since 2016.

Figure 2.6.2: Total U.S. Automobile Imports (Includes Light Trucks), 2003-2017

Source: USA Trade Online

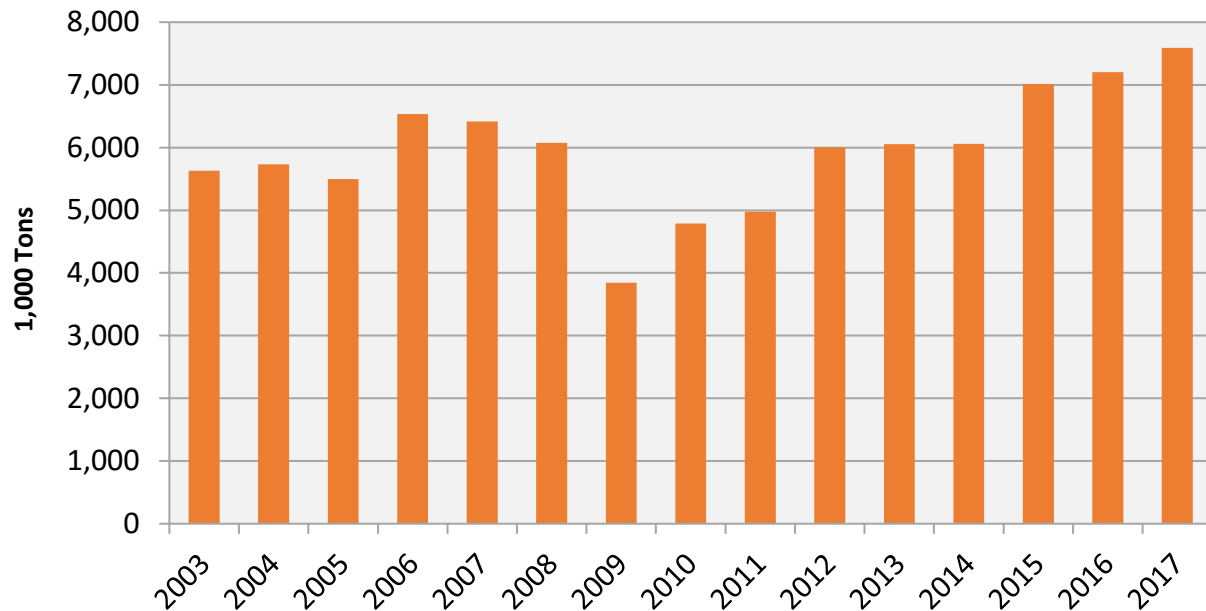
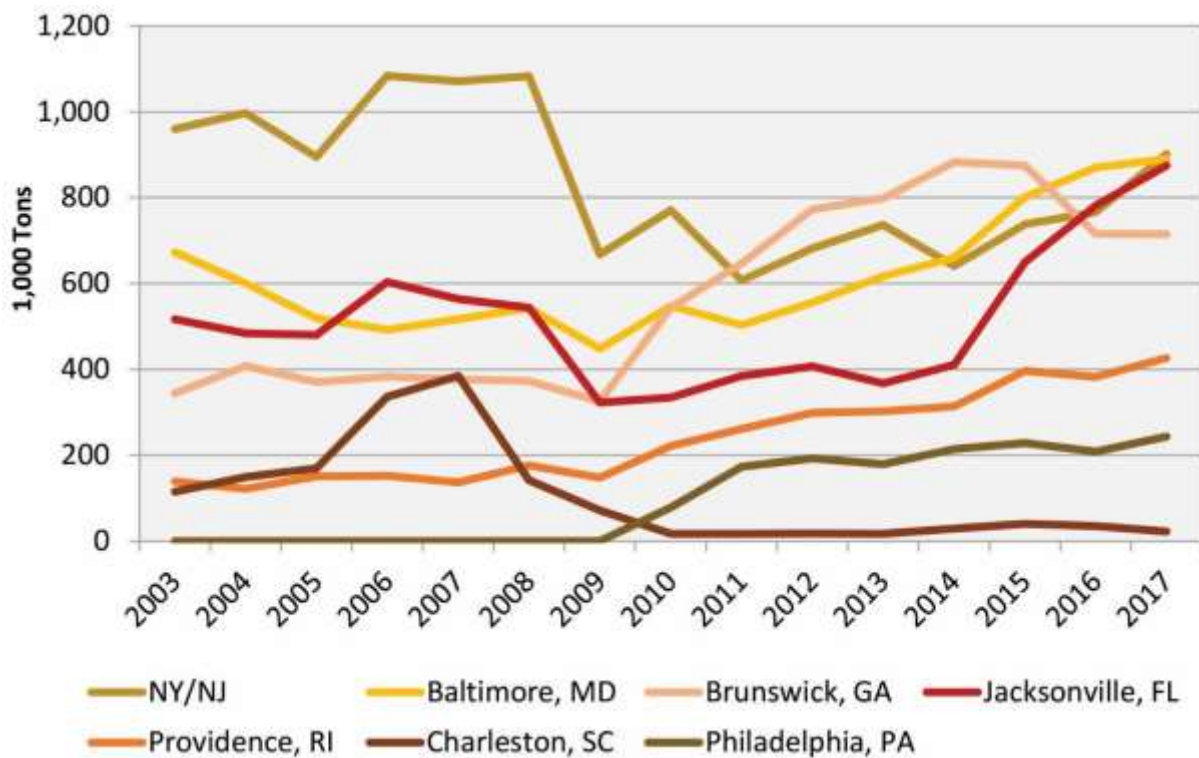
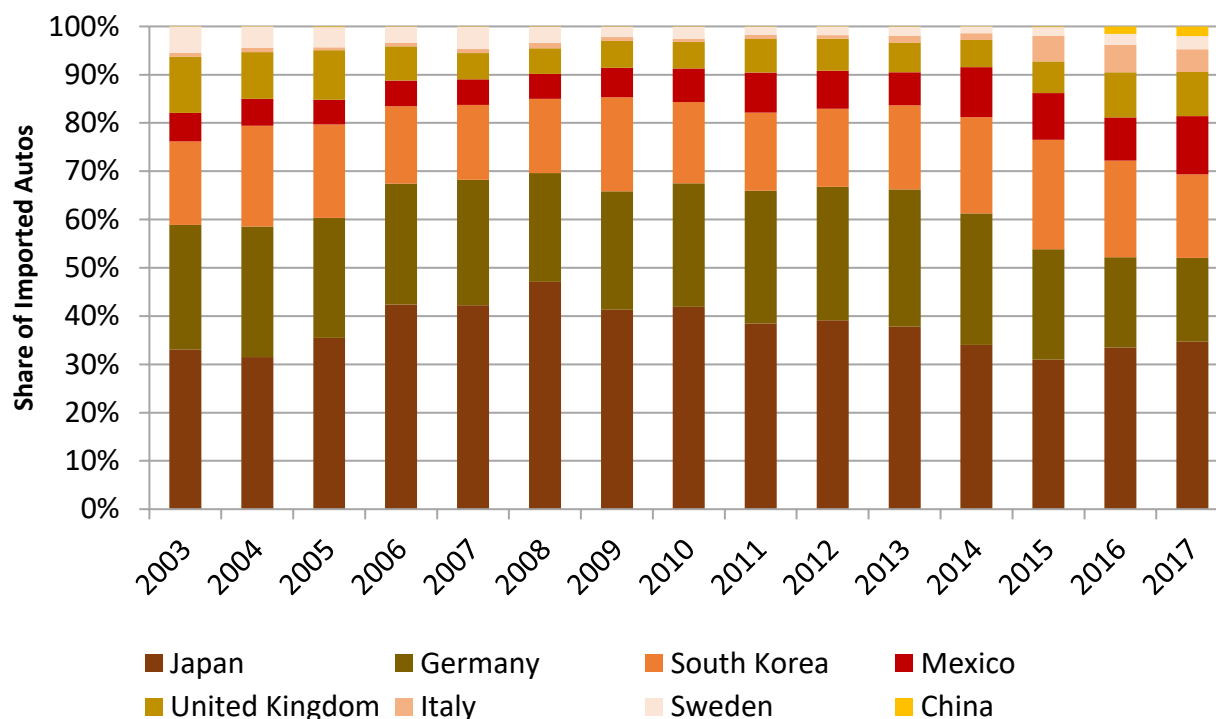


Figure 2.6.3: Automobile Imports at Select U.S. Ports, 2003-2017*Source: USA Trade Online*

Japanese imports have been decreasing, while importation of Mexican models has been on the rise. In 2010, automobiles imported from Mexico accounted for 7 percent of total automobile imports to the U.S.; by 2017, Mexico accounted for 12 percent. Since 2008, the share of automobile imports handled from Japan has fallen from nearly 47 percent to slightly more than 35 percent (2017). The recent growth in Mexican automobile imports at Port Everglades is consistent with the trend at other ports on the East Coast, and makes sense from a logistics perspective, since Port Everglades provides a geographically central location from which to serve the South Florida population, and also an opportunity for transshipment of both import and export vehicles onto Caribbean and South America services that call Port Everglades.

Figure 2.6.4: Distribution of Automobile Imports by Country of Origin (Select East Coast Ports Only), 2003-2017

Source: USA Trade Online



Mexican automobile production has been increasing since 2015. Key passenger vehicle manufacturers now located in Mexico include GM, FCA Group, Ford, Nissan, Honda, Toyota, Mazda, BMW, Volkswagen, Audi, and Kia. Together, these automakers produce more than 40 brands and 500 different models in 23 manufacturing plants. The following are major recent or near-term investments in the automobile manufacturing industry in Mexico:

- BMW is investing about \$1 billion in a new plant in San Luis Potosí, which will begin production in 2019 and employ 1,500 people. The majority of vehicles produced at this facility will be sold within North America (61 percent U.S.); 21 percent will be shipped to Europe; the rest will be shipped to South America and Asia.
- Nissan and Daimler signed a joint venture, investing \$1.4 billion in a new plant in Aguascalientes, which began production in 2017. This facility will build compact vehicles for Infiniti and Mercedes brands. The initial capacity of the plant is 230,000 units.

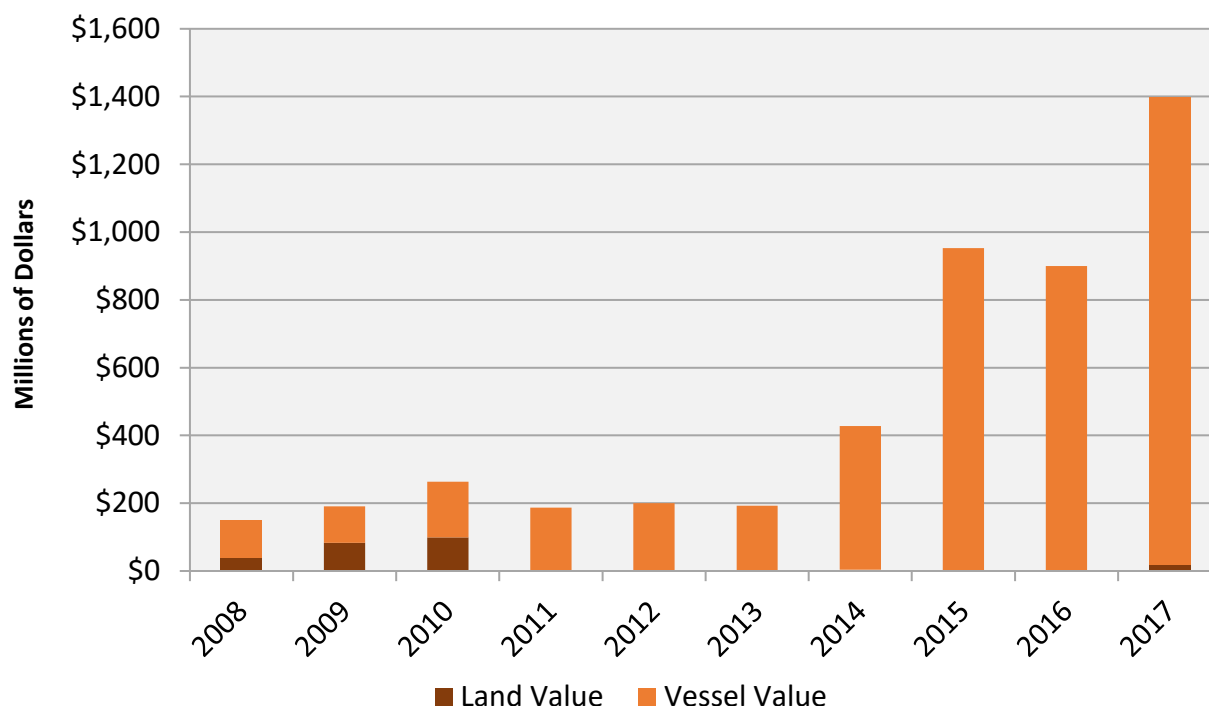
- Kia invested some \$1 billion in a Nuevo León automobile plant that began production in 2016, with the capacity to build 300,000 vehicles annually.
- Toyota is investing \$1 billion to build a new plant in Guanajuato to produce the Corolla. This facility is scheduled to begin production in 2019, with a capacity of 200,000 Corollas per year.
- Ford is doubling its vehicle production in Mexico, investing \$1.5 billion in a new plant in San Luis Potosí that will produce 350,000 cars annually by 2020. In addition, Ford had previously announced that it would invest \$2.5 billion in two new engine transmission plants that will support expansion of its diesel engine production capacity in Mexico.
- GM announced in 2014 that it was investing \$5 billion through 2018 to double capacity at its four Mexico plants in Coahuila, San Luis Potosí, México (state), and Guanajuato.
- Mazda opened a new small-car assembly plant in 2014 in Salamanca. This plant has an annual capacity of 200,000 vehicles.

Mexican automobile import distribution within the U.S. southern states historically has been dominated by surface transportation modes. As shown in Figure 2.6.5, however, waterborne shipments of imported Mexican automobiles to Florida have been increasing dramatically since 2013.²³ Given the recent growth in the automobile manufacturing sector within Mexico, and the increase in waterborne distribution of imported automobiles within the State of Florida, future growth in Mexican automobile imports at U.S. ports will depend upon the ability of individual ports to successfully compete for this cargo. Port Everglades has a foot in the door, and may be well-positioned to grow this business line in the future.

²³ For Mexican automobile imports, the U.S. Census Bureau reports value by mode, not tonnage.

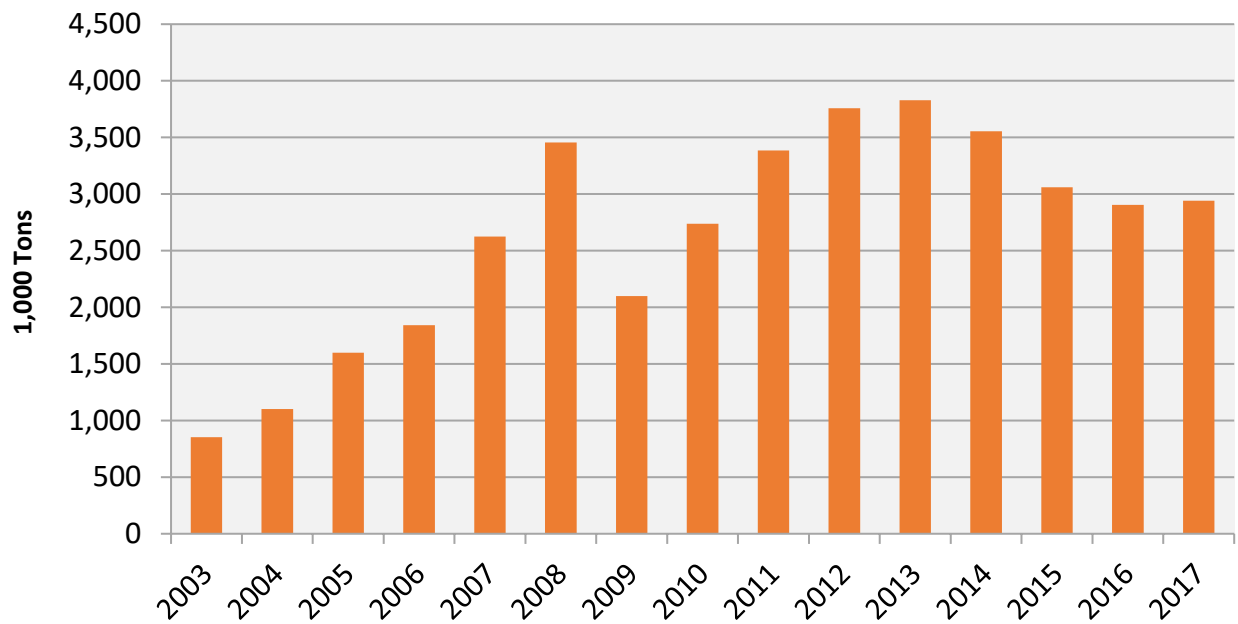
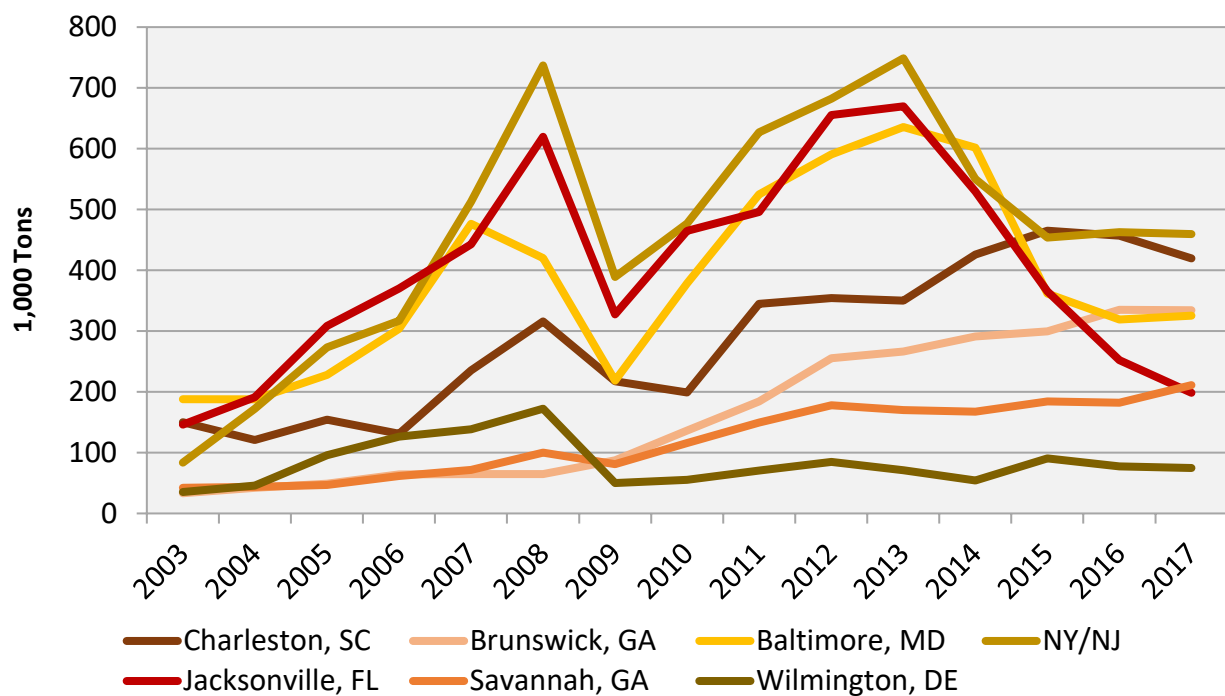
Figure 2.6.5: Florida Automobile Imports from Mexico by Mode of Transport, 2008-2017

Source: USA Trade Online



Automobile exports from the U.S. grew steadily in the early 2000s through 2008, with the vast majority of the exports being handled by East Coast ports. See Figure 2.6.6. While the effect of the market downturn on U.S. automobile exports is evident in 2009, the subsequent recovery of the automobile export market occurred more quickly than the automobile import market, with pre-recession export levels being exceeded by 2012. Since 2013, the market has again exhibited a downward trend, which is especially pronounced at East Coast ports.

JAXPORT, Port of Baltimore, and the port of NY/NJ all experienced sharp declines, beginning in 2013. Production in Mexico increased, displacing exports traditionally manufactured in the Midwestern U.S. In contrast, the South Atlantic ports of Charleston, Brunswick, and, to a lesser extent, Savannah have demonstrated strong growth in automobile exports. This directly reflects the growth of automobile manufacturing facilities in South Carolina, Georgia, and Alabama. See Figure 2.6.7

Figure 2.6.6: U.S. Automobile Exports, 2003-2017*Source: USA Trade Online***Figure 2.6.7: Automobile Exports at Select U.S. Ports, 2003-2017***Source: USA Trade Online*

With the shifting of production to the Southeastern U.S. by both domestic manufacturers and foreign transplant manufacturers, exports via the South Atlantic ports of Charleston and Brunswick will likely continue to increase. The ability to attract U.S. manufactured export vehicles destined for markets with which Port Everglades has strong trade ties by rail from production facilities in Alabama represents a real and growing market opportunity for Port Everglades.

Overall population in South Florida (Broward, Miami-Dade, and Palm Beach Counties) is projected to grow at 1.4 percent per year through 2038, based on population forecasts developed by the Florida Demographic Estimating Conference (December 2017) and the University of Florida Bureau of Economic and Business Research.²⁴ In order to forecast future automobile imports at Port Everglades, this growth rate was applied to the 8,000 import units projected to be handled in 2018 at the port. In addition, based on interviews with the current processor, an additional 8,000 annual import units were added by 2021, which is the near-term volume growth expectation for Port Everglades. Imports were then projected to grow consistent with population throughout the remaining forecast period.

With respect to Port Everglades' projected automobile exports, the GDP projections of the Caribbean and countries along South America's East Coast were applied to the current 8,000 automobile units projected for 2018 at Port Everglades. These GDP projections were developed from country specific GDP projections from the International Monetary Fund, World Economic Outlook, 2016 (revised May 24, 2018). The GDP projections by country were used to project automobile exports from 2019 to 2030. Due to uncertainty as to long-term country-specific performances from 2030 to 2038, exports across all countries were projected to grow at 2.5 percent annually.

Table 2.6.1 shows the projected (unconstrained) growth in new automobile imports and exports at Port Everglades through 2038. It is anticipated that the total market potential for automobile imports and exports at Port Everglades is about 40,000 units annually. This market may be realized sooner rather than later, if more automobile manufacturers decide to serve the South Florida import market via all-water services to Port Everglades, and/or if more automobile manufacturers choose to build their export products at production facilities in Alabama and other

²⁴ Source: UF BEBR Florida Populations Studies, Volume 51, Bulletin 180, January 2018

sites in the Southeastern U.S. that allow Port Everglades to be a cost-competitive option.

Table 2.6.1: Projected Port Everglades New Automobile Throughput (CEUs), 2018-2038

Source: Martin Associates

	2018	2019	2023	2028	2033	2038
Import Automobiles	8,112	8,226	16,922	18,140	19,466	20,845
Export Automobiles	8,296	8,603	9,949	11,930	13,816	15,632
Total Automobiles	16,408	16,829	26,870	30,070	33,262	36,477

Assuming the industry standard 1,700 units per acre annual throughput, about 20 acres would be required to handle the projected automobile business at Port Everglades, which is roughly three times the size of the current footprint. It should be noted that there is new uncertainty about the impact of tariffs on automobile imports under the current U.S. presidential administration. However, the projections are long-term, and due to the diversity of production sites worldwide, it is almost certain that import vehicles will continue to satisfy a portion of U.S. automobile consumer demand.

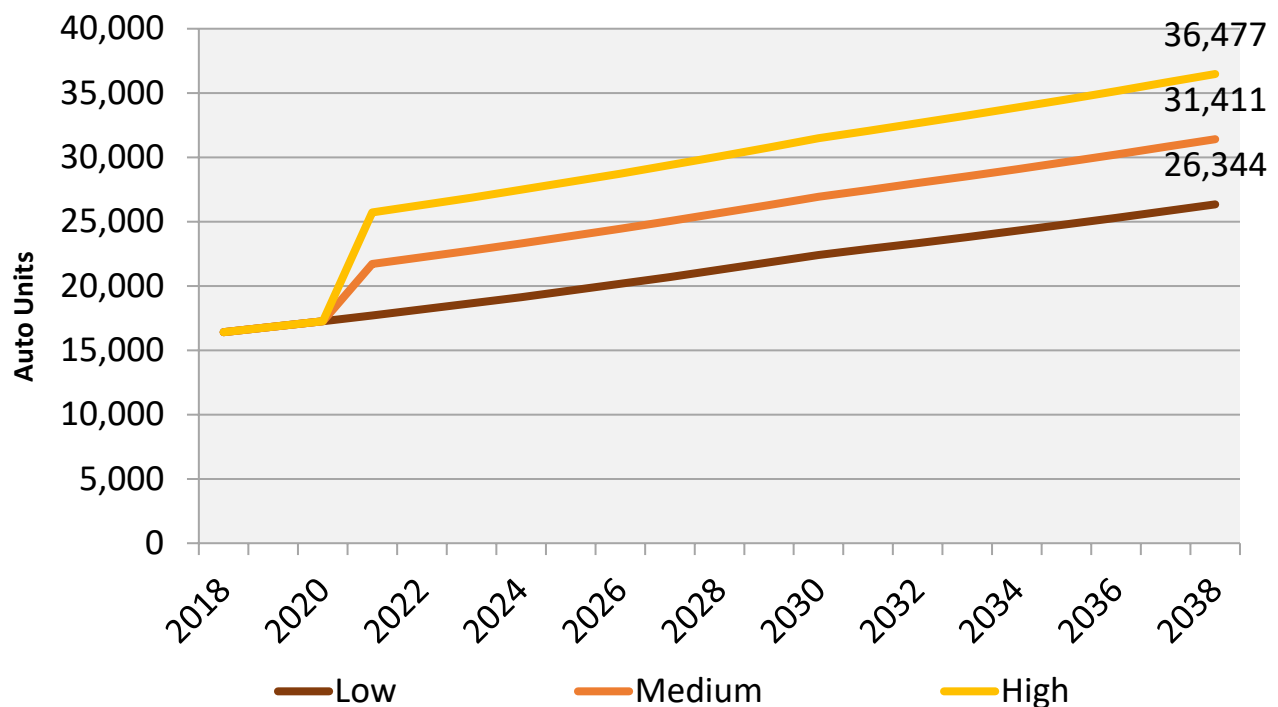
Figure 2.6.8: Summary of Automobile Projections (CEUs), 2018-2038*Source: Martin Associates*

Figure 2.6.8 shows High, Medium and Low projections for planning purposes for automobile volumes at Port Everglades. These are unconstrained projections. The High projection assumes that an additional import account of 8,000 autos per year will be secured by 2021, and that auto imports will continue to grow at the State of Florida population projection rate. The Low scenario assumes that no new auto account is secured over the next five years. The Medium scenario is the average of the high and low auto projections. Due to Port Everglades' unique position relative to the two-way automotive trade as discussed above, the High projection is deemed most likely.

2.6.2 Break-Bulk Market Assessment

Port Everglades' break-bulk cargo volumes, consisting mainly of steel products plus some other miscellaneous break-bulk cargo, have been highly inconsistent during the 11-year period from 2006-2017, but have remained at about 250,000 tons since 2015.

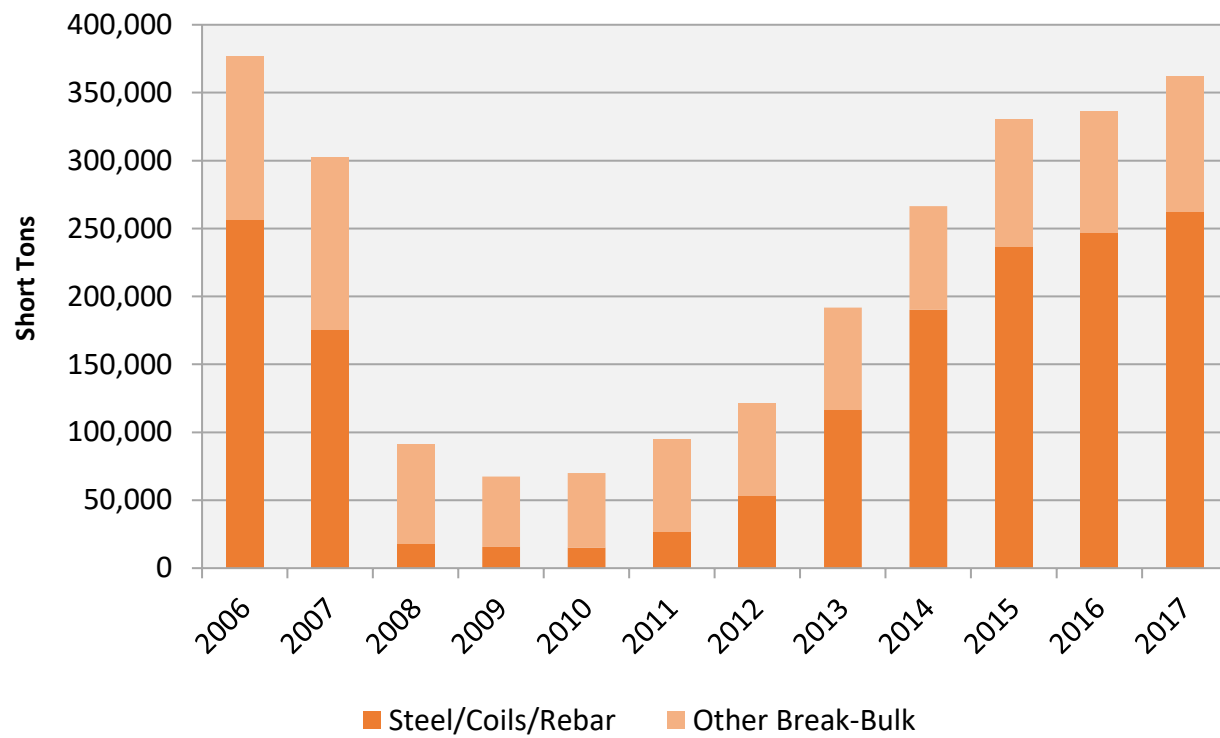
Driven by steel imports, which are tied to construction and industrial activity, this line of business correlates closely to the general economic cycle, and fluctuates

dramatically, depending on development activity within the South Florida market. As such, break-bulk cargo volumes experienced a steep decline leading up to the global recession, with 2006 volume levels only returning as of 2017. Miscellaneous break-bulk (non-steel) cargo has remained consistent for the past 11 years, implying that it is a small but stable market.

While they constitute the majority of Port Everglades' break-bulk volume, steel imports represent a very small total volume relative to other cargo types handled at the port (i.e. liquid-bulk containers). Steel has also been volatile, in the sense that it fluctuates substantially from year-to-year.

Steel products at Port Everglades are typically handled in either the Midport or Northport areas of the port. Interviews with the terminal operators handling steel products indicated that the operations are very inefficient, due to berth conflicts and intra-port drayage requirements. For example, rebar is discharged at Berth 29, but must be drayed more than a mile to a Southport laydown area.

This internal dray is currently necessary, but it is both inefficient and costly, since it must be handled by an over-the-road truck that must travel along Eller Drive and enter Southport via the McIntosh Road gate, rather than using an alternative internal circulation route. Berth 30 is not a good alternative for unloading steel cargos that are stored in Midport and/or Northport, since the internal "chute road" cannot be utilized, since the bridge at 36th Street has insufficient load capacity to support heavy cargo movements, and since Berth 30 is one of the highest-demand container berths in Southport. A solution to this operational situation must be devised in the near-term, for this line of business to remain viable at Port Everglades.

Figure 2.6.9: Port Everglades Break-Bulk Cargo, 2006-2017*Source: Port Everglades*

On the vessel side, in numerous cases where a break-bulk ship is being worked at a shared berth, the vessel discharging steel is forced to leave the berth, go to another berth to lay up, or even out to anchor for however long the berth conflict exists, then return to the original berth to complete vessel operations. This shifting from berth to berth results in an additional \$25,000-\$30,000 cost to the vessel operator. Furthermore, a steel ship cannot be worked at Berth 5 when a cruise vessel is at Berth 4. Berthing conflicts occur regularly at Berths 16, 17, and 18 as well.

The proximity to the steel market demand in Broward County, and especially Miami-Dade, would ordinarily result in a more cost-effective dray from Port Everglades to these markets than if this cargo were handled at Port of Palm Beach. However, inefficiencies associated with current berthing practices and the lack of physical adjacency of berths used for break-bulk vessel operations to associated storage yards, which results in intra-Port draying, may result in the loss of this cargo to Port of Palm Beach, despite the higher costs associated with delivering the cargo from Palm Beach to final destinations in Broward and Miami-Dade Counties. A

related issue is that the intra-port drayage of steel imports from one part of Port Everglades to another adds to an already very congested port traffic situation. Given the relatively small contribution of this line of business to Port Everglades' overall financial portfolio, its continuation in the long-term should be questioned.

In light of the myriad issues related to steel imports at Port Everglades, the most likely long-term forecast for this line of business is that the miscellaneous non-steel break-bulk cargos which move on the small "island hopper" vessels will be maintained for export on the southbound trades, with steel imports leaving the port completely within the next 10 years, as construction activity in South Florida subsides in step with the natural business cycle.²⁵ In this scenario, break-bulk cargo would remain, and be confined to only about 100,000 tons per year. Even at this level, though, the handling of break-bulk vessels and cargo at Port Everglades needs to be reevaluated and made more efficient, in order to minimize traffic impacts, improve operational efficiencies, and reduce costs for the customer. A traffic study of internal truck flows within Midport, and between Midport and other areas of the port (i.e. Southport and Northport), is clearly needed.

Under the unconstrained high break-bulk scenario, it is assumed that steel products will remain at about 250,000 tons per year, with overall break-bulk cargo leveling off at 350,000 tons per year throughout the forecast period.

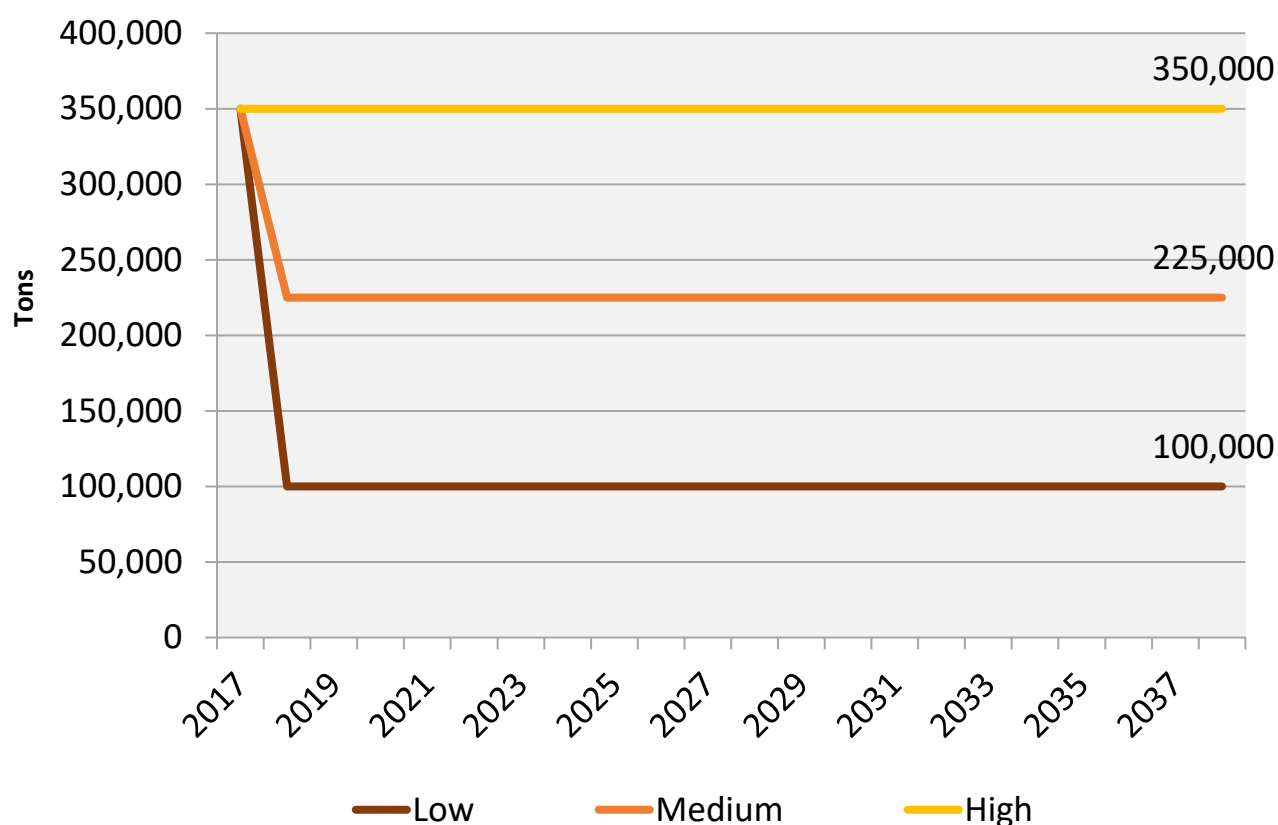
Three scenarios for break-bulk cargo were used for projection purposes, with all three being unconstrained. The high projection assumes that the 250,000 tons of steel imports are maintained throughout the forecast period, with other break-bulk tonnage remaining at 100,000 tons annually. The medium scenario assumes that 50 percent of the steel is handled at the port in the long term, with 100,000 tons of other break-bulk also remaining. Under the Low scenario, no steel is handled at Port Everglades in the future, but 100,000 tons of other break-bulk products continue to be handled. From a planning perspective, Port Everglades will need to

²⁵ *Per the Florida Economic Estimating Conference, January, 2018 and Florida, an Economic Overview, February 7, 2018 (Florida Legislature Office of Economic and Demographic Research): "Total construction expenditures (including nonresidential and public, as well as residential) continue to grow throughout the entire forecast period, with 11.8 percent growth in Fiscal Year 2017-2018, and 8.0 percent in Fiscal Year 2018-2019 before gradually settling in the 4.3 to 4.7 percent range towards the end of the period. Helped by the nonresidential component, total construction expenditures return to peak levels by Fiscal Year 2019-2020, although the private residential component does not return to peak levels until Fiscal Year 2021-2022. In a related measure, the construction employment sector does not get back to its peak level at any time during the ten-year forecast period".*

accommodate demand for break-bulk cargo, ranging from 100,000 to 350,000 tons annually.

Figure 2.6.10: Summary of Break-Bulk Projections (Tons), 2018-2038

Source: Martin Associates



2.6.3 Dry Bulk Market Assessment

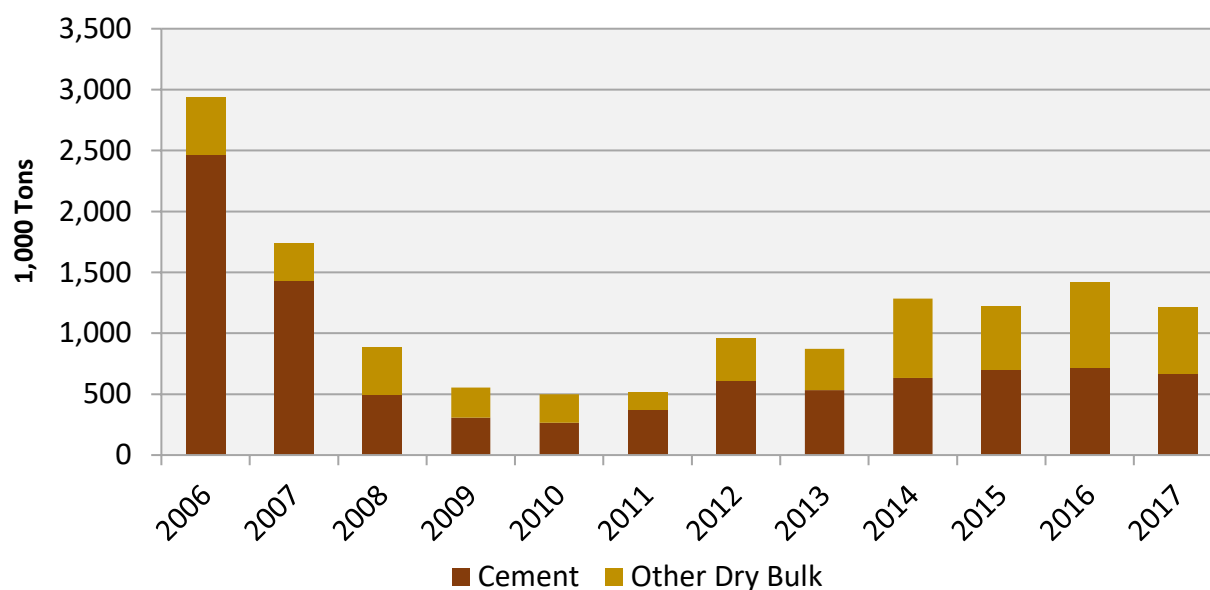
Dry bulk cargo handled at Port Everglades consists of cement and miscellaneous dry bulk, including ash, bauxite, slag and coal. See Figure 2.6.9. Cement has declined significantly over time – from a high of 2.5 million tons in 2006, to about 600,000 tons in more recent years. Bauxite, slag, and coal are handled by Host Terminals, and the vessels typically call Berth 5. Bulk cargos typically are off-loaded, reloaded in trucks, and drayed off-port to local cement manufacturers. These cargos move on 50,000 DWT vessels, requiring 40-41 feet of draft. As with break-bulk vessels, due to periodic conflicts with cruise operations, dry bulk vessels are sometimes moved off their assigned berth and sent out to anchor, returning to the berth later so as to not conflict with cruise operations. This situation creates cost

to the vessel operators in the amount of \$25,000-\$30,000 per shift. Unlike break-bulk vessels, the draft requirements of dry bulk vessels largely precludes them from calling alternative ports (such as Palm Beach and Fort Pierce). In some cases, Port Manatee has been used as an alternative, and the dry bulk has been trucked to South Florida consumption points from there.

Within the last three years, other non-cement dry bulk cargos have ranged between 500,000 and 700,000 tons annually. Interviews with the bulk operators at Port Everglades suggest that this volume will likely be sustained over the next several years, due to potential construction activity. In addition, there exists the potential for increased imported limestone to augment the current limestone production sourced from the Lake Belt Region.

Figure 2.6.11: Port Everglades Dry Bulk Cargo, 2006-2017

Source: Port Everglades



Currently, the Lake Belt Area in Northwest Miami-Dade County, which consists of 89 square miles and produces nearly 60 million tons of limestone annually, supplies nearly one-half of the Florida demand for limestone. The Lake Belt Region has the State's highest-quality limestone, and it is able to produce aggregates that meet State DOT and Federal Highway and aggregate specifications for cement, concrete, concrete products, and asphalt, which are needed to build roads, bridges, runways, schools, homes, hospitals, office buildings, and public facilities.

Based on interviews with the key limestone users in cement production, the reserves of limestone are being drawn down, and will need to be augmented by increased imports of limestone for use in cement production to serve the South Florida construction industry. In addition, documentation shows Lake Belt permits issued in 2010 were for a 10-year period, making 2020 a key year. Based on “Limerock Production and Demand,” about nine tons of limestone per capita are consumed per year. As population grows, so does the demand for limestone. Based on population projections for the State of Florida, by 2038, some 5.5 million additional residents will live in the state. Based on the nine tons of limestone per capita figure, projected population growth will support the demand for about 50 million tons of limestone over the next 20 years, or about 2.5 million tons per year of limestone demand for the entire state. Based on the assumption that the Lake Belt Region supplies about 50 percent of the limestone statewide, and further that supplies are being drawn down, there will be an increasing need for imported limestone. Estimates by industry have put this level at between 2 million and 4 million tons per year of imported limestone.

This potential imported limestone market presents an opportunity for Port Everglades, in that the port is the only port in South Florida besides Port *Miami* that can accommodate a vessel requiring a 40 foot draft. In addition, the FEC railroad provides excellent direct access from Port Everglades to areas throughout Florida where cement manufacturing occurs. In order to handle this additional 2 million tons of limestone annually, conveyor access to the FEC ICTF in Southport would be required to connect the ICTF to a berth, preferably within the STNE. In this scenario, one of the new berths created on the north side of the STNE, where permanent STS cranes are prohibited, would be used as a dedicated dry bulk facility. Assuming 2 million tons per year, and 50,000 tons per vessel, this scenario would require 40 calls per year, which would effectively preclude this berth from being used for regular container operations. Even with 1 million tons of limestone imports, 20 calls per year would be generated, with an average stay at berth in the 3-day range.

Unconstrained high and low dry bulk cargo projections were developed for this 2018 Update, factoring in this potential for limestone, along with other cargo types. For future projection purposes, the following assumptions were made under the high scenario:

- Cement will grow to 1 million tons per year by 2020, reflecting capacity constraints, and will remain constant at that level through the remainder of the forecast period.
- Other dry bulk, besides limestone, will average about 700,000 tons annually throughout the forecast period.
- Limestone imports of 1 million tons per year, beginning in 2020, will grow to 1.65 million tons per year by 2038.

In the Low scenario, no limestone market is assumed to materialize at Port Everglades.

Figure 2.6.12: Projected Port Everglades Dry Bulk Imports (Tons), 2018-2038

Source: Martin Associates

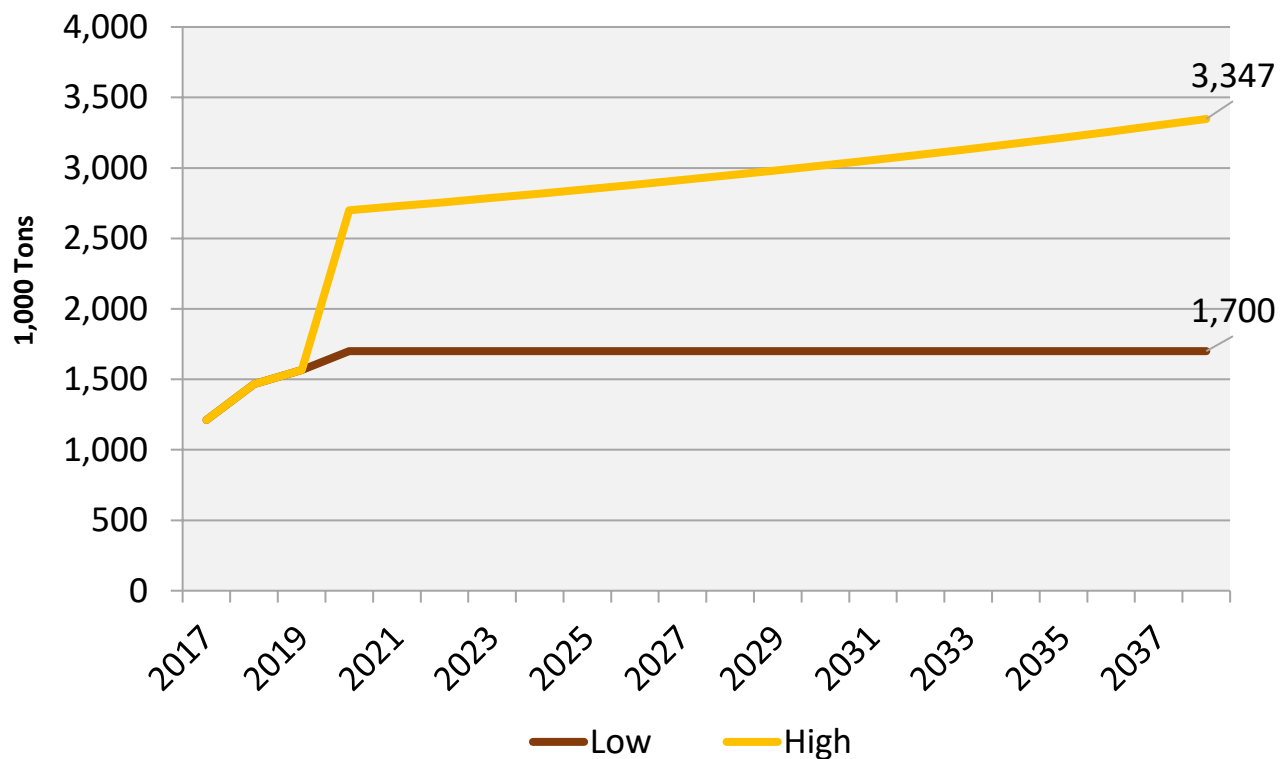


Table 2.6.2: Projected Port Everglades Dry Bulk Imports (Tons), 2018-2038*Source: Martin Associates*

Year	2018	2019	2023	2028	2033	2038
Cement	765,307	865,307	1,000,000	1,000,000	1,000,000	1,000,000
Other Dry Bulk	700,000	700,000	700,000	700,000	700,000	700,000
New Limestone			1,086,735	1,248,331	1,433,955	1,647,182
Total	1,465,307	1,565,307	1,700,000	2,948,331	3,133,955	3,347,182

Figure 2.6.12 below shows projected 20-year high and low dry-bulk volumes at Port Everglades. Table 2.6.2 presents this same information by product type. By 2038, unconstrained dry bulk is projected to range between 1.7 and 3.4 million tons.

In addition to these dry bulk projections, there is the possibility that with 3D printing-based manufacturing increasing within the next 30 years, the demand for bulk resins and other bulk materials may increase significantly, as raw materials for use in the 3D printing process become the key import items used for manufacturing final products, including houses, equipment, and machinery; this could revolutionize the bulk shipping industry with a similar impact on containerized trade, equipment, machinery, and ocean-shipping fleets.

While still in its infancy, 3D printing could have a significant impact on the demand for bulk imports and related storage capacity at ports around the world. This concept has not been included in the bulk cargo projections, since it is impossible to project the potential impact of 3D printing on future port uses and needs at this juncture. Suffice it to say, all ports, including Port Everglades, should keep it within their long-term strategic lens, particularly beyond 20 years.

2.6.4 Other Ro-Ro Cargo and Yacht Market Assessment

In addition to miscellaneous break-bulk cargos that move to the Caribbean and Central and South America, Port Everglades' north-south services also carry exports of used ro-ro cargo, such as tractors, buses, and a variety of yachts for

repositioning. Volumes of these cargos have declined significantly, since peaking at nearly 250,000 tons in 2008. Since 2012, volume has been reduced by 73,000 tons. See Figure 2.6.13.

Looking to the future, two scenarios were developed to project future uses of ro-ro cargo and yacht volumes that typically move on-island services. See Table 2.6.3 and Figure 2.6.14. For the baseline projections, given the continued decline in this cargo since 2012, average tonnage levels since 2013 have been assumed to remain constant for the entire 20-year forecast period (FY2019-FY2038). An optimistic scenario assumes that the highest level of ro-ro tonnage and yachts handled between 2009 and 2017 will be reached again within approximately 30 years, resulting in 20-year volume of just under 200,000 tons.

Figure 2.6.13: Other Cargo Handled at Port Everglades, 2006-2017

Source: Port Everglades

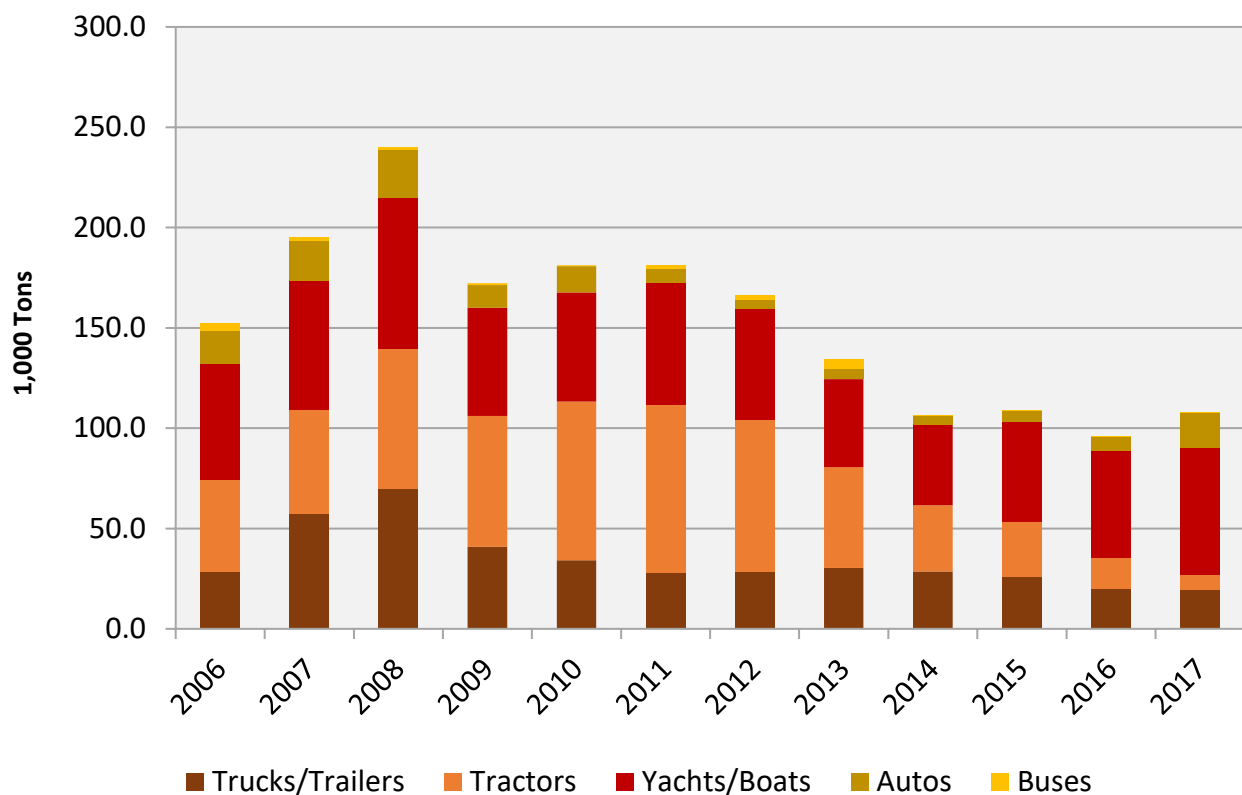


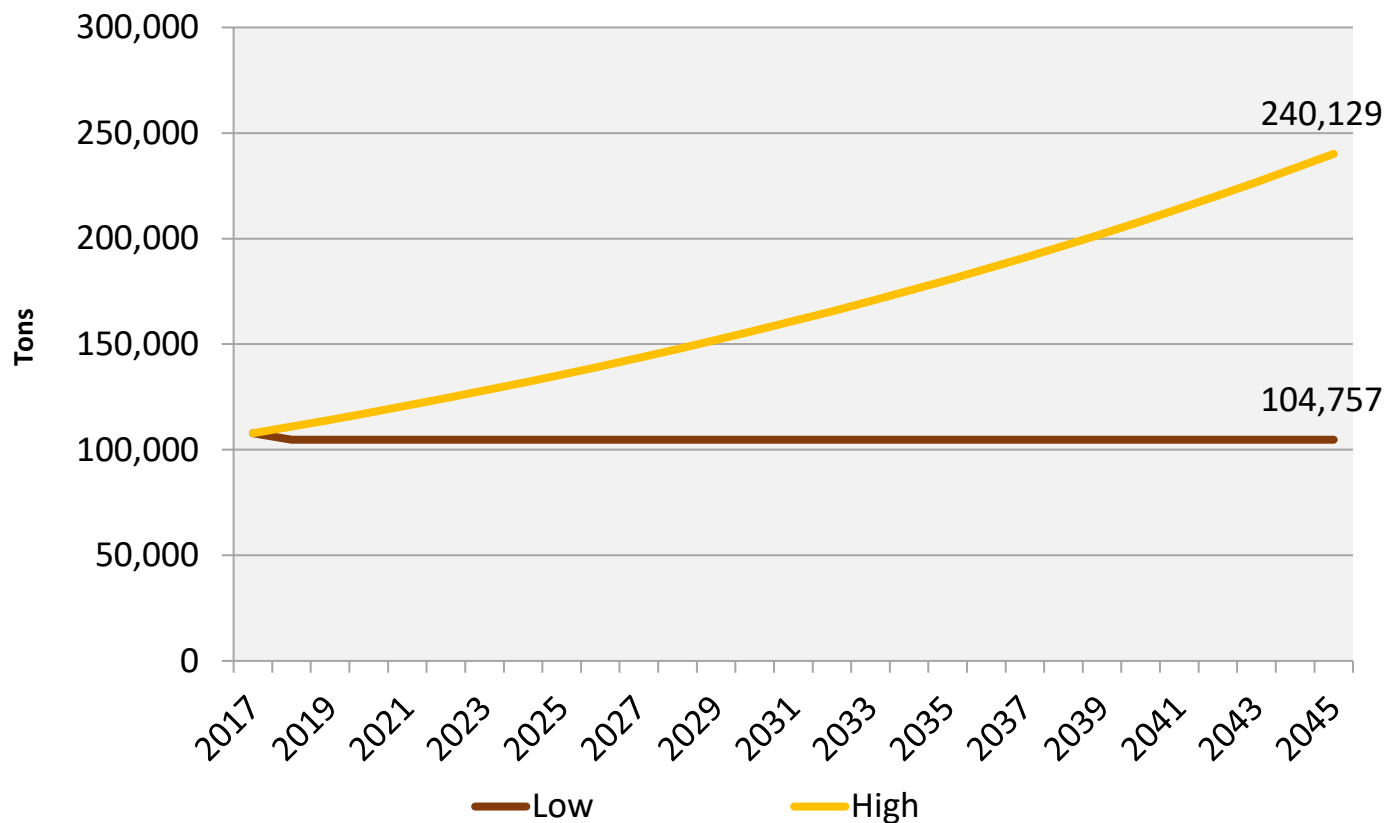
Table 2.6.3: Projected Port Everglades Used Ro-Ro and Yacht Volumes (Tons), 2018-2038

Source: Martin Associates

Year	2018	2019	2023	2028	2033	2038
Used Ro-Ro/Yachts (Baseline)	104,757	104,757	104,757	104,757	104,757	104,757
Used Ro-Ro/Yachts (Optimistic)	110,969	114,187	128,021	147,695	170,391	196,576

Figure 2.6.14: Other Cargo Handled at Port Everglades, 2018-2038

Source: Port Everglades



2.7 FTZ Trends and Port Everglades ILC Fit

2.7.1 FTZ Overview

As stated previously, an FTZ is a secure area under U.S. Customs and Border Protection (CBP) supervision that is generally considered outside the Customs area of the U.S. upon activation. Located in or near a CBP port of entry, an FTZ is the U.S. equivalent of an international free-trade zone.

The intent of the U.S. FTZ program is to stimulate economic growth and development in the United States. In an expanding global marketplace, there is increased competition among nations for jobs, industry, and capital. The FTZ program was designed to promote American competitiveness by encouraging companies to maintain and expand their U.S. operations. The duty on a product manufactured abroad and imported into the U.S. is assessed on the finished product, rather than on its individual parts, materials, or components. A U.S.-based manufacturer is therefore at a disadvantage, compared with its foreign competitor, which must pay a higher rate on parts, materials, or components imported for use in a manufacturing process. The FTZ program attempts to “correct” this imbalance by treating products made in an FTZ – using U.S. labor, services, and inputs – for the purpose of tariff assessment, as if it were manufactured abroad.²⁶

Authority for establishing an FTZ is granted by the Foreign-Trade Zones Board under the Foreign-Trade Zones Act of 1934, as amended (19 U.S.C. 81a-81u). Foreign and domestic merchandise may be moved into zones for operations, including storage, exhibition, assembly, manufacturing, and processing. No retail trade of foreign merchandise may be conducted in an FTZ, however. FTZ sites are subject to the laws and regulations of the United States, as well as those of the states and communities in which they are located.

Within an FTZ, usual formal CBP entry procedures and payments of duties are not required on the foreign merchandise, unless and until it enters the Customs territory of the U.S. for domestic consumption. At that point, the importer generally has the choice to pay duties at the rate of either the original foreign materials or the finished product. Domestic goods moved into the zone for export may be

²⁶ Source: www.cbp.gov

considered exported, upon admission to the zone for purposes of excise tax rebates and drawback.

Specific advantages of using an FTZ include:

- CBP duty and federal excise tax, if applicable, are paid when the merchandise is transferred from the zone for consumption, and not until then, effectively deferring these expenses.
- While in the zone, merchandise is not subject to U.S. duty or excise tax. Certain tangible personal property is generally exempt from state and local ad valorem taxes.
- Goods may be exported from the zone, free of duty and excise tax.
- CBP security requirements provide protection against theft.
- Merchandise may remain in a zone indefinitely, whether or not subject to duty.
- The rate of duty and tax on the merchandise admitted to a zone may change as a result of operations conducted within the zone. Therefore, the zone user who plans to enter the merchandise for consumption to CBP territory may normally elect to pay either the duty rate applicable on the foreign material placed in the zone, or the duty rate applicable on the finished article transferred from the zone, whichever is to their advantage.

According to the president of the National Association of Foreign-Trade Zones (NAFTZ), which is the leading member-based FTZ organization in the U.S., while the FTZ program continues to demonstrate its value to the U.S. economy, it also continues to be a “work in progress as the global economy and technology continue to evolve, creating new opportunities and challenges.”²⁷ Autor goes on to say in the NAFTZ 2017 Annual Report that there are several ways the FTZ program can be made more effective. They include:

- Complete the integration process, enabling FTZ users to have full use of CBP’s Automated Commercial Environment (ACE) platform.
- Update customs regulations governing FTZs, which date back to 1986.

²⁷ Source: www.naftz.org/wp-content/uploads/2018/02/2017-Annual-Report.pdf

- Ensure that companies in U.S. FTZs can compete on equal terms with their foreign competitors, particularly in countries benefitting from free-trade agreements with the U.S.

2.7.2 National Trends

The FTZ program is a significant contributor to the U.S. economy, in terms of employment and the size and value of trade (both exports and imports). According to NAFTAZ, during 2016, the value of goods exported directly from American FTZs to foreign countries totaled nearly \$76 billion (5.2 percent of total U.S. merchandise exports). This number represents a 10.5 percent decline from the previous year's export total from FTZs, but continued a downward trend that began in 2014. This trend is due almost entirely to the continued drop in the global price of oil, since it impacts FTZ-located oil-refining operations, which constitute a substantial percentage of FTZ activity nationwide.

Despite volatility in the global petroleum market, petroleum refining remained a leading FTZ export sector in 2016. According to the FTZ Board's annual report, refineries and petroleum-related operations accounted for 12 of the top 25 exporting subzones in 2016. As in previous years, pharmaceuticals and motor vehicles also represented major FTZ export sectors, accounting for two of the Top 7 exporting subzones. Employment in foreign-trade zones has remained steady since 2014, with approximately 420,000 Americans working in FTZ activities.

FTZs also continue to play a key role in U.S. production and distribution operations that rely on global supply chains to remain competitive. In 2016 (the latest data available), the value of shipments into FTZs totaled \$610 billion, of which \$384 billion (63 percent) was for production operations and \$226 billion (37 percent) for warehouse/distribution operations. About 63 percent of total shipments into FTZs involved domestic-status merchandise, indicating that FTZ production activities involve a combination of foreign inputs with significant domestic content.

Foreign-status inputs in FTZs totaled \$225.3 billion in 2016, accounting for 10.2 percent of all goods imported into the U.S. While this figure has trended down since 2012, it again appears to be mainly the result of the sharp drop in oil prices and petroleum's diminished share in the value of total FTZ imports since 2014, which saw a small increase in 2016 – from 31.5 percent to 36.3 percent. Meanwhile,

nonpetroleum imports into FTZs saw a decrease from 7.4 to 6.5 percent of total U.S. goods imports from 2015 to 2016. (See Figure 2.7.1).

Among non-oil products, the largest percentage increases in foreign-status goods received in FTZs for production operations in 2016 included:

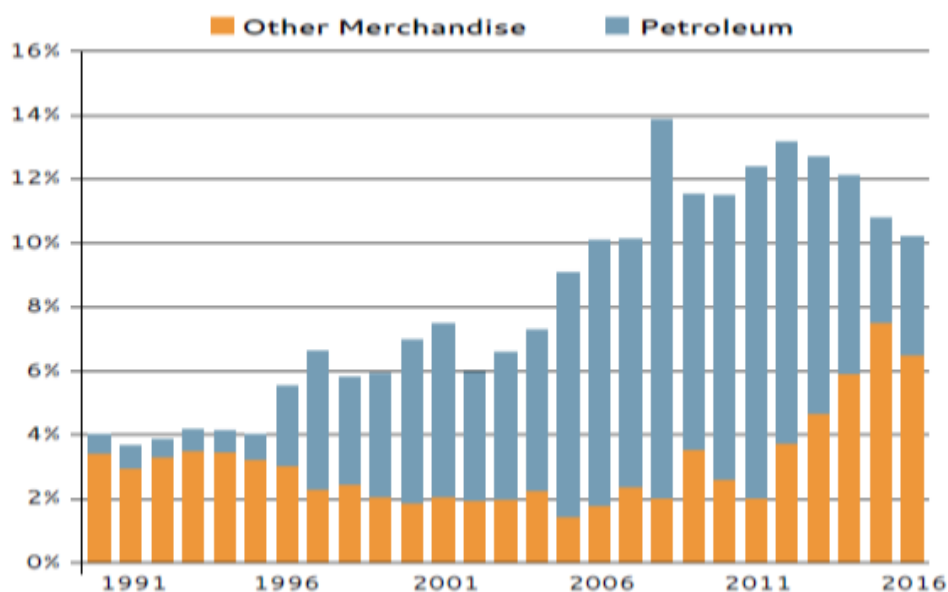
- Rail cars, parts, and equipment
- Iron/steel
- Electrical machinery
- Aircraft/spacecraft
- Optical, photographic, and medical instruments
- Pharmaceuticals

The largest percentage increases for warehouse/distribution operations were:

- Food products
- Fragrances/cosmetics
- Consumer electronics
- Advanced fiber materials
- Consumer products
- Beverages/spirits

Figure 2.7.1: FTZ Imports Share of Total U.S. Goods Imports, 1990-2016

Source: NAFTAZ 2017 Annual Report; FTZ Board Annual Reports; U.S. Census Bureau



Recent FTZ Activity

According to the NAFTAZ 2017 Annual Report, in 2016, there were 264 approved FTZs (up from 262); 195 active FTZs (up from 186), with a total of 324 active production operations (unchanged) and 3,300 firms using FTZs (up from 2,900). The FTZ Board docketed 88 requests and issued 85 decisions, including the establishment of two new FTZs, the reorganization or expansion of 16 zones under the alternative site framework (ASF), and 53 applications and notifications for new or expanded production authority. Under delegated authority, the FTZ Board staff also processed 192 additional requests, including minor modifications and scope determinations. See Tables 2.7.1 and 2.7.2.

Table 2.7.1: Establishment or Expansion of FTZ Subzones, 2017

Source: NAFTAZ 2017 Annual Report

Company	Location	Subzone	Approval
Jos. A. Bank Mfg. Co.	Hampstead, MD	73D	01/04/17
Thor Industries, Inc.	Jackson Center, OH	100D	01/09/17
Samsung Electronics	Dallas/Ft. Worth, TX	168	01/12/17
AGFA Corp.	Branchburg, NJ	44I	01/27/17
AxisCare Health Logistics	Toa Baja, PR	163E	02/02/17
CGT U.S., Ltd.	New Braunfels, TX	80E	02/03/17
Best Petroleum Corp.	Toa Baja, PR	163F	02/08/17
Topship, LLC	Gulfport, MS	92F	02/28/17
Brake Parts Inc.	Hazleton, PA	24E	03/02/17
Volvo Car US Operations	Ridgeville, SC	21F	03/02/17
ExxonMobil Oil Corp.	Jefferson County, TX	115B	03/13/17
Wacker Polysilicon	Charleston, TN	134B	03/30/17
Danos & Curolle Maritime	Morgan City, LA	124Q	04/07/17
Aceros de America Inc.	San Juan, PR	61S	04/13/17
STIHL Inc.	Virginia Beach, VA	20E	04/13/17
Mead Johnson & Co.	Zeeland, MI	43B	05/04/17
Caribe Rx Services, Inc.	Caguas, PR	163G	06/08/17
Destileria Serralles, Inc.	Ponce, PR	163I	06/08/17
R. Ortiz Auto Distributors	Caguas, PR	163H	06/08/17
Expeditors Int'l	Inwood, NY	37E	06/13/17

Company	Location	Subzone	Approval
Premier Logistics, LLC	Tulsa, OK	53C	06/16/17
Scott USA Inc.	Ogden, UT	30C	06/16/17
Universal Metal Prods.	Pharr, TX	12B	07/14/17
Westlake Chemical Corp.	Westlake, LA	87F	08/11/17
5.11, Inc.	Manteca, CA	231B	08/17/17
R.W. Smith & Co/Trimark	Lewisville, TX	168C	08/25/17
Glovis America, Inc.	Shreveport, LA	145B	08/11/17
MTD Consumer Group	Martin, TN	283A	08/24/17
Hitachi Automotive	Berea, KY	29F	08/25/17
LT Autos, LLC	Ponce, PR	163J	09/07/17
BMG America, Inc.	Marion, SC	127C	09/08/17
Mitsubishi Chemical	Sacramento, CA	143D	09/13/17
Lam Research Corp.	Freemont, CA	18F	09/14/17
LOOP LLC	St. James, LA	124D	10/13/17
Gulfstream Aerospace	Dallas, TX	168E	11/06/17
Lockheed Martin Corp.	Littleton, CO	123G	11/08/17
Ekornis, Inc.	Somerset, NJ	44	11/13/17
Consolidated Diesel Co.	Enfield, NC	214A	11/28/17
Orgill, Inc.	Coeur d'Alene, ID	280B	12/13/17
North Am. Hoganas Co.	Hollsopple, PA	295B	12/19/17

No new FTZs were established in 2017, and the status of applications processed in 2018 is unknown; in other words, the total number of approved FTZs, as of the writing of this 2018 Update, is assumed to still be 264. As shown in Figure 2.7.2, the FTZ Board did approve six applications for reorganization under the ASF in 2017, bringing the total number of FTZs organized under the ASF as of December 31, 2017, to 162, with nine applications pending that are expected to be processed in 2018. Port Everglades (Broward County) is among the pending ASF applicants.

Table 2.7.2: Alternative Site Framework Reorganizations, 2017*Source: NAFTAZ 2017 Annual Report*

FTZ Location	FTZ Number	Approval
Imperial County, CA	FTZ-257	03/13/17
Fayette/Hardeman/McNairy Counties, TN	FTZ-238	03/14/17
Boone County et al., WV	FTZ-229	06/26/17
Hidalgo County, TX	FTZ-12	08/11/17
Pinellas/Hernando/Pasco Counties, FL	FTZ-193	09/07/17
City of Athens, TX	FTZ-269	12/06/17

Once these pending ASF applications are processed, 171 of the 264 total approved FTZs in the U.S. will be ASF zones (65 percent). This data represents a clear trend toward ASF, and away from the Traditional Site Framework (TSF) under which Port Everglades' FTZ-25 is currently organized. In line with this trend, Port Everglades submitted an ASF application to the Board in 2017. The comment period for this application just closed and approval is expected in the coming months.

Alternative Site Framework

A typical general purpose zone, such as the existing FTZ general purpose site located at Port Everglades, provides leasable storage/distribution space to users in general warehouse-type buildings with access to various modes of transportation. Many FTZ projects include an industrial park site with lots, on which zone users can construct their own facilities. Subzones are normally private plant sites authorized by the Board and sponsored by a grantee (i.e. Broward County in the case of FTZ-25) for operations that usually cannot be accommodated within an existing general-purpose zone.

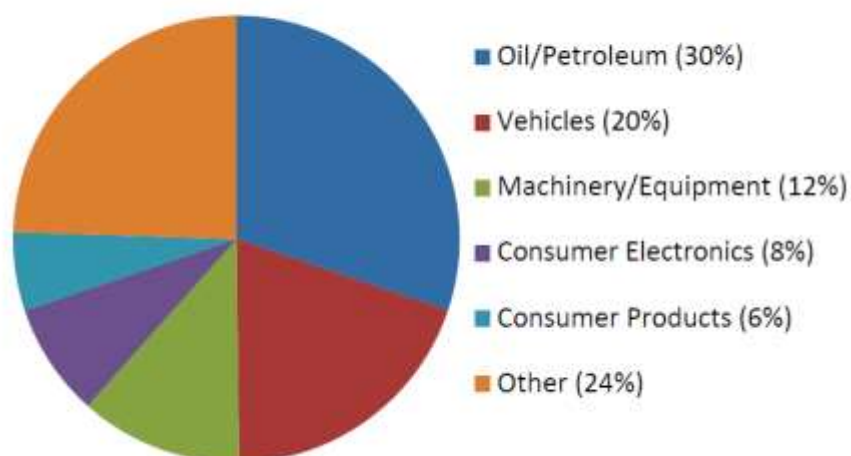
The ASF, which was officially established by the FTZ Board in late 2008, is an optional framework for organizing and designating sites that allows zones to use quicker and less complex procedures to obtain FTZ designation for eligible facilities. To reorganize under the ASF, each zone Grantee must propose a service area. Once approved by the FTZ Board, a subzone or usage-driven site can be designated anywhere in the service area within 30 day, using a simple application form. The ASF allows FTZ designation to be brought to any company that needs it, eliminating the need for zone grantees to predict where the zone will be needed and to predesignate sites.

One of the most significant benefits of the ASF is convenience. The ASF option does not require a Grantee to locate other zone status property to remove or transfer to the proposed new site, as with a TSF boundary modification. The ASF also allows a Grantee organization to restructure its zone with a formal reorganization application, so there is one primary or magnet site, with a permanent approval followed by up to five additional magnet sites. Magnet sites are essentially the same as current general-purpose zone industrial park sites, such as the one located at Port Everglades.

Usage-driven sites, which are also allowed under the ASF, are individual sites where an actual warehousing or manufacturing company can commit to activating its operation after approval by the Foreign-Trade Zones Board. Usage-driven sites are able to be secured through an administrative boundary modification, which proceed in thirty (30) days. If a company has a manufacturing facility, it would be permitted to secure Production Notification authority (120-day approval for manufacturing), if it qualifies. The major benefit to Grantees and companies is that they may quickly add sites without having to identify zone- status property to remove from the existing zone. There is a three-year time limit on usage-driven sites, and a five-year time limit placed on magnet zone sites. Usage-driven sites must have an operator activate their zone within the three-year time limit. Magnet sites similarly must have at least one operator activate within the five-year time limit.

2.7.3 Florida FTZs

The State of Florida has 20 active FTZs in 20 different locations, the largest of which are located in Broward, Miami-Dade, Duval, Orange, Escambia, and Hillsborough Counties. Figure 2.7.2 presents a summary of Florida FTZ activity in 2016, which is the most recent year for which complete data is available.

Figure 2.7.2: FTZ Activity Summary, State of Florida, 2016*Source: FTZ Board 78th Annual Report to Congress*

STATE SUMMARY	
Merchandise	\$10,000-25,000 mil
Received: Exports:	\$1,000-5,000 mil
Total Shipments:	\$5,000-10,000 mil
Employees:	7,001-8,000

Broward County's FTZ-25 ranked as the 4th most active FTZ in the U.S. in 2016, and is Florida's oldest and largest FTZ, serving 75 businesses in its general-purpose zone, and supporting over 550 direct jobs in the local economy at 20 locations across Broward County. Broward County serves as Grantee for FTZ-25, which currently has five special-purpose subzones at the port. Non-contiguous sites that are part of FTZ-25 include acreage in Davie, about six miles west of the port, and farther southwest in the Miramar Park of Commerce as well as acreage in Lauderdale Lakes, Dania Beach, Pompano Beach, Oakland Park, Fort Lauderdale, Pembroke Park, and Deerfield Beach. These off-port locations help diversify and distribute the economic opportunities and jobs generated by port operations. In addition to FTZ-25, Broward County is home to FTZ-241, and the Grantee of it is the City of Fort Lauderdale. FTZ-241 is a fraction of the size of FTZ-25, in terms of the value of total shipments handled annually (approximately 5 percent).

Like Broward County, Miami-Dade County is home to two different FTZs (FTZ-281 and FTZ-32). The larger of these – FTZ-281 – is the second most active FTZ in Florida, in terms of the value of total shipments. Miami-Dade County is the Grantee for FTZ-281. A private entity called Greater Miami Foreign-Trade Zone, Inc., is grantee for FTZ-32.

JAXPORT is the grantee for FTZ-64, which is the next most active FTZ in Florida, followed by FTZ-32, FTZ-42 in Orlando (Greater Orlando Aviation Authority), FTZ-249 in Pensacola (Pensacola-Escambia County Promotion and Development Commission) and FTZ-79 in Tampa (City of Tampa).

Competitive Dynamics

In the U.S., FTZs are more mission-oriented than profit-driven, since benefits are intended to accrue to users of FTZs, not to FTZ Grantees. Grantees have the ability to determine application fees and other fees necessary to support FTZ administrative responsibilities, but are required to do so on a cost-recovery basis. In other words, generating surplus revenue is not generally allowed or considered a legitimate role of the Grantee. FTZ operators, on the other hand, are typically private companies, and therefore have more leeway and discretion with regard to rates and tariffs, since profit is an inherent aspect of the warehousing, logistics, and distribution industry.

Ports, too, may benefit financially, if indirectly, from increased FTZ use, since international goods stored or otherwise handled at an FTZ in close proximity to a given port are likely to be shipped via that same port, thereby resulting in higher cargo volumes, and associated revenue and overall economic impacts. In addition, since the mission of the FTZ program since its inception has been economic development, and since Grantees for FTZs are typically (though not always) public or quasi-public entities – i.e. counties, cities, ports, etc. – there is inherent competition between Grantees to attract FTZ users to one location vs. another, in order to attract and create jobs in one political jurisdiction vs. another.

Given Port Everglades' unique mix of cruise and cargo activity, including both a sizeable liquid bulk portfolio and the third-highest number of multiday cruise revenue passengers in the world, it is no surprise that FTZ-25 ranks in the top five nationally. From a regional perspective, in light of the substantial cross-county commerce that takes place in South Florida, Port Everglades is also well-positioned

to compete for FTZ users that use other ports in the area, namely Port *Miami* and Port of Palm Beach, particularly once Broward County adopts the ASF. The value to the port of having non-port users as FTZ customers is likely to be marginal, however, so Port Everglades would need to assess the value of a broader recruitment effort against the cost of such an effort. This information is discussed in greater detail in Section 2.7.5.

2.7.4 Port Everglades International Logistics Center

The PE-ILC is a proposed 16.65-acre mixed-use development featuring a total combined warehouse area of 238,144 square feet, plus 44,992 square feet of office space. The development will include onsite parking and fumigation facilities, and will replace the existing FTZ-25 buildings currently located across McIntosh Road, directly to the east (see Figures 2.7.3-2.7.4). This proposed development is planned as a 50-year ground lease, developed as a joint-venture between three private-sector partners, each of which will own one third of the project's interest:

- **International Warehouse Services, Inc. (IWS)**
IWS occupies and operates part of the existing FTZ-25 buildings, and has been a tenant and port client for more than 30 years; IWS remains a family-owned business, managed by the original founders.
- **ANF Group, Inc. (ANF)**
ANF has been constructing and developing projects in Broward County since 1981.
- **Treadwell Franklin Infrastructure Capital, LLC (TFIC)**
TFIC and its principal have been involved in over 12 million square feet of industrial and office product development in South Florida; the primary development activities for the PE-ILC will be carried out by TFIC.

Major tenants of the PE-ILC will include:

- **IWS**
IWS is anticipated to lease and occupy over 90,000 square feet of warehouse space (the entirety of Building 2 as proposed), in addition to approximately 8,000 square feet of office space.

- **Tenant B**

An as-yet-unidentified tenant is anticipated to lease and occupy a significant portion of, or the entire area of, Building 1 (146,200 square feet); the developer is currently working with prospective tenants to occupy this space, with one application pending.

- **Port Everglades**

FTZ-25 staff will maintain an office within the new PE-ILC (Building 2) of approximately 2,500 square feet.

- **CBP**

CBP is anticipated to lease and occupy an appropriate amount of office space to meet the needs of maritime-related divisions of CBP.

- **USDA**

U.S. Department of Agriculture maritime-related inspection services are anticipated to lease and occupy an appropriate amount of office space to meet their needs.

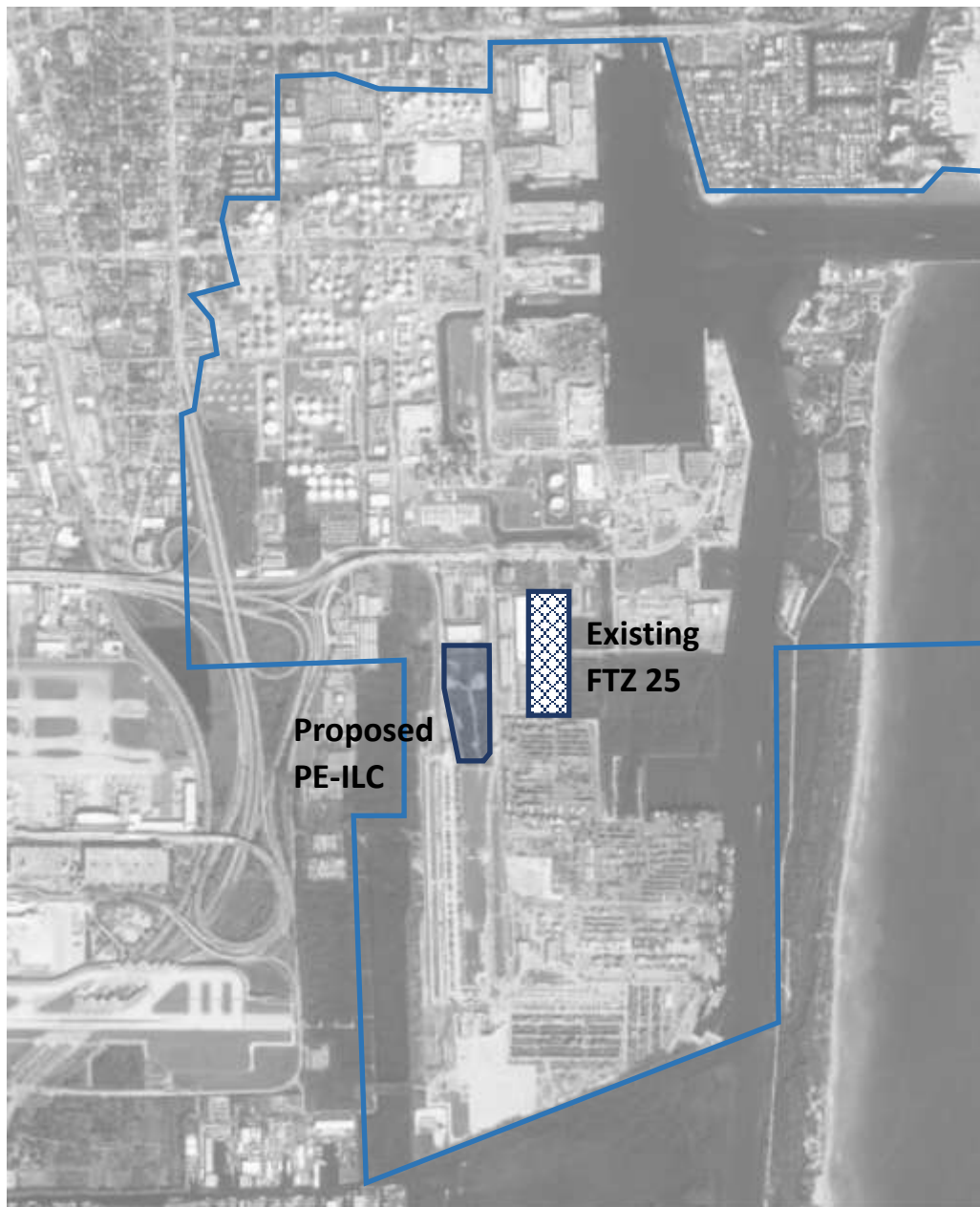
Figure 2.7.3: Port Everglades International Logistics Center Rendering

Source: Port Everglades



Figure 2.7.4: Port Everglades International Logistics Center Location

Source: B&A



The B&A team has not performed a commercial/industrial real estate analysis as part of the 2018 Update, and cannot independently verify the appropriateness or quantify the value of the PE-ILC as proposed. That said, in general terms, as proposed, the PE-ILC could be ideally suited to meet a portion of the cold chain logistics demand discussed in Section 2, particularly if Building 1 is developed as a cold-storage facility with direct onsite rail access.

Figure 2.7.5: Port Everglades International Logistics Center Site Plan (Proposed)

Source: Port Everglades



As previously elaborated, there is growing interest in the development of temperature-controlled warehouses and transload facilities near ports, both within and outside of Florida. In the case of Port Everglades, this demand is driven by the

potential to capture an increasing share of South American perishable imports (i.e. fruits and vegetables), as well as export perishables (i.e. meat and poultry) from the U.S. Midwest that are bound for countries in the Caribbean, Central, and South America, which are well-served by Port Everglades' tenants. The potential for Florida exports of citrus to Europe via Port Everglades provides a further opportunity for the development of temperature-controlled facilities with direct rail and Port access.

In most cases, the demand for cold storage/temperature-controlled warehouses is specific to facilities that can provide transload/cross-dock operations, since imported perishable cargo moving via containers must be stripped at the port, then transferred to domestic truck or rail for distribution without breaking the cold chain. Similarly, perishables for export, such as meat and fish, must be reloaded from over-the-road truck or rail into marine containers at the temperature-controlled/refrigerated warehouse without breaking the cold chain. Current inquiries at Port Everglades regarding the establishment of a cold chain logistics complex underscore the importance of the perishables market, and lend credence to the proposed PE-ILC as a value-add to Port Everglades that creates strong potential synergy with current and potential future trade flows.

2.7.5 Implications for Future Marketing Strategies

Given the prevalence of FTZs within the U.S., particularly within major port-adjacent metropolitan areas (i.e. four separate FTZs in South Florida), there is little evidence to suggest that having an FTZ is a competitive advantage for an individual port, in terms of attracting or sustaining containerized cargo volumes. However, it is almost certainly true that not having an FTZ would serve as a competitive disadvantage for a Port like Port Everglades. In this sense, while it is not easy to quantify the direct benefits of FTZ-25 on Port Everglades cargo volumes, there is plenty of evidence that port users can and do benefit from using FTZ-25. The benefits of an FTZ for a given company depend on myriad factors, however, so not all port users will benefit from FTZ designation at Port Everglades or elsewhere.

FTZ-25 has been successful in the past, to the extent that it has provided Port Everglades users with business advantages associated with FTZs. Given Port Everglades' unique mix of cruise and cargo activity, having an on-port FTZ has proven to be, and likely will continue to be, a valuable logistics asset that meets a

clear market demand. Two principal and related challenges that limit growth in the number of FTZ users are:

- Lack of information/awareness
- Perceptions associated with activation and compliance processes

Most active FTZ users in South Florida, and more broadly, likely have a positive story to tell, in terms of the benefits of FTZs. Some of these stories no doubt also include positive testimonials related to the unexpected ease or simplicity of achieving these benefits, compared to prior expectations. One potential marketing strategy related to FTZ-25 is to work closely with current FTZ-25 users to develop testimonial-based marketing materials and a network of existing users that new or potential new users can access to better understand what is involved, and why they should bother (see Figure 2.7.6).

Another path to expansion of FTZ-25 is the adoption of the ASF. As discussed above, the ASF streamlines the FTZ application process, thereby reducing the “fear factor” of businesses that might be considering FTZ activation, but still remain undecided and/or unsure as to the value and process involved. This strategy may even increase the appeal of Port Everglades among companies that do not currently ship products via Port Everglades, but who would qualify for FTZ activation within FTZ-25 under the ASF. The ASF could also potentially serve as a marketing tool for Port Everglades in the sense that it differentiates FTZ-25 from other FTZs in the tri-county region. Given that Broward County has already applied for ASF status for FTZ-25, the benefits of ASF will likely be realized in the near term.

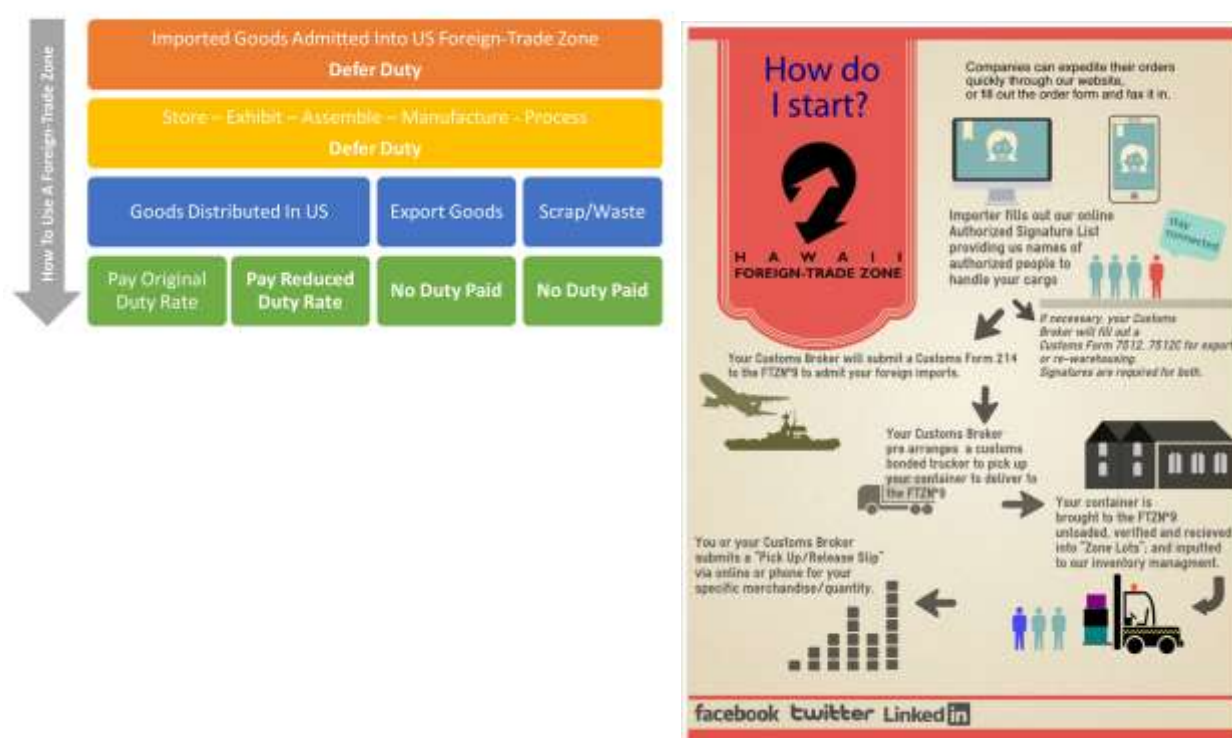
Another marketing strategy could be to host regular FTZ-25 information sessions at different locations and venues around the county, to help inform potential users of the benefits and help educate them about the process. Local chambers of commerce and regional entities, such as the Florida Customs Brokers and Forwarders (FCBF), would be natural partners in this endeavor, since their members would be potential beneficiaries of FTZ-25 activation.

Maintaining FTZ-25 as a strategic marketing tool is important. However, it is unclear exactly what level of resource allocation in terms of marketing dollars or staff time, should be allocated by the port to expand FTZ-25 use. This is not to say that FTZ-25 does not add value to Port Everglades. It clearly does add value, in the sense that it

has the potential to save existing and future port users significant amounts of money, due to the tax, cash flow, and other benefits that it facilitates. However, the benefits of FTZ activation accrue almost entirely for port users, rather than the port itself, and there is little evidence to suggest that shippers select one port over another, due mostly or entirely to reasons related to FTZ status. Therefore, it is reasonable to question the degree to which FTZ-25 expansion should be prioritized by Port Everglades in terms of resource allocation.

Figure 2.7.6: Sample FTZ Infographics

Source: cdrpc.org; ftz9.org



One potential future strategy in this regard could be to partner more closely with the Greater Fort Lauderdale Alliance (GFLA), Broward County Department of Economic Development, the South Florida Manufacturers Association, and other economic development groups to incorporate FTZ-25 more directly into their business recruitment efforts. FTZ-25, particularly if restructured under the ASF, aligns very naturally and directly with the missions of these organizations and new users of FTZ-25 – and its primary beneficiaries – are equally likely to be GLFA “customers” as port customers.

With regard to the PE-ILC, as already discussed, in addition to its designation as an FTZ general purpose site (or magnet site under the ASF), if this proposed development successfully incorporates both state-of-the-art cold storage capability and direct rail access, then its potential to contribute to future Port Everglades two-way containerized cargo volumes, particularly perishables, could be substantial. Since land at Port Everglades is limited and container operations are projected to grow in the future, maximizing the PE-ILC footprint for uses that contribute directly to Port Everglades container volumes would seem to be a win-win strategy.

2.8 LNG Bunkering Assessment

2.8.1 LNG Bunkering Drivers

The two main drivers behind decisions to convert to liquefied natural gas (LNG) fuel are compliance with emissions regulations and cost savings associated with lower LNG fuel costs.

Standards for marine vessel emissions have been getting increasingly stricter, both globally and regionally (North America). The driving standard has been the International Maritime Organization (IMO) Annex VI of the International Convention for the Prevention of Pollution from Ships, commonly known as MARPOL. MARPOL Annex VI defines emission and fuel quality requirements, both globally and locally for Emission Control Areas (ECAs). An ECA can be designated for sulphur oxide (SOx), particulate matter (PM), nitrogen oxide (NOx), or all three types of emissions.

MARPOL restrictions have been in place in the Baltic and North Seas for a while, and have more recently been applied to North America, including the U.S. Caribbean. The following is a list of the existing ECAs by date of adoption:

- Baltic Sea (SOx, adopted 1997); enforced in 2005
- North Sea (SOx, 2005/2006)
- North America, including most of U.S. and Canada (NOx and SOx, 2013/2015)
- U.S. Caribbean, including Puerto Rico and the U.S. Virgin Islands (NOx and SOx, 2011/2014)

In addition, the IMO demanded a reduction of sulfur content in maritime fuel, for use in the North Sea, the English Channel, and the Baltic Sea – all of which fall within a Sulfur Emission Control Area (SECA) – from 1.0 percent to 0.1 percent after January 1, 2015. Further sulfur reductions are required in 2020 and 2025. Further NOx Tier III reductions came into effect in 2016. In order to meet the lower emission requirements, shippers have chosen either to add technology to their ships to remove the emissions, or change to a cleaner burning fuel – MGO and LNG being the two most practical options. When compared to Heavy Fuel Oil (HFO), LNG results in:

- 85 percent less NOx and Sox
- 90 percent less PM
- 30 percent less carbon dioxide (CO₂)

This latter point is particularly important long-term, since reduction in greenhouse gases is a major component and primary goal of international and regional climate change initiatives. LNG is largely viewed as a favorable fossil fuel alternative, given its reduced emissions that is based on the success the Baltic area, especially Norway, has had using LNG to meet their emission-reduction targets.

With regard to cost, North America has gone through a gas revolution in recent years, due to the introduction of fracking technology to extract gas from shale deposits. In 2010, the U.S. Energy Information Administration (EIA) released estimates, putting U.S. natural gas reserves at their highest level in four decades. In 2012, the U.S. became the top gas producer in the world. This additional supply has caused natural gas prices to reduce substantially, with demand to date remaining stable. As a result, LNG prices across the global market have come down and mostly stabilized.

Meanwhile, HFO and diesel pricing is tied to the oil price per barrel, which has been a very volatile market over the last 10 years. Even with recent low oil prices, natural gas has been more competitive on an energy-content basis, compared to diesel and HFO, and is forecast to remain more competitive in the foreseeable future.

To create LNG, there are additional costs that get added to the cost of natural gas, but these are fixed costs that are not affected by market volatility. These costs are also being reduced as new technology is implemented, and as LNG production

increases to provide an economy of scale benefit. Competitive LNG price forecasts are another factor that drive vessel operators to consider it as a fuel. From a port perspective, there could also be significant initial capital investment costs associated with LNG infrastructure. The magnitude of this initial investment varies by the alternative ultimately used to provide LNG to vessels, as elaborated in the following section.

2.8.2 LNG Bunkering Alternatives

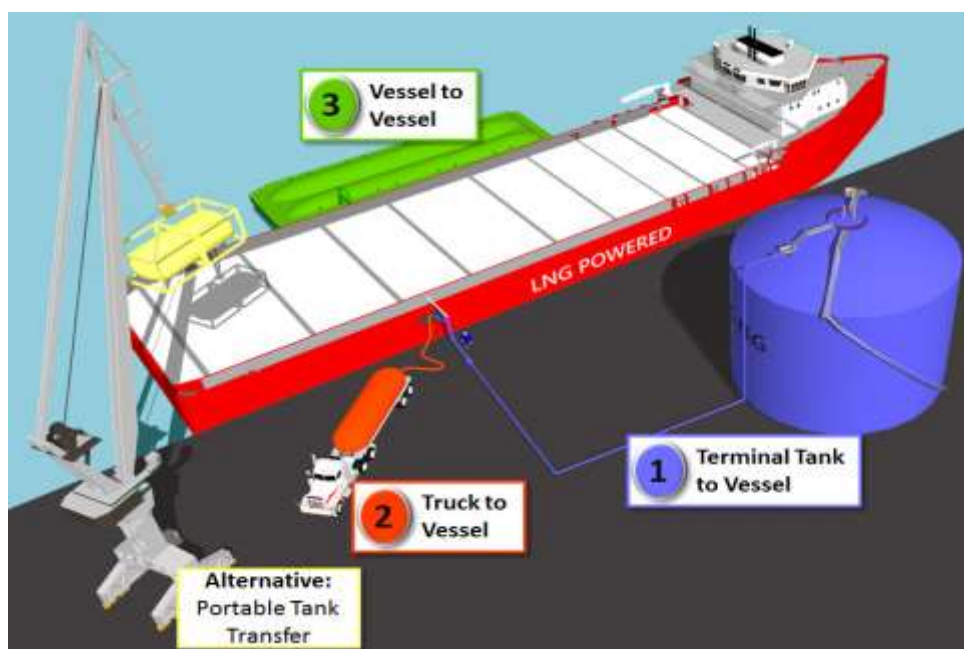
For bunkering purposes, LNG fuel is generally produced offsite, then transported to berth for loading onto a vessel (see Figure 2.7.1).

LNG bunkering can be accomplished in a number of ways:

- Port Tank to Ship (PTS)
This bunkering process involves pumping LNG through a pipeline, directly from a storage tank located at or near the berth.

Figure 2.8.1: Standard LNG Bunkering Options

Source: ABS via ww2.eagle.org²⁸



²⁸ The ABS report “Bunkering of Liquefied Natural Gas-Fueled Marine Vessels in North America” provides numerous insights into LNG bunkering operations, market drivers and guidelines.

- **Truck to Ship (TTS)**

LNG is pumped from individual tanker trucks to the vessel at berth; the LNG source (i.e. storage tanks) is located offsite and the trucks must drive into the vessel operating area.

- **Ship to Ship (STS)**

LNG is pumped from a barge (or other LNG storage vessel) to the vessel being bunkered. Vessel-to-vessel transfers are the most common form of bunkering for traditional fuel oil.

- **Portable Tank Transfer (PTT)**

LNG is pre-loaded into a tank then the tank is loaded onto the vessel and connected. Once all the LNG in the tanks has been consumed for fuel, it will need to be replaced with another full tank. These tanks could be standard ISO-sized tanks or custom tanks specific to a given vessel.

Each of these delivery processes is elaborated below.

Port Tank to Ship (PTS)

For PTS, LNG is transferred from a fixed storage tank through a cryogenic pipeline to the ship at berth. The tank can be filled from an external LNG source using trucks, rail cars, or a cryogenic pipeline to supply the LNG. The storage tank would be sized based on the volume and frequency of fueling operations as well as the frequency of supply. A typical operation is the Harvey Gulf site at Port Fourchon, LA. This facility has 270,000 gallons (1,000 m³) of storage capacity and is capable of pumping 500 gallons per minute (two m³ per minute). This infrastructure cost \$10-\$15 million to develop with the tanks accounting for about one third of the total cost.

Figure 2.8.2: Harvey Gulf Port Fourchon LNG Bunker Fuel Facility

Source: harveygulf.com²⁹



This method offers the least flexibility in that the ships must dock at a specific location for the bunkering operation. Most ports will not allow other operations to occur while bunkering is occurring, meaning loading/unloading operations in the surrounding areas are typically halted for the duration of the bunkering process. Generally, the assets are fixed so if the bunkering operations cease then there is no residual value. The use of bullet type tanks would allow the tanks to be removed and sold for other applications.

Truck to Ship (TTS)

For TTS, LNG trucks transport LNG from an off-site LNG facility to the port where the ship is berthed. Fuel is then pumped from the trucks, through a flexible cryogenic hose which is connected to the ship. The trucks carry smaller volumes and have smaller pumps, meaning this operation takes longer than the PTS process. A typical truck would carry 5,000 gallons (21 m³) of LNG and unload at 50 gallons per minute (0.2 m³ per minute). The infrastructure for this process is extremely portable since only the truck with unloading equipment is required.

²⁹ From news release – February 14, 2014: “Harvey Gulf Breaks Ground With LNG Facility” (http://www.harveygulf.com/pdf/press/Harvey_Gulf_BREAKS_GROUND_WITH_LNG_FACILITY.pdf)

Figure 2.8.3: Example Truck to Ship (TTS) LNG Bunkering Operation

Source: Conference presentation by Fleet Energy America at June 2015 Natural Gas for Off-Road Applications USA



The order of magnitude cost is \$0.5 million for a single truck operation. Another option is use of self-contained trailers, such as the Orca LNG trailers provided by Chart Industries. These units are equipped with their own transfer equipment to allow direct connection to the vessel and have 3,400 to 6,200 gallons (12 to 24 m³) capacity. Other LNG trailers have a larger capacity, 12,500 to 18,000 gallons (48 to 72 m³) but require a loading station to transfer the LNG from the trailer to the vessel. This loading station would be skid mounted and could be moved; however, it is another piece of equipment that must be managed and requires flexible power connections.

The TTS method offers maximum portability and flexibility since the LNG can be provided to one or more ship(s) at any berth with truck access. Most ports will not allow other operations to occur while bunkering is occurring, meaning loading/unloading operations in the surrounding areas are typically halted for the duration of the bunkering process. The equipment required for this process can be moved from port to port or re-sold if the bunkering operations cease. There is also a market to lease these trucks since they are portable and in high demand. The major drawback of this method of LNG bunkering is the number of trucks required to complete a large-vessel bunkering operation and the speed of delivery,

particularly in light of the standard practice of halting other operations while bunkering is underway.

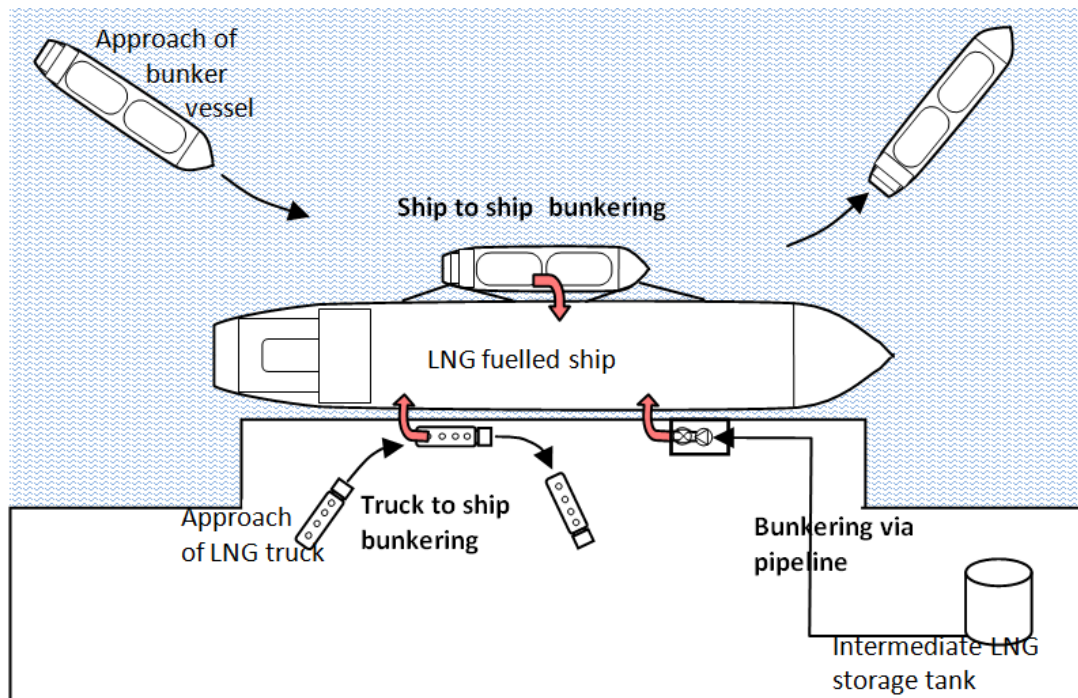
Ship to Ship (STS)

For vessel-to-vessel transfer, an LNG barge is typically used (see Figures 2.7.4 and 2.7.5). The bunker barge (or ship) must be filled at an LNG plant with a port facility or at a port that has an LNG storage tank. The source of the LNG will dictate how the bunker vessels get re-filled. These vessels range in size from roughly 132,000 to 1.06 million gallons (500 m³ to 4,000 m³) and discharge the fuel at a rate of about 132,000 gallons per hour (500 m³ per hour). They are shallow draught vessels, generally used for local port operations and designed for operation alongside cargo (or cruise) ships. A typical bunker barge costs approximately \$15 million, depending on the size.

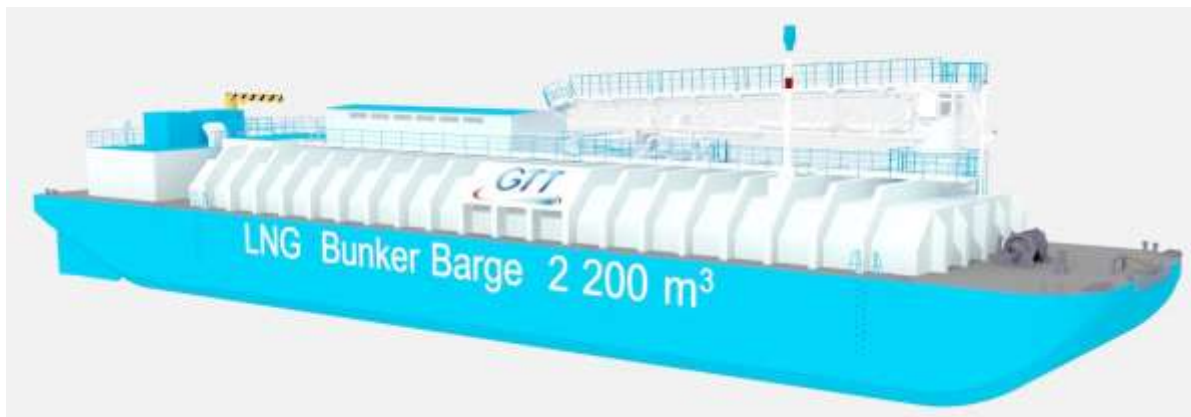
This is a very flexible method of LNG bunkering and allows the fueling vessel to operate wherever the ship requiring fuel is moored. It does not require any infrastructure changes to the port or berthing facilities as the bunker vessel can be moored directly to the ship that it is fueling. Some marine terminals allow portside operation to proceed while the ship to ship fueling process occurs. This allows for cargo and stocking operations to proceed in parallel with fueling.

Figure 2.8.4: Ship to Ship (STS) Bunkering

Source: dma.dk/themes/LNGinfrastructureproject³⁰

**Figure 2.8.5: Five GTT 2,200 m³ (580,000 Gallon) LNG Bunker Barge**

Source: Conference presentation by GTT at June 2015 Natural Gas for Off-Road Applications USA



³⁰ Source: Danish Maritime Authority

(http://www.dma.dk/themes/LNGinfrastructureproject/Documents/Final%20Report/LNG_Full_report_Mgg_2012_04_02_1.pdf)

Larger ships, such as the vessels used for mid-scale LNG transport, could be used for bunkering fuel operations especially along a coast line where the distance from the LNG source to the bunkering port may be greater or the shipping conditions (i.e. rough waters) prevent the use of a barge. These vessels would be small scale LNG carriers in the range of 2.6 million to 7.9 million gallons (10,000 to 30,000 m³) and be capable of doing ship to ship transfers while at sea. This allows the fueling process to take place away from port but can be prohibited by rough weather conditions.

Portable Tank Transfer (PTT)

Standard 20 foot and 40 foot ISO LNG containers can be used to transfer LNG pre-loaded in the containers with a respective capacity of 740 and 1,590 cubic feet (21 and 45 m³). These containers can be transferred on board the vessel using the same equipment for handling other ISO containers. Once on board they can be stacked (if needed) and connected into a common manifold to supply fuel to the vessel. Generally these ISO LNG storage units will be loaded off-site at an LNG plant then transported to the terminal by truck. Since the units typically hold the LNG for 60 days with no boil off gas the units can be loaded ahead of time and allow for a quick transfer of the LNG aboard the vessel. Each unit costs between \$150,000 and \$200,000, depending upon the storage capacity. These tanks can also be leased for shorter term operations.

Figure 2.8.6: LNG ISO Storage Units

Source: Courtesy of Chart Industries – LNG Equipment Solutions Product Catalog



The use of LNG containers allows for quick loading of the fuel with operations similar to the loading of containerized cargo. It is also very flexible in that the fuel can be delivered to any port that currently handles containers and does not require any modifications to the port facilities. However, it is a very specific solution primarily for cargo ships that are fitted with a fueling manifold. The majority of cargo vessels are not equipped with this type of system, and this method is likely inappropriate for cruise vessels, meaning it currently has limited application for Port Everglades.

2.8.3 Bunkering Method Comparison

Table 2.8.1: Pros and Cons of Different LNG Bunkering Methods

Source: Hatch

Bunkering Operation	Pros	Cons
Port Tank to Ship (PTS)	<ul style="list-style-type: none"> • Medium bunker flow • Suitable for small to mid-size vessels 	<ul style="list-style-type: none"> • High capital • Location specific (Not portable) • Requires pipe, truck or rail LNG delivery
Truck to Ship (TTS)	<ul style="list-style-type: none"> • Low capital • Lease or re-sell equipment • Portable for use at multiple locations • Delivery from LNG plant 	<ul style="list-style-type: none"> • Low bunker flow • Suitable for small vessels
Ship to Ship (STS)	<ul style="list-style-type: none"> • High bunker flow • Suitable for all size vessels • Allows fuelling at port or at sea • Portable • Allows for other port operations during bunkering 	<ul style="list-style-type: none"> • High Capital
Portable Tank Transfer (PTT)	<ul style="list-style-type: none"> • Quick loading • Standard container equipment • Portable • Low capital • Lease or re-sell 	<ul style="list-style-type: none"> • Requires additional fuel manifold on vessel • Extra equipment handling • Not suitable for large vessels due to number of containers • Very specific application

The most suitable application of each method of bunkering is as follows:

- PTS – small to mid-sized vessels with a designated fueling area
- TTS – small vessels which berth at ports easily accessible by road
- STS – large vessels or bunkering at ports not easily accessed by road, or at sea/anchor
- PTT – mid-size container vessels equipped with fueling manifold

The maturity of a site may evolve from one method to another as the volume of bunker increases and new equipment becomes available. A good example of this is how Tote is transitioning its bunkering supply from a trucking operation to enable start up then move into a more permanent bunker barge configuration.

The duration of the various bunkering operations for a typical vessel are presented in Table 2.7.2. Based on these duration ranges and being practical, a TTS operation would work for small vessels such as a tug and PTS would work for mid-size to small vessels such as Lakers, tugs and ferries. An STS bunkering operation is the only practical method for large vessels such as cruise ships and large container ships. For cruise ships a PTS solution could work but only if it were dedicated to one ship or if the ships only take a partial load.

Table 2.8.2: Bunkering Operation Duration

Source: Hatch

Vessel Type	Bunkering Operation	PTS	TTS	STS
	Gallons Per Hour	105,000	16,000	500,000
	Cubic Meters Per Hour	400	60	1,895
Vessel Type	Fuel Capacity (gallons/cubic meters)	Bunker Operation Duration (hours)		
Harbor Tug	25,000 / 95	0.2	1.6	0.1
Great Lakes Bulker	200,000 / 760	1.9	12.5	0.4
Cruise Ship	600,000 / 2,270	9.5	62.5	2
Container Ship	2,000,000 / 7570	19.0	125.0	4.0

2.8.4 Port Everglades Demand Dynamics

LNG bunkering infrastructure is not currently widely available although the industry has started to align itself to allow for dual fuel usage.

The cruise ship industry, and in particular Carnival Corporation, is leading the way in ordering and bringing into service dual fuel (LNG and diesel) vessels with 19 LNG-powered vessels in the current orderbook. Since an LNG-powered cruise vessel could potentially spend an entire year in just one or two homeports, the bunkering needs of this ship can be satisfied relatively easily compared to a container ship deployed in a major East-West trade lane that sails around the world every couple of months and calls many different ports. It is expected that the LNG bunker market will develop gradually over the next five years then jump considerably in the 5-10 year range with most if not all newbuilds having LNG capability. It is quite likely that this type of vessel will be in use in Port Everglades within the next 2-3 years, meaning the cruise industry is the priority for Port Everglades in terms of developing LNG bunkering capability.

For the cargo industry, the U.S. flag carriers (i.e. Crowley, Tote, Pasha, Matson) have been leading the way. It makes sense for these carriers to use LNG since they often operate in limited point-to-point trade lanes (i.e. JAXPORT-Puerto Rico or Long Beach-Hawaii), sometimes entirely within an ECA, meaning the benefits of LNG are more significant to them and the fuel itself only needs to be available in a couple of ports to meet their bunkering needs throughout the year. The petroleum industry has built a number of LNG-ready tankers which are in use in the Gulf Coast moving products from refineries to U.S. ports. Currently, there are at least two LNG-ready tanker vessels – Louisiana and Magnolia State – delivering petroleum products to Port Everglades. These vessels were constructed to allow for easy addition of onboard LNG storage capacity once LNG fueling infrastructure is in place. It is expected that this industry will adopt and convert their vessels within the next 5-10 years once LNG infrastructure is in place.

The various delivery methods discussed above are evaluated below, specific to the appropriateness of their application at Port Everglades.

- **Truck to Ship (TTS)**

This method is impractical for Port Everglades due to the already congested roads during cruise season as well as the length of time required to fuel a cruise ship from a truck.

- **Ship to Ship (STS)**

This is the best solution for Port Everglades since it keeps truck traffic off of Port roads and supplies cruise ships in the most timely manner. It is not without challenges, though, particularly at Berths 25-29, since barge/ship-based fueling would have to occur outboard of a berthed cruise vessel and would create major navigational issues for ships needing to access Southport.

- **Port Tank to Ship (PTS)**

This method would work for a single vessel but would not work when multiple vessels require fueling, such as is likely to be the case for cruise ships within 10 years. This method also requires a large number of trucks to refill the tank in between fueling stops which would add a lot of traffic. Although it could work as an interim solution for an initial ship it would require quite a bit of space near the cruise berths and would eventually not be able to supply the demand.

Due to the large bunkering requirements of cruise ships and other issues highlighted, the only practical delivery option envisioned for Port Everglades in Midport is ship to ship bunkering. In Southport, port tank to ship bunkering is being evaluated to potentially service Crowley vessels in international trade lanes (as opposed to domestic/Puerto Rico service).

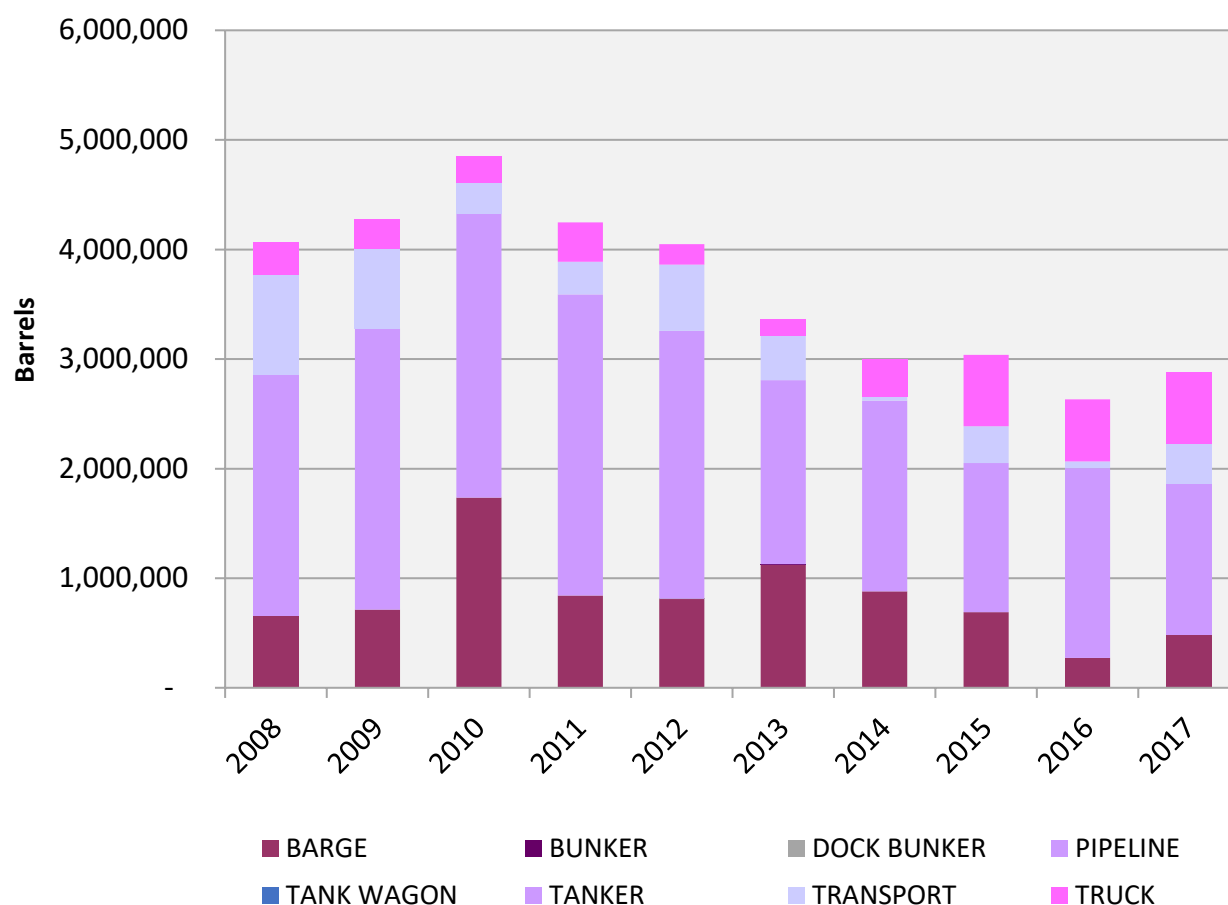
Eventually (after 10 years) if LNG demand is substantial enough it could warrant a dedicated LNG supply terminal located near the port with pipe delivery to the ships. A natural gas pipeline is located close to the port; however, real estate for a liquefaction plant and routes for a cryogenic pipeline would need to be determined. It is recommended that this possibility be reviewed as part of the 20-year Vision Plan portion of the 2018 Update.

2.8.5 Potential Ship to Ship Solutions at Port Everglades

Current options to provide ship-to-ship bunkering at Port Everglades include:

- The Eagle LNG Partners terminal developed in Jacksonville could be used to fill barges and transport LNG to Port Everglades (over 300 miles). This facility is currently being used by Tote for its JAXPORT operations.
- American LNG, controlled by Fortress Equity Partners, has developed an LNG plant in Titusville which could be used to fill barges and transport LNG to Port Everglades (over 200 miles). This operation currently only has a truck and rail loading facility; a barge transfer scheme would need to be added.
- American LNG has also developed an LNG plant in Hialeah, near Miami. This location is close (13 miles) to Port Everglades although it has no water access and currently only has a truck and rail loading facility, meaning a barge transfer scheme would need to be added.
- LNG America is developing an LNG supply network feeding many of the ports in the Gulf from a supply in Port Arthur, Texas. This is over 1,000 miles from Port Everglades; however they are expanding their supply chain and may propose an intermediate solution.

LNG suppliers are actively building a supply chain to provide LNG for bunkering purposes but also as a waterborne export cargo. As this supply chain continues to grow more options will become available for Port Everglades.

Figure 2.8.7: Port Everglades Bunkering (Barrels) Activity, 2008-2017*Source: Port Everglades*

Finally, in reviewing the bunkering data provided by Port Everglades, it is noted that bunkering requirements at the port have decreased substantially during the past seven years (see Figure 2.7.7). To remain competitive long-term as a cruise homeport Port Everglades must develop reliable and efficient LNG bunkering infrastructure. Providing LNG fueling infrastructure could give Port Everglades a competitive advantage against other ports in the short term (five years), but within 10 years (i.e. by 2027), LNG bunkering capability will be required to sustain and grow the cruise line of business. A strategic approach would be to work with a fuel supplier to develop the LNG supply chain for the port. The supplier could use their existing infrastructure to deliver LNG product to clients at the port along with other clients in the area.