Town of Palm Beach

Master Plan for the Town Docks and Accessory Structures

Baird.

Executive Summary

The Town Docks present the first impression of the Town of Palm Beach when crossing Royal Park Bridge. The beauty and serenity of the vessels moored at the docks provide an instant ambiance that reflect the elegance and sophistication of the Town of Palm Beach.

However, the Docks are starting to show their age and need rehabilitation and upgrading. Thus, the Town undertook this Master Plan to develop a vision for the Town Docks and determine a course of action.

The first step was to solicit feedback from the Mayor, Town Council, upland property owners, dock patrons, Town residents, and Town staff. There was general agreement that the docks need to be updated, but that a mixture of vessels should be maintained and the general feel of the docks should remain the same. A preference was also expressed for floating docks.

A market demand and rate analysis was also performed. This showed that the demand for dock space in southeast Florida is rising and that alternatives could be based on the vision for the Town Docks. It was also determined that rates at an updated Town Dock facility could be raised to market rates, especially given the stature of the Town of Palm Beach. The Town Docks' competitive advantage is its location with the implicit elegance and security of being located in the Town of Palm Beach.

Three alternatives are presented in the Master Plan ranging from minor expansion of the current layout to the addition of an additional dock north of the current Brazilian Dock, and multiple larger slips. The potential revenue generation, length, and construction cost of each alternative is summarized below.

Table 1.1: Summary of Predicted Revenue and Construction Cost

	Alternative 1	Alternative 2	Alternative 3
Annual Revenue	$13.5M	$16.3M	$16.4M
Cost	$26.3M	$30.7M	$31.8M
Dock Length	8,923 ft	10,673 ft	10,076 ft

In addition to the installation of a new dockage system, the cost includes dredging the mooring basin, a new bulkhead, renovating the three buildings, and addressing parking by adding 19 additional parking spaces with no loss of green space.

It is anticipated that construction could begin in April 2020. It may require two summer seasons to complete the work, though other construction timing opportunities are available.

The Recreation Advisory Commission voted to recommend Alternative 3 and the Town Council voted to support Alternative 3. Town Council directed staff to move forward with project development.

Table of Contents

Executive Summary i

Table of Contents ii

1. Introduction 1

2. Outreach and Public Input 2

3. Existing Conditions 4

3.1 Docks and Bathymetry 4

3.2 Tides and Water Levels 6

3.3 Tidal Currents 6

3.4 Storm Surge 6

3.5 Wind 7

3.6 Waves 8

3.7 Sediment and Substrate 8

4. Basis of Design 9

4.1 Market Demand 9

4.2 Floating vs Fixed Docks 9

4.3 Telescoping vs Protruding Piles 10

4.4 Maximum Vessel Length and Draft 10

4.5 Fairway Width 12

4.6 Functional Requirements and Dock Width 12

4.7 Wave Attenuation 12

5. Dock Layout Alternatives 14

5.1 Alternative 1 14

5.2 Alternative 2 16

5.3 Alternative 3 18

6. Dock Utilities and Amenities 20

6.1 Electrical Service 20

6.2 Potable Water Supply 20

6.3 Sanitary 20

6.4 Fire Suppression System 21

6.5 Security 21

6.6 Internet Connectivity 21

6.7 Trash Collection 22

6.8 Oil and Oily Water Disposal 22

6.9 Fueling 23

6.10 Dinghy Dock 23

6.11 Kayak Launch 24

6.12 Staffing 25

7. Parking 26

8. Dock Infrastructure 29

8.1 Brazilian Dock Building 29

8.2 Australian Dock Building 30

8.3 Peruvian Dock Building 30

8.4 Bulkhead 31

9. Construction Sequencing and Timeline 33

9.1 Construction Sequencing 33
9.2 Project Timeline 34
10. Rate and Revenue Structure 36
10.1 Current Revenue 36
10.2 Town Rates vs Competing Marinas 36
10.3 Proposed Rates and Potential Revenue 37
11. Grant Assistance Funding Opportunities 38
11.1 Florida Inland Navigation District 38
11.2 Florida Fish & Wildlife Conservation Commission 39
12. Operating & Construction Costs 40
12.1 Operating Costs 40
12.2 Opinion of Probable Construction Cost 41
13. Acknowledgements 44
14. References 45

List of Tables

Table 1.1: Summary of Predicted Revenue and Construction Cost i
Table 3.1: Existing Slip Mix 4
Table 3.2: Tidal Elevations 6
Table 3.3: Storm Stage at Town Docks based on SLOSH Modeling 7
Table 4.1: Vessel Length/Draft Relationship for Design 11
Table 5.1: Alternative 1 Slip Mix 14
Table 5.2: Alternative 2 Slip Mix 16
Table 5.3: Alternative 3 Slip Mix 18
Table 10.1: Select Comparison of Annual Rates between the Town Docks and Nearby Marinas 36
Table 10.2: Proposed Rate Structure 37
Table 10.3: Projected Revenue by Alternative 37
Table 12.1: Opinion of Probable Construction Cost 41

List of Figures

Figure 1.1: View north to the Town Docks 1
Figure 2.1: View of Lake Drive Park 3
Figure 3.1: Existing Conditions of Dock Layout and Bathymetry .. 5
Figure 3.2: Wind Rose for West Palm Beach Airport (ISU, 2017) 7
Figure 3.3: Wake Restrictions in vicinity of Town Docks 8
Figure 4.1: Pile with a Telescoping Pile (Bellingham) 10
Figure 4.2: PIANC Guidance on Vessel Length vs Draft 11
Figure 4.3: Conceptual Island and Wave Attenuation Structure South of the Town Docks 13
Figure 4.4: Living Shoreline at the Par 3 Golf Course (PBC, 2018) 13
Figure 5.1: Alternative 1 15
Figure 5.2: Alternative 2 17
Figure 5.3: Alternative 3 19
Figure 6.1: Typical Pedestal for Electrical, Water and Internet/Phone connection (Palm Harbor) 20
Figure 6.2: Gate and Keypad at Peruvian Dock 21
Figure 6.3: Trash at Australian Dock Collection Area 22
Figure 6.4: Oil collection area 23
Figure 6.5: On Deck Fuel service at Riviera Beach Marina 23
Figure 6.6: Floating kayak launch example (Accudock) 24
Figure 7.1: Proposed Revision to Brazilian Dock Parking Lot ... 27
Figure 7.2: Proposed Revision to Australian Dock Parking Lot . 28
Figure 8.1: Architectural Rendering of the Proposed Brazilian Dock Building 29
Figure 8.2: Architectural Rendering of the Proposed Australian Dock Building 30
Figure 8.3: Architectural Rendering of the Proposed Peruvian Dock Building 30
Figure 8.4: Bulkhead Fronting the Town Docks 31
Figure 8.5: Backfill Loss behind the Bulkhead 31
Figure 8.6: Cracking in the Bulkhead 32
Figure 9.1: Probable Project Timeline 35
Figure 10.1: Historic Town Dock Revenue 36

Appendix A **Compendium of Public Meeting Comments**
Appendix B **Bulkhead Inspection Report**
Appendix C **Marina Management Services Market Analysis Report**
Appendix D **REG Architects Architectural Renderings**
Appendix E **2018 Town of Palm Beach Docks Fee Schedule**

1. Introduction

The Town Docks should reflect the elegance and sophistication of the Town of Palm Beach.

The Town Docks present the first impression of the Town of Palm Beach when crossing Royal Park Bridge. The beauty and serenity of the vessels moored at the docks provide an instant ambiance that reflect the elegance and sophistication of the Town of Palm Beach. The Town Docks are also the only public marina on the island of Palm Beach. It is essential that the Town Docks be a world-class facility keeping with the stature of the Town.

First constructed in the 1940s, the docks have been expanded and updated, but the last major renovations were conducted between 1993 and 1998. The Town recognized that an upgrade to the Town Docks was necessary. Thus, this Master Plan effort was undertaken to develop a vision for the Town Docks.

It was critical through the Master Plan development process to understand and integrate the opinions of a multitude of individuals. While any changes will obviously impact dock patrons, the Town stressed that the effect of any modifications to residents along South Lake Drive, and other Town residents that enjoy Lake Drive Park, must also be considered. Thus, public outreach has been a major component of the planning effort.

The Town Docks also provide an important source of revenue for the Town. Thus, the Master Plan also includes an estimate of upgrade costs and potential revenue generation. A market analysis was performed to determine demand for various slip sizes, including recommendations on the amenities to ensure that the Town Docks are a state-of-the-art facility but with fair market rates.

Multiple dock layouts were developed based on the market analysis and considering feedback from the public to maintain a range of vessels at the Town Docks.

Figure 1.1: View north to the Town Docks

2. Outreach and Public Input

Outreach and inclusion of public input was a critical element of the Town Dock's Master Plan.

A key effort in the development of the Master Plan was outreach to Town residents and dock patrons. The following meetings were held:

- Mayor and Town Council members
- Focus group with Royal Park Home Owners Association (21 attendees)
- Focus group with Dock Patrons (24 attendees)
- Public meeting and presentation at the Recreation Advisory Commission

An opinion survey was also circulated to the dock patrons to solicit their suggestions and obtain feedback on various aspects of the Town Docks (31 responses).

There were several common themes throughout these meetings, which are summarized here. A compendium of the comments recorded during the open meetings are presented in Appendix A.

The docks are dated and need upgrading.

There was unanimous agreement in all comments that the docks are dated, showing their age, and need to be rehabilitated.

These are the TOWN DOCKS. Keep the same feel.

This thread was reflected in a variety of statements all echoing that they wanted to retain the unique character of the Town Docks. Some indicated that the docks should not be expanded, that a mixture of vessels sizes should be maintained, and that footprints of the existing buildings not be expanded. The public also voiced opposition to a convenience store to sell supplies.

Opinions on the size and mixture of vessels varied.

Parallel with maintaining the feel of the docks was significant and varied feedback on the maximum size and number of vessels that the Town Docks should serve. The dock patrons were some of the most ardent supporters of having a mixture of slips.

The Docks should serve Town Residents.

Many commenters suggested that the Town Docks should provide a service to Town residents. This is the one public marina in the Town of Palm Beach and should serve Town residents.

Parking is insufficient.

It was made clear that parking solutions should be considered but not at the detriment of the existing green space. Revising the parking along South Lake Drive per the "Bonci" report was also raised.

Floating docks are preferable over fixed docks.

There was almost unanimous agreement that floating docks are preferable compared to fixed docks. This is a safety issue as well as for ease of docking and protection of the boats. The preference is to have piles within the deck structure rather than adjacent to the deck.

Consider a kayak launch.

Several residents expressed hope that a kayak launch could be included in the plan, because the Town Docks were one of the few public access points to the Lake Worth Lagoon.

Don't reduce the green space.

Numerous upland residents expressed concern about reducing the green space within Lake Drive Park. There was concern that the green space would be reduced to expand parking for the Town Docks.

Figure 2.1: View of Lake Drive Park

3. Existing Conditions

3.1 Docks and Bathymetry

The Town Docks consist of three piers: Brazilian, Australian, and the Peruvian Dock (listed north to south and named after the adjacent east/west roads, see Figure 3.1). The deck is aluminum and rests on a concrete cap supported by concrete piles. Thus, the deck does not rise and fall with the tide. They were last rehabilitated between 1993 and 1998.

Table 3.1: Existing Slip Mix

Slip Size (ft)	Brazilian Dock	Australian Dock	Peruvian Dock	Total
50	9	2	3	14
60	6		9	15
80	14	2		16
100		8		8
110		8	9	17
120		5		5
130		5		5
Total	29	30	21	80
MST	172 ft	262 ft	172 ft	606 ft
Length	2,040 ft	3,452 ft	1,813 ft	7,305 ft

Marginal side tie (MST) is a section of dock that can moor vessels but is not intended to service a particular length of vessel. Typically, longer than an individual slip, multiple vessels of various sizes can moor along MST, giving the marina added flexibility in mooring arrangements. MST at the existing docks is located at the western end of each dock.

The controlling depth in the Intracoastal Waterway (ICW) is stated as 12 feet (relative to mean lower low water (MLLW)), though in the vicinity of the Town Docks, it is as deep as 23 feet. The water depth at the docks varies from approximately 4.5 feet to 20 feet, though the majority of the area is 8.5 feet deep. The southern slips at the Peruvian Dock are shallower at approximately 7.5 feet. There is shoaling directly underneath each of the dock structures.

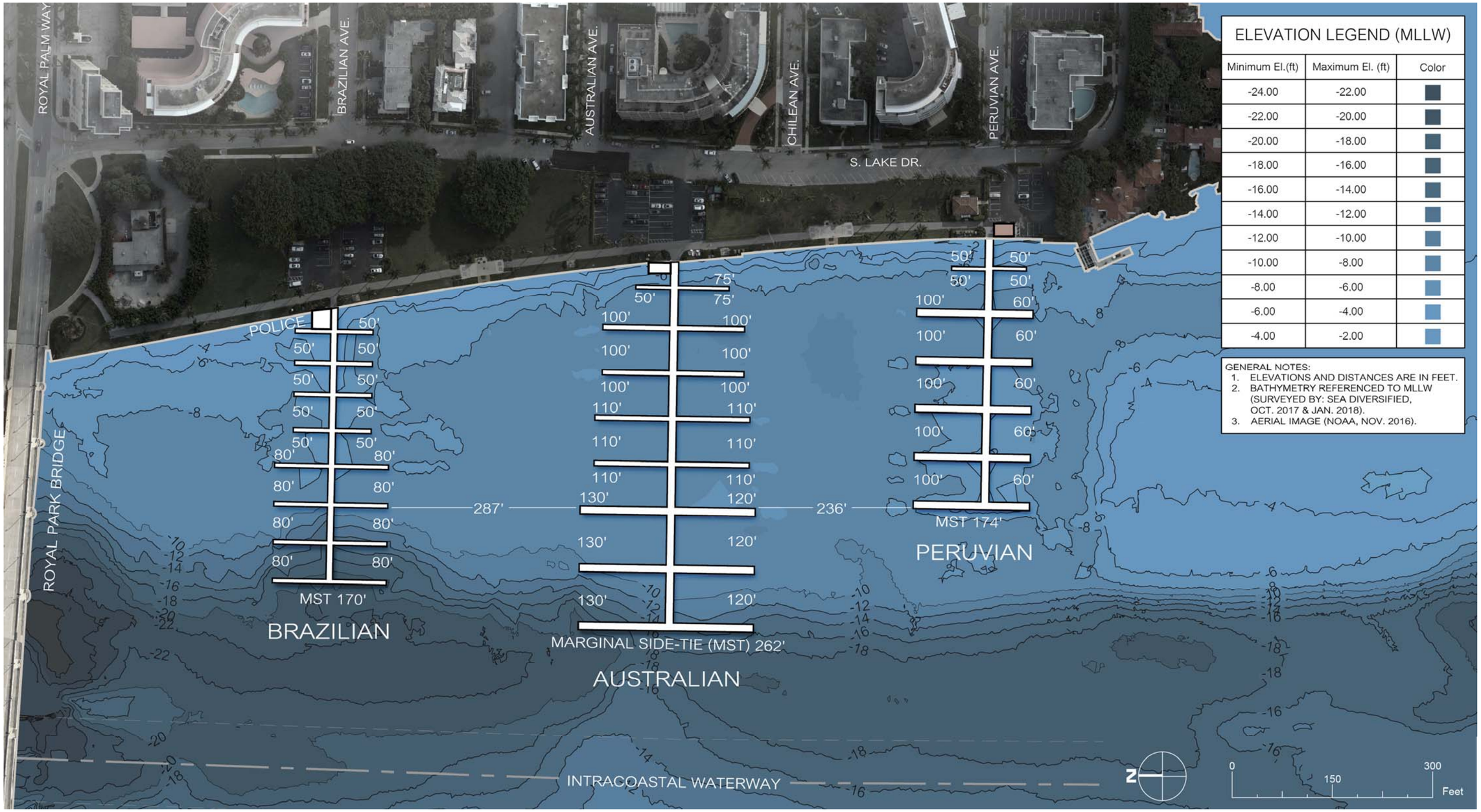

Figure 3.1: Existing Conditions of Dock Layout and Bathymetry

3.2 Tides and Water Levels

The mean tidal range at the Town Dock is 2.6 feet (MLW to MHW) as shown in Table 3.2. Given that most navigation charts typically refer to MLLW when discussing depths, all elevations are referenced to MLLW.

Mean tidal range = 2.6 feet

Table 3.2: Tidal Elevations

Description	Elevation (feet, MLLW)
Dock Elevation	5.5
Mean Higher High Water	2.91
Mean High Water	2.72
NAVD '88	2.41
Mean Tide Level	1.44
Mean Low Water	0.15
Mean Lower Low Water	0.00

The data in Table 3.2 is based on NOAA tide station 8722621, which used to be located at the Town Docks.

NOAA (2018) published a sea level rise rate of 0.0121 feet/year (3.68 mm/year) for the Lake Worth Pier based on a linear trend and using measurements dating back to 1970. Assuming a 50-year project life (construction by 2020) and a continuation of this linear trend, then a lower end of the expected sea level rise is 0.6 feet. NOAA provides a wide range for low (0.98 feet), intermediate (2.23 feet), and high (4.40 feet) sea level rise by 2070. The Southeast Florida Compact (2015) suggested using USACE's high sea level rise estimate, which would suggest that sea level will rise 1.71 feet by 2060.

3.3 Tidal Currents

Currents through the Town Docks were observed and estimated but not measured. The USACE (2014) measured currents as part of a Lake Worth Lagoon modeling effort and estimated peak spring flood tides of just over 1 knot. Considering the difference in cross-section, peak currents at the Town Docks are estimated to peak at 2 knots. Previous studies at Currie Park suggest stronger flood currents (southward directed) than ebb currents (northward directed) with peak speeds of 1.3 knots. The tidal currents suggest that vessels be aligned in a north-south direction to minimize vessel exposure to the currents.

3.4 Storm Surge

Storm surge is an increase in water level due to storm induced winds and atmospheric pressure change. NOAA (2016) developed an analysis of storm surge throughout south Florida using the SLOSH model, including within the Lake Worth Lagoon. Storm stage at a mean tide level in the immediate vicinity of the Town Docks was extracted from this data set and is presented in Table 3.3.

Table 3.3: Storm Stage at Town Docks based on SLOSH Modeling

Storm	Storm Stage (ft, MLLW)
Tropical Storm	3.6
Category 1	3.9
Category 2	4.8
Category 3	5.5
Category 4	6.7
Category 5	8.0

3.5 Wind

Hurricane force wind speeds, water level, and expected vessel size are used to develop design criteria for the dock elements. However, average wind conditions are also important elements for determining potential wave conditions.

The wind rose in Figure 3.2 shows that winds mainly arrive from the east to southeast, and this is also the direction of the strongest winds. Tropical storm force winds are infrequent enough that they don't register as a percentage and should be considered separately.

The Town Docks recommend that dock patrons relocate their vessels if there is an imminent threat of a hurricane.

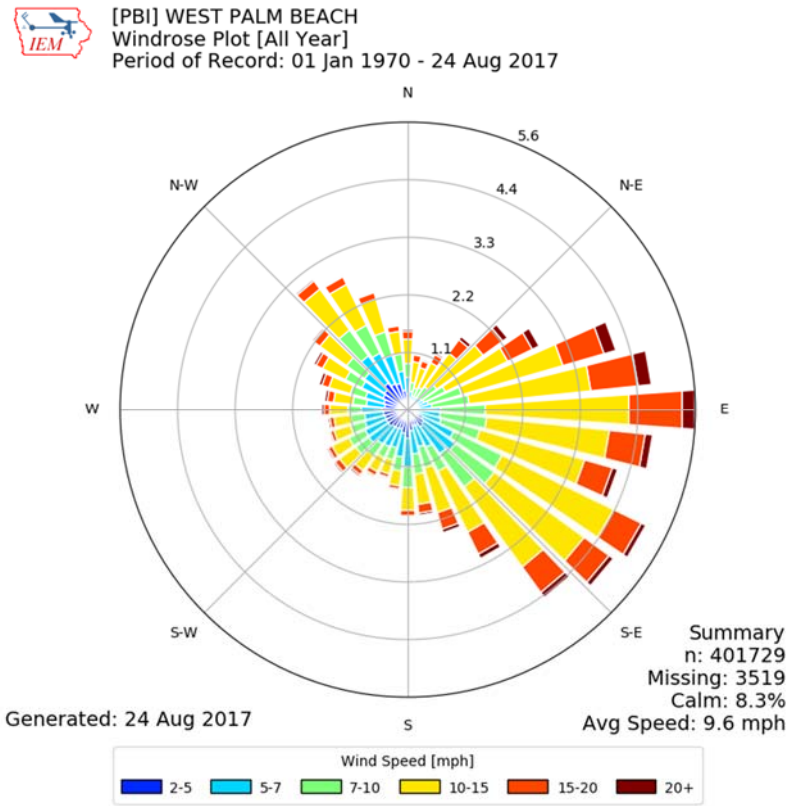

Figure 3.2: Wind Rose for West Palm Beach Airport (ISU, 2017)

3.6 Waves

Waves impacting the project site are created either by wind or boat wakes.

As shown in Section 3.5, winds are predominantly from the east to southeast and thus don't affect the Town Docks. However, approximately 3% of the time, the wind direction is either directly north or south, which has the potential to generate one-foot waves during 20 mph winds. Typically, wind direction and wind strength don't combine to generate waves greater than 0.5 feet at the Town Docks.

Dock patrons more often complain about boat wakes rocking vessels in the marina. The boat wakes are created by vessels traveling north from the Southern Blvd Bridge and trying to arrive at the Royal Park Bridge while it's open. While the Town Docks are located within a "minimum wake zone" Figure 3.3 (Palm Beach County, 2018), the boundary is located only 700 feet from the southeast corner of the docks. Thus, the boat wake can still propagate into the marina, even if the vessels elects to comply with the wake restriction, and vessels can often create boat wakes greater than one foot within the marina. The Dockmaster notifies passing vessels of their infraction when possible.

3.7 Sediment and Substrate

A sediment analysis was not performed during the development of the Master Plan. However, the bulkhead inspection video footage showed a sand substrate along the entire length of the bulkhead, and probing suggested a sandy substrate within the marina.

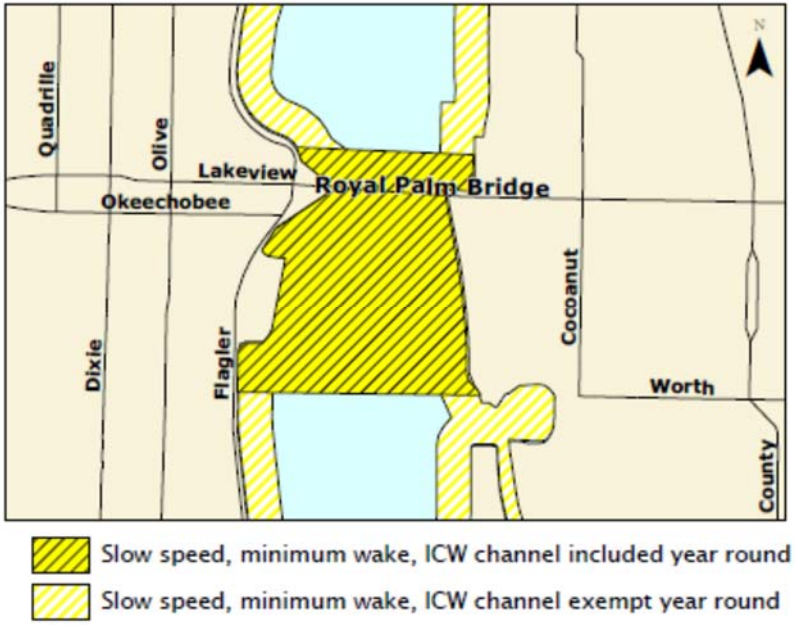

Figure 3.3: Wake Restrictions in vicinity of Town Docks

Palm Beach County (2008) showed that over 78% of Lake Worth Lagoon had a sandy substrate. The Lagoon suffers from localized areas of muck, mostly related to runoff, but the Town Docks are not located close to the larger canals responsible for this runoff.

There is a rock ledge south of the Peruvian Docks, but the extent or depth of rock within the Dock basin is unknown. This will need to be investigated prior to any proposed dredging. The sediment transport rate in this area is also not known. These and other environmental factors, such as potential contamination, will have to be evaluated as part of the final design, engineering and the regulatory process.

4. Basis of Design

This section discusses various elements that affect the development of various alternatives. This includes the market demand for number, size, and type of vessels, type of docks, the required draft and sizing of the docks to facilitate dock use, and end service amenities.

4.1 Market Demand

In 2017, 93% of the Town Dock patrons purchased an annual lease. Thus, if a proposed alternative maintains the present mixture of vessels and a similar rate structure, then similar utilization rates can be expected.

Mooring space demand in southeast Florida is outstripping capacity.

This Master Plan is considering upgrading services and amenities, and expanding the docks. Therefore, a market analysis was performed to determine whether changes to the docks in terms of number of slips, slip mixture, and/or rate structure would positively or negatively affect utilization and revenue. It was determined that there is a demand for a variety of vessels, including larger vessels, and that demand for mooring space is outstripping capacity in southeast Florida. Furthermore, even the largest possible increase in Town Dock space could be rented at market rates. Thus, alternatives should be based on the vision for the Town Docks without concern for whether there is sufficient demand.

4.2 Floating vs Fixed Docks

There was strong preference by dock patrons (81%) for floating docks over fixed docks. This is the trend within the marina industry, and floating docks are recommended for the Town Docks.

It is recommended to install floating docks.

Floating docks provide the following advantages over fixed docks:

- Easier boarding of vessels across a range of tidal conditions, e.g. constant freeboard.
- Easier mooring as slack line is not needed to account for tides.
- Reduces risk of damage to the vessel, because the vessel and dockage system move up and down with the tide in the same relationship and rate.
- Minimizes risk of submerging power cables and pedestals during storm surges.
- Provides better wave attenuation.

Floating docks are recommended as they provide improved safety, easier embarking/disembarking, and a better patron experience.

4.3 Telescoping vs Protruding Piles

Piles are used to hold the floating docks in place. Most docks have piles that protrude through the deck, and the deck has either rollers or bumpers to protect the deck and the pile as the deck rises and falls with the tides.

Telescoping piles consist of two steel pilings. The outer piling is driven into the bed rock and acts as a sleeve for the inner piling, which is fitted in a socket affixed to the dock structure (Figure 4.1). There are several benefits to this system including greater deck space, avoiding any mooring impediments, and improved aesthetics.

Figure 4.1: Dock with a Telescoping Pile (Bellingham)

Telescoping piles can be more expensive than protruding pile designs but should be considered during the engineering and design phase. They could be bid as an alternative if price is a significant concern.

4.4 Maximum Vessel Length and Draft

The vessels currently moored at the Town Docks range in length from 50 feet up to 200 feet. The industry trend is that vessels are increasing in size (length, beam, and draft). Ultimately, the vessels that can moor at the Town Docks will be limited by the navigable draft of the ICW, which is listed as -10 feet MLLW. The Florida Inland Navigation District (FIND) and U.S. Army Corps of Engineers (USACE) periodically dredge the ICW to -12 feet MLLW to maintain navigation but are only required to provide -10 feet MLLW. FIND is currently considering to dredge the ICW to -15 feet MLLW, but this maybe five to seven years away. Rybovich Marina recently obtained approval to dredge their marina to -14.7 feet MLLW.

PIANC (2013) provides guidelines for the design of superyacht facilities. Figure 4.2 provides the relationship between vessel length and draft with the average being the red line and the blue dashed lines providing a 90% population envelope (note this figure is provided in metric units). The current 10-foot limiting water depth suggests that the upper limit of vessel size may be 190 feet. However, the largest vessel currently moored at the Town Docks is 200 feet long and transits to the Town Docks by timing the tide.

If the vessel captains are willing to consider using high tide then vessels up to 230 feet should be able to access the

Town Docks along the ICW at the authorized -10 feet MLLW depth. Maintenance of the ICW to -12 feet MLLW provides additional clearance. There are naturally deeper slips at the western end of the existing docks, which accommodate the larger vessels upon arrival.

Given a 50-year planning horizon, it is recommended that the Town position themselves for potential future dredging of the ICW and use -14.7 feet MLLW as a limiting depth. Deeper dredging at this time may minimize the need for future maintenance dredging, and be more cost effective in the long term. While a dredge depth of -14.7 feet MLLW could accommodate a 340-foot long vessel, this size is not keeping with the vision of the Town Docks; therefore, it is recommended that the Town Docks have slips designed for vessels up to approximately 230 feet in length.

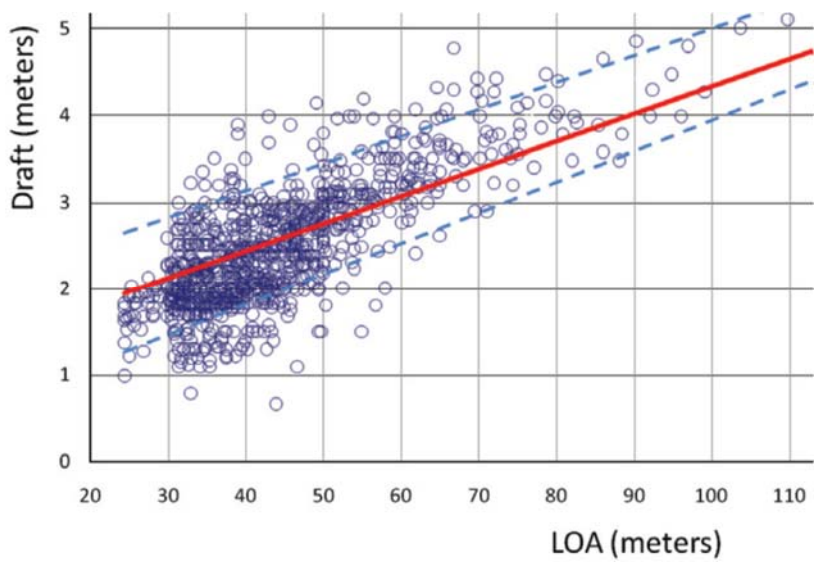

Figure 4.2: PIANC Guidance on Vessel Length vs Draft

The Master Plan assumes a maximum vessel length of approximately 230 feet while considering opportunities for future larger vessels.

The length/draft relationships assumed in the design process are summarized in Table 4.1.

Table 4.1: Vessel Length/Draft Relationship for Design

Length (ft)	Mean Draft (ft)	90% Envelope Draft (ft)
50	<4	4
65	5	6.5
80	6.5	7
110	7.5	10
130	8	10.5
150	8.5	11
160	9	11
200	10	12.5
230	11	13.5
250	12	14.0
300	13.5	15.5

The beam of a 230-foot vessel will typically average 40 feet with the 90% envelope ranging up to 45 feet.

4.5 Fairway Width

The fairway is the distance directly across from the slip and is typically described in relation to the vessel length. The minimum fairway width should be at least 1.5 L, where L is the length of the longest vessel.

4.6 Functional Requirements and Dock Width

The width of the head pier and finger pier were based on the following functional requirements and assumptions:

- Piles would be located within and extend through the floating dock
- A motorized cart should be able to navigate the length of the pier head and finger piers of larger slips
- Major site utility components, e.g. transformers, backflow preventers, dock boxes, would be located along the main pier (included in the concept drawings)

It is suggested that the main piers and MST docks be 16 feet wide while the finger piers be 8 feet wide for vessels less than 100 feet in length and 12 feet wide for vessels greater than 100 feet in length.

4.7 Wave Attenuation

Town Dock patrons have complained that waves rock their vessels while moored at the facility. These waves may be either wind generated or boat wakes. Options to attenuate waves at the Town Docks, include:

- Wave attenuation via floating docks (recommended)
- Non-uniform bulkhead face (recommended)
- Southward relocation of the “no wake” zone
- Construct a spoil island to the south of the docks
- Construct a wave dissipation structure
- Construct a living shoreline or revetment along the bulkhead

It is recommended that concrete pontoons be used throughout the dock system rather than plastic as these provide greater wave attenuation capability. Additional wave attenuation features can be added to the bottom of these.

If/when the bulkhead is replaced, it is recommended to use the “Z” shape of sheet piles to provide a non-uniform face that will interfere with the shape of the reflected waves, thus dissipating wave energy.

It would be beneficial to relocate the “no wake” zone (shown by the red triangle in Figure 4.3) further to the south. This was attempted several years ago but ultimately failed. Boaters objected to the movement of the “no wake” zone so that they could better time the raising of the bridges. Boaters may ignore the “no wake” designation regardless of its location. While a consideration, this option should not be relied upon to address wave attenuation at the Town Docks.

An environmentally friendly solution would be to construct an island to the south of the Town Docks (Figure 4.3). This could also be used to beneficially dispose of some of the material dredged while deepening the facility. The challenge is that the island would be offset from the channel due to navigation safety, which would limit its effectiveness. While the island

would be low, the opinions of the adjacent property owners should be solicited.

Figure 4.3: Conceptual Island and Wave Attenuation Structure South of the Town Docks

Another alternative is to construct a narrow wave dissipation structure to the south of the docks (red box in Figure 4.3). This could be created from either a series of piles, a timber crib structure, or a narrow rock rubblemound structure. This would be less intrusive than the disposal island concept.

A living shoreline (sloped boulder face planted with mangroves) constructed along the face of the bulkhead could help reduce wave reflection compared to the current smooth vertical bulkhead. The Town constructed a 2,000-foot mangrove planter adjacent to the Par 3 Golf Course, which was highly successful, and this concept could be applied (Figure 4.4).

Figure 4.4: Living Shoreline at the Par 3 Golf Course (PBC, 2018)

While this will increase the longevity of the existing bulkhead, a new bulkhead will ultimately be required due to continued deterioration and loss of backfill. A revetment may not directly solve these issues. Other considerations include the slope of the revetment, which will reduce available mooring space by potentially 20 feet along the length of the bulkhead. The revetment may also attract fisherman and collect trash.

5. Dock Layout Alternatives

5.1 Alternative 1

Alternative 1 is the closest in principle to the existing dock layout. It can be considered as bringing the existing layout to current design standards.

Alternative 1 most closely replicates the existing docks.

Key elements of this design, shown in Figure 5.1, include:

- Designed to mirror the existing dock layout with similar number of slips and slip lengths.
- Five slips added to the Peruvian Dock (four by adding another slip set and one at the bulkhead).
- Some slips were lengthened as existing vessels overhang the existing docks.
- Increased the number of sub-85-foot slips by two compared to the existing conditions (from 46 to 48).
- The docks extend further west to facilitate industry standard with respect to berth and finger pier width.
- Australian and Peruvian Docks shifted slightly north to minimize dredging while maintaining safe navigation fairways.
- MST similar to existing conditions.
- Dredging to provide safer navigation and mooring (33,700 cy).

Table 5.1 summarizes the slip mix, MST, and total length of dock space.

Table 5.1: Alternative 1 Slip Mix

Slip Size	Brazilian Dock	Australian Dock	Peruvian Dock	Total
65	3	4	4	11
80	26		11	37
110			11	11
130		26		26
Slip No.	29	30	26	85
MST	176 ft	276 ft	206 ft	658 ft
Length	2,451 ft	3,916 ft	2,556 ft	8,923 ft

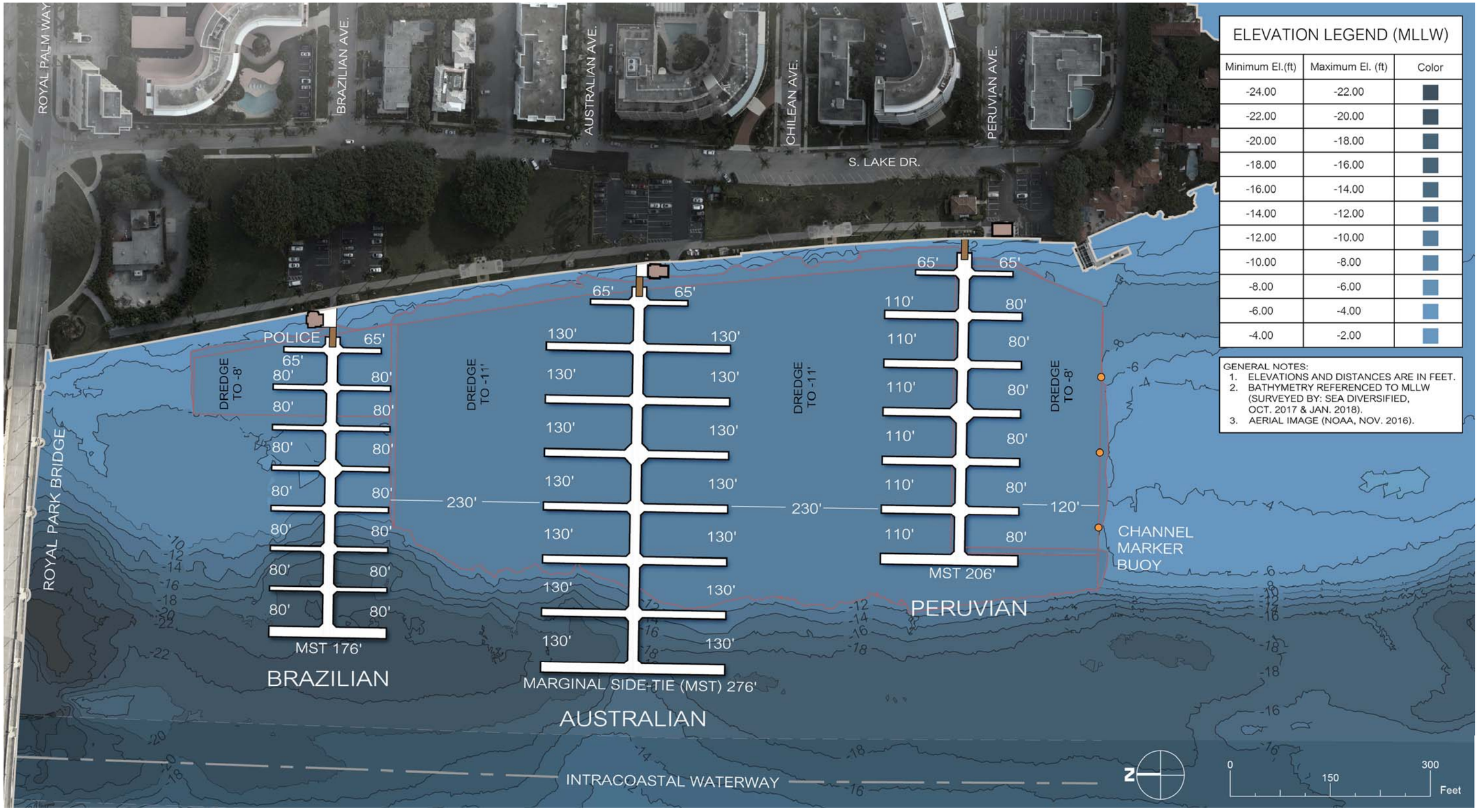

Figure 5.1: Alternative 1

5.2 Alternative 2

Alternative 2 was designed to increase the potential revenue for the Town by increasing slip lengths while decreasing the total number of slips (Table 5.2). The increased dock length still caters to shorter vessels but allows for the industry trend of larger vessels in the future.

Alternative 2 maintains potential revenue while decreasing the number of slips.

Figure 5.2 shows the proposed layout for Alternative 2. The obvious changes are to the Peruvian Dock and the addition of the Palm Way Dock, but other key elements are listed below:

- Adding a dock (temporarily referred to as the Palm Way Dock) north of the Brazilian Dock to increase dock space and flexibility for mooring various size vessels.
- Lengthen the Peruvian Dock to provide greater wave protection.
- Switch the south side of the Peruvian Dock to MST. This increases flexibility for mooring various size vessels and maximizes grant funding opportunities. This decreases the slip count but maintains ability to berth smaller vessels.
- Increase the number of longer slips (130 feet +) to facilitate current and future demand for larger vessels.
- Decrease total number of slips
- The total dockage length has been increased to 10,673 feet
- Dredge to -12 ft MLLW throughout the majority of the marina to provide optimum dockage conditions.
- Dredge the Palm Way Dock area to -14.7 feet MLLW to facilitate future potentially deeper vessels.
- The dredge volume is estimated at 70,600 cy.

Table 5.2: Alternative 2 Slip Mix

Slip Size	Palm Way	Brazilian Dock	Australian Dock	Peruvian Dock	Total
65				1	1
80		16	2	1	19
130		13	13		26
150			13	13	26
Total		29	28	15	72
MST	500 ft	226 ft	296 ft	786 ft	1,808 ft
Length	500 ft	3,196 ft	4,096 ft	2,881 ft	10,673 ft

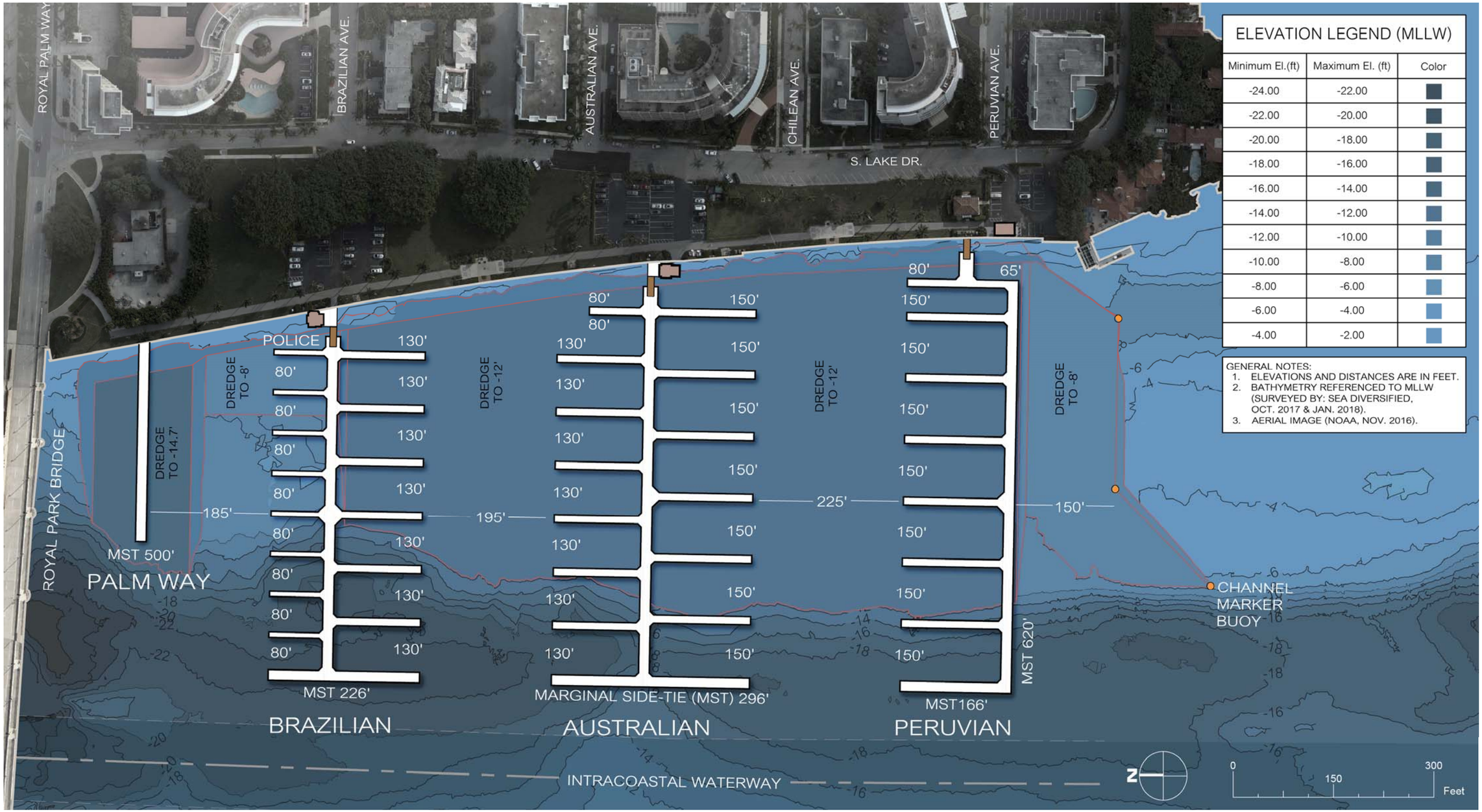

Figure 5.2: Alternative 2

5.3 Alternative 3

Alternative 3 was intended to have the Peruvian Dock provide greater wave protection, maintain a mixture of large and smaller vessels while maximizing the total dock space available.

Alternative 3 provides improved wave sheltering and increases total dock length and number of slips.

Key design elements of Alternative 3 (Figure 5.3) include:

- Add the Palm Way Dock north of the Brazilian Dock to increase dock space and flexibility for mooring various size vessels.
- Maximize the length of the Peruvian Dock to provide greater wave protection to the rest of the marina.
- Maintain a similar number of slips (83 compared to the existing 80) but facilitates additional vessels through MST.
- Maintain a significant number of sub-85-foot slips (38) to maintain the mixture of vessels and "feel" of the Town Docks.
- Increase the number of longer slips.
- Have six slips capable of mooring 200-foot vessels.
- Increase MST, which is useful when applying for grant funding and provides additional flexibility to moor multiple smaller vessels or one larger vessel.
- Increase total dockage length to 10,076 feet.
- Dredge the facility to provide safer navigation and mooring conditions (84,200 cy).
- Some slips are being dredged to -14.7 feet MLLW to prepare for future, potential deepening of the ICW.

Table 5.3: Alternative 3 Slip Mix

Slip Size	Palm Way	Brazilian Dock	Australian Dock	Peruvian Dock	Total
65		1		2	3
75		2			2
80		23	2	8	33
90				1	1
110					11
120		1		11	1
130			13		13
150			13		13
200		2		4	6
Total		29	28	26	83
MST	500 ft	341 ft	296 ft	474 ft	1,611 ft
Length	500 ft	2,916 ft	4,096 ft	3,344 ft	10,856 ft

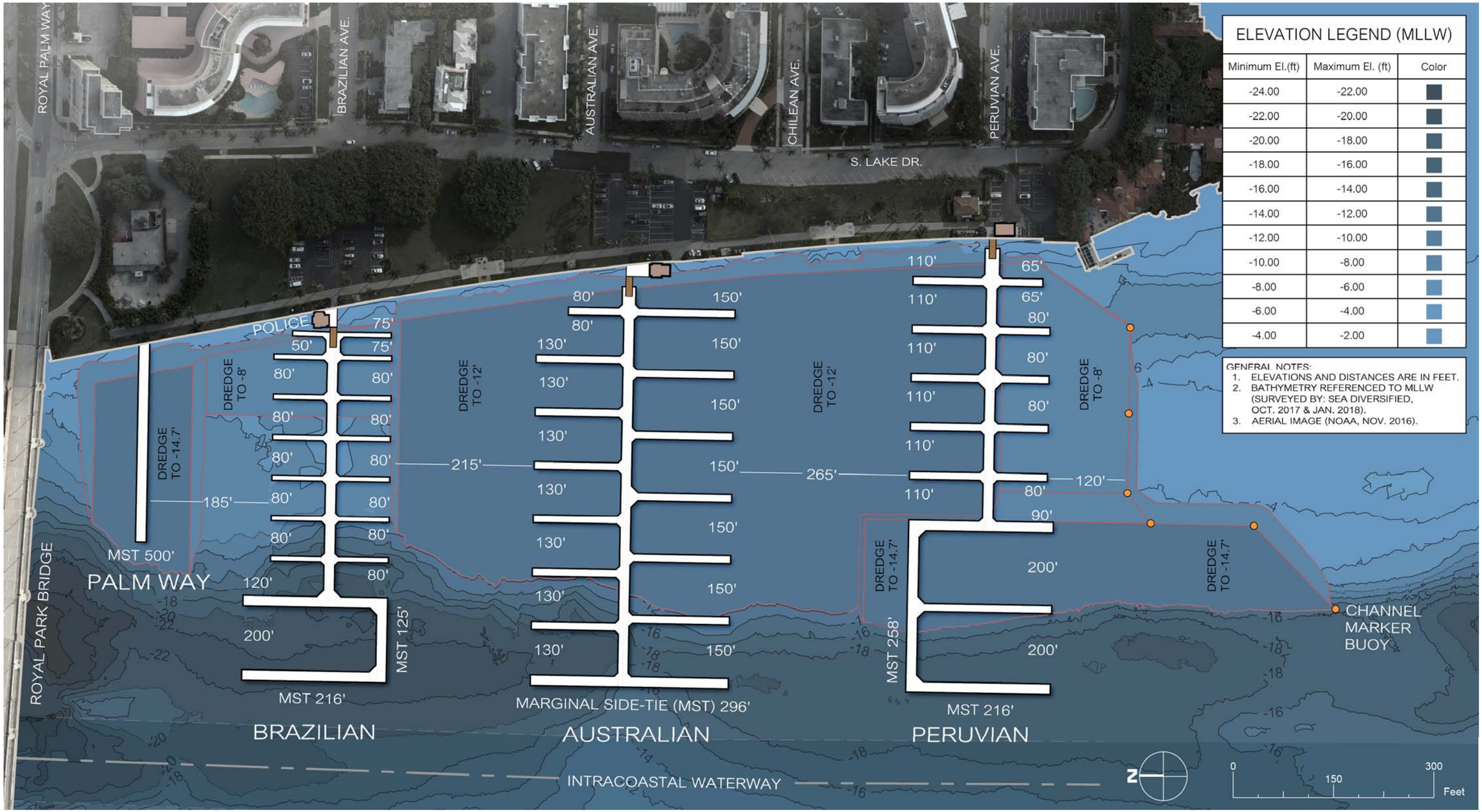

Figure 5.3: Alternative 3

6. Dock Utilities and Amenities

6.1 Electrical Service

Electrical service is a required element in a modern marina. The market trend towards larger vessels inherently increases electrical demand, but even older vessels are being retrofitted with equipment that increases electrical demand. Supplying sufficient land-based power alleviates the need for vessels to supplement their power needs via on-board generators. This reduces noise and odor pollution.

The electrical supply at the Town Docks varies by slip, but the majority of slips have either 50 amp or 100 amp single phase supply. Several of the larger slips have a 100 amp, three phase 480V supply. The largest slip has a twin 200 amp, three phase, 480V supply.

It is recommended that slips up to 65 feet in length have two 50 amp, 240 volt receptacles. For slips larger than 65 ft, a variety of power options should be provided, which includes 480V, 240V, and 208V, three-phase with up to 200 amp.

Each slip will be metered individually and charged based on their electrical usage.

Figure 6.1 shows a typical pedestal that vessels can hook up to that includes electrical, water, and communication connections.

Figure 6.1: Typical Pedestal for Electrical, Water and Internet/Phone connection (Palm Harbor)

6.2 Potable Water Supply

Again, providing potable water is a requirement at a facility such as the Town Docks. Fresh water is supplied to each slip via a hook-up at the utility center. This utility will remain with any revised dock alternative.

6.3 Sanitary

The Town Docks currently provide a self-serve, in-slip waste water pump-out capability. The vessel connects to a pump-out hook-up located near the pedestal and then connects to it with a pump-out cart. A similar system will be installed with new docks.

6.4 Fire Suppression System

Fire suppression systems will be installed and will be in accordance with the Florida Fire Prevention Code. It is anticipated that, similar to the existing fire suppression system, a separate 4-inch fire main will extend along the docks with 2 ½-inch standpipes with fire department connectors. This will be coordinated with the local Fire Chief during design and permitting.

6.5 Security

Security was raised repeatedly during the public meetings, with respect to both the docks themselves, Lake Drive Park, and the surrounding neighborhoods.

Currently, each dock has a gate with an entry keypad (Figure 6.2) to limit public access to the docks. There are security cameras throughout the facility that dock staff can watch in real time as well as review footage. Security guards patrol the area when dock staff are off duty, and Town Police watch the area as part of their regular patrols.

Patrons responded overwhelmingly that there should be roving security personnel at the docks, and that video cameras should be used (93% and 96% respectively). Opinion was more split about the timing of dedicated security personnel with 2/3 of the respondents suggesting night time only and 1/3 suggesting dedicated security staff should be present 24 hours/day. Real-time surveillance of the cameras by security personnel at an additional cost was favored by 39% of the respondents while 61% opposed this concept.

Figure 6.2: Gate and Keypad at Peruvian Dock

The current camera system is linked to the Town's Police monitoring system while still allowing the Dock Master the ability to look at real-time feed and review saved footage. These capabilities should be maintained.

Lift-arm gates to the parking lot will restrict parking by unauthorized vehicles.

6.6 Internet Connectivity

Internet connectivity has become an expected amenity at state-of-the-art marina facilities. This can be provided either through a wired or wireless (Wi-Fi) connection. Both are currently provided at the Town Docks, though 81% of the dock patrons surveyed stated that the Wi-Fi service was

unacceptable. The Town is currently upgrading the Wi-Fi service at the docks.

The Wi-Fi system is unacceptable to patrons but is currently being upgraded.

6.7 Trash Collection

Trash and recycling bins are located within the parking lot at each dock. However, the volume of trash has increased due to an increasing trend towards on-line shopping and associated packaging (Figure 6.3). Feedback from the public and dock patrons is that the trash collection areas are often unsightly. One option is to relocate all trash collection to the Department of Public Works (DPW) area and install a trash compactor to minimize the trash volume. Additional dock staff is recommended to facilitate daily collection and transport of trash to the DPW. This will improve aesthetics and allow existing trash collection areas to be converted to additional parking.

Relocate trash and oil collection to DPW.

Figure 6.3: Trash at Australian Dock Collection Area

6.8 Oil and Oily Water Disposal

The Town Docks currently provide an oil disposal service (Figure 6.4). This is a typical service provided at up-scale marina facilities, and it is recommended that the Town Docks continue to provide this service. However, rather than have the unsightly container at the Australian parking lot, one option is to relocate the oil collection area to the DPW. An additional staff member may be required to collect and transport the oil to the facility. This will improve aesthetics of the Australian Dock parking area. This area could be converted to additional parking.

Figure 6.4: Oil collection area

6.9 Fueling

The Town Docks do not currently provide fueling services. This is prohibited by the Sovereign Submerged Lands Lease. Providing a fueling service, similar to that provided at competing marinas (Figure 6.5), could increase Town revenues. However, this will require an upland fuel bunker, which would reduce parking capacity. It will also create significant fuel truck traffic. While a convenience for vessels at the Town Docks, it only becomes a significant revenue generator with sufficient transient vessels. Given these issues and restrictions, it is not recommended to provide fuel service at the Town Docks.

Figure 6.5: On Deck Fuel service at Riviera Beach Marina

6.10 Dinghy Dock

The existing docks do not have a temporary mooring location for dinghies or small, day visit boaters. This was suggested for inclusion in the Master Plan as a mechanism to drive additional revenue for the Town and increase traffic along Worth Avenue. However, the loss of a slip to accommodate a dinghy/daily dock may decrease revenue, and it's unclear as to which customers would elect to travel to Worth Avenue by a small boat. Therefore, space for this dinghy dock was not included in the Master Plan.

A dinghy dock is currently not included in the Master Plan.

6.11 Kayak Launch

Several public comments were received requesting that a kayak/canoe/paddleboard launch be considered in the Master Plan for the Town Docks. Public access to Lake Worth Lagoon is limited, and the Town Docks provide an opportunity to expand the usage of Town owned property.

Figure 6.6: Floating kayak launch example (Accudock)

The Florida Fish and Wildlife Conservation Commission (FWC) (2010) provides guidelines for kayak launches. The FWC recommends to:

- Choose access site with minimal exposure to winds, current, and motorized boat traffic.
- Choose existing natural sites if available and appropriate.
- Consider carry capacity of launch, parking, and waterway.

Installing a kayak launch at the Town Docks is NOT recommended. The Town should consider an alternate site.

Installing a kayak launch at the Town Docks is NOT recommended for the following reasons:

- Safety. Strong currents can make exiting and returning to the slip challenging, and kayaking around motorized vessels poses a danger to the paddler and the vessels.
- Insufficient parking.
- Lack of storage.
- Security. Promoting kayaking around the docks is a security concern for dock patrons.
- Loss of dockage revenue as the launch will eliminate an available slip unless attached to the bulkhead.
- Limited staff to regulate usage.

Instead it is recommended that the Town consider alternate sites to provide kayak launch facilities.

6.12 Staffing

The Town Dock currently employs a full-time dockmaster and two part-time dock attendants. Comparable marinas will typically have one full-time staff member for every 20-25 slips. Thus, the staffing level at the Town Docks is slightly below this level. While the majority (68%) of the patrons indicated that staffing levels were sufficient in the survey, 32% suggested that more staff would be appropriate.

It is recommended that a full-time Dock Attendant be hired while maintaining two part-time staff. This will allow for an increased level of service, specifically related to the collection and removal of trash to the DPW and transport of oil to the DPW.

Add a full-time position to address additional needs and level of service.

7. Parking

There are 131 parking spots distributed between the three parking lots. The Peruvian and Australian lots have assigned parking spots while Brazilian lot is open.

Parking has been identified as one of the key issues at the Town Docks. Every dock patron that responded to the survey stated that the parking was insufficient.

Parking is insufficient. Recommend reconfiguring the parking lots to add 19 spots while increasing greenspace.

Several suggestions were considered, including:

- Revising the parking lot layout
- Providing a seasonal valet service
- Installing parking barrier gates
- Revising parking alignment along South Lake Drive
- Constructing a parking garage

Revising the parking lot layout was supported by nearly half (48%) of the dock patrons while 30% thought it wasn't worth the cost. The remaining 22% selected "suggest an alternate solution".

There was very limited support for a valet service (11%) and a mixed response for a parking barrier system (50% thinking it's a great idea and 46% stating it isn't worth the cost). The Dock Master is supportive of a gate system as parking enforcement is a constant and time intensive effort. It is recommended to install remote controlled lift-arm gates.

A parking garage would not keep with the character of the area, potentially negatively impact green space, and impact the view of upland property owners. Therefore, it is not recommended to pursue this concept further.

A previous Master Plan for Lake Park Drive (Laquatra Bonci Associates, 2007) suggested:

- Developing an overall comprehensive parking strategy for the entire downtown.
- Converting diagonal parking on the park side of South Lake Drive to parallel parking and move the balance of spaces into the controlled marina lots.

It should be noted here that the scope of the Town Dock Master Plan was limited to consider parking within the footprint of the existing parking lots. Thus, revisions to parking layout along South Lake Drive were not considered. Parking lot layout alternatives were developed while increasing the amount of green space within Lake Drive Park. The proposed layout configurations would provide:

- Brazilian Dock – increase by 15 to 59 spots (Figure 7.1)
- Australian Dock – increase by 4 to 59 spots (Figure 7.2)
- Peruvian Dock – unchanged at 32 spots

Figure 7.1: Proposed Revision to Brazilian Dock Parking Lot

Figure 7.2: Proposed Revision to Australian Dock Parking Lot

8. Dock Infrastructure

Apart from the docks themselves, three buildings and the bulkhead are considered part of the dock infrastructure and they also need rehabilitation and upgrading.

There are three buildings that service the needs of the Town Docks, one at each dock. Office and storage space is severely limited, and bathrooms should be updated to meet ADA codes. The patron survey suggested that only 32% of respondents thought that communal showers were a necessity whereas 71% thought that a communal restroom was a necessity. Thus, it is proposed to maintain the same number of restrooms but reduce the number of showers.

8.1 Brazilian Dock Building

There is currently a one-story building at the Brazilian Dock, which houses two bathrooms (each with its own shower), an office for the TPB Police, an electrical room, and a small lounge area with a few books and a chair. It is 528 sf and sits over the water on a concrete slab supported by piles.

This is the largest building of the three, and it is proposed to demolish the existing structure and replace it with a two-story building within the same slab footprint (Figure 8.1). This provides the best option to increase the available space while not increasing the building footprint and minimizing sight-line obstruction because it is behind the large banyan of trees. The Dockmaster and staff offices would be relocated to this building allowing for a larger reception area. The police office would remain here, and the bathrooms upgraded, though one shower would be removed.

Figure 8.1: Architectural Rendering of the Proposed Brazilian Dock Building

8.2 Australian Dock Building

The Australian Dock building is two stories tall and sits on a 32 ft by 20 ft pile supported concrete slab. The Dockmaster's 96 sf office is located upstairs while two bathrooms (and accompanying showers), the staff office, and an electrical room occupy the 400 sf base floor.

It is proposed to demolish this building and replace it with a single-story building within the 640 sf existing footprint (Figure 8.2). It will have two restrooms (with one shower), an electrical room, and a storage area.

Figure 8.2: Architectural Rendering of the Proposed Australian Dock Building

The concrete slab and piles need to be replaced (Kimley-Horn, 2008).

8.3 Peruvian Dock Building

The Peruvian Dock building is 10 ft wide and 16 ft long and houses an electrical room and a storage room. It is located landward of the bulkhead.

It is proposed to maintain the electrical room and convert the storage room into a restroom within the same building footprint. The covered but outdoor seating area outside the building will remain, but rather than a metal framed awning, converted to a fixed roof cover with two pillars.

Figure 8.3: Architectural Rendering of the Proposed Peruvian Dock Building

The floor plans and additional renderings of the various buildings are shown in Appendix D.

While a metal gate is shown in these renderings, a glass barrier is also being considered.

8.4 Bulkhead

A bulkhead (seawall) extends 1,550 feet along the length of the Town Docks from Royal Palm Bridge to the southern extent of Peruvian Dock parking lot. A bulkhead inspection was performed as part of the Master Plan effort and is included in Appendix A.

The bulkhead is comprised of steel sheet pile, with a vertical concrete face and 11-inch wide concrete cap. The cap elevation is approximately 5.5 feet MLLW. Scour at the base of the seaward side of the bulkhead has exposed the sheet pile.

Figure 8.4: Bulkhead Fronting the Town Docks

There are two areas where backfill is being lost behind the bulkhead, which indicates a crack in the bulkhead. There are also several areas where the bulkhead cap is cracked and spalling. In short, the bulkhead is showing its age (estimated at more than 40 years old). Spot repairs of the bulkhead will be required periodically but likely increasing in frequency over time until the bulkhead must ultimately be replaced.

Figure 8.5: Backfill Loss behind the Bulkhead

Figure 8.6: Cracking in the Bulkhead

It is recommended that the bulkhead be replaced by constructing a steel sheet pile bulkhead less than one foot in front of the existing bulkhead. A concrete cap will be placed on top of the sheet pile, and the system will be tied into the existing bulkhead. It is proposed to raise the elevation of the cap of the new bulkhead by two feet to account for sea level rise and provide additional storm surge protection. This would still be lower than the current outfall section of the bulkhead. It would also be possible to create a continuous seating area along the wall by refinishing and widening the surface of the current wall for a sitting surface and using the new bulkhead as the backrest. A seat wall height is typically 1.5 to 2 feet high.

The existing bulkhead and entrance to the docks is sufficiently high to prevent against nuisance flooding (caused by high astronomical tides) for another 30 years. Thus, there is not an immediate need to raise this section, which would increase the length of the sloped portion of the deck and landside walkway. Instead, it is recommended to provide slotted panel gate features that can be installed when a major tropical storm threatens to provide protection against upland flooding. This would provide one continuous flood protection section from Royal Park Bridge to Peruvian Avenue. The waterfront promenade could be upgraded when the wall extension is integrated.

9. Construction Sequencing and Timeline

The construction sequence is important so that the inconvenience to Dock Patrons can be minimized.

9.1 Construction Sequencing

One of the primary goals when developing a possible construction sequence is to minimize interruption to existing dock patrons. Some of the recommendations are to perform construction during the less busy summer months and always have one dock fully functional.

Schedule construction between April and October and always have one dock fully functional to limit the inconvenience to Dock patrons.

It is preferable to perform the dredge work after removing the existing dock structures but before installing the new structures. The steps involved in replacing the existing docks include:

- Relocating vessels to alternate docks
- Disabling utilities and installing upland utility upgrades
- Removing the existing dock structure
- Dredging within the dock footprint and adjacent fairways
- Installing piles and dock structure
- Installing utilities along dock and connect to upland service
- Relocating vessels to the new dock

The time to complete this is different for each dock due to the size of the existing structure to be demolished and the proposed size of the new dock, which will vary based on the selected alternative.

The following possible construction sequence and timeline is envisioned:

- Brazilian Dock – April to August 2020
- Australian Dock – June to October 2020
- Palm Way Dock (if applicable) – April to June 2020
- Peruvian Dock – May to August 2021
- Buildings – May to October 2020
- Bulkhead (Royal Park Bridge to Australian) – April to September 2020
- Bulkhead (Australian to South end) – May to September 2021
- Brazilian Parking Lot – September 2020

- Australian and Peruvian Parking Lots – September 2021

This potential construction sequence and timeline assumes that the Contractor has sufficient manpower and equipment to perform multiple tasks simultaneously.

An alternate project construction sequence would demolish the Peruvian Dock in September and October of 2020. The footprint of the Peruvian Dock could then be dredged. This would complete all of the dredging work and avoid the high remobilization cost of the dredge for the second summer. The dock would then be installed during the summer of 2021.

The Town may also want to consider continuing construction through the winter of 2021. However, it is anticipated that installation of the Peruvian Dock could take approximately six weeks. This work entails vibrating steel piles into the subsurface, which can be loud. An additional few weeks of work would then be required to install all the appurtenances and utilities along the dock. This work should be less distracting to dock patrons but still occurring during the peak of the winter season.

9.2 Project Timeline

A probable timeline is provided in Figure 9.1.

Following approval of the Master Plan and selection of an alternative, the next phase of the work is to start on the permitting, engineering, and design (PED) phase. Given the estimated construction cost, the Town must issue a Request for Qualifications and select a consultant to perform this work. This will take several months following the Town contracting procedures.

Permitting of the project will also take several months given the expected review times by various State and Federal permitting agencies. A time frame of nine months is not unusual given official review times and requests for additional information. One of the key elements will be a seagrass survey given that dredging is recommended for every alternative. This survey must be performed between June and September.

While the permit is being processed, the engineers will develop construction plans and specifications as part of the construction bid package.

The construction bid package can be prepared prior to finalization of the final design documents, but issuance of a Request for Proposal should wait for final issuance of State and Federal permits, as special permit conditions can affect the cost. Given the complexity of the project, it is also recommended that Contractors be provided at least 45 days to develop bid submissions.

Construction will then proceed as discussed in the Construction sequencing section.

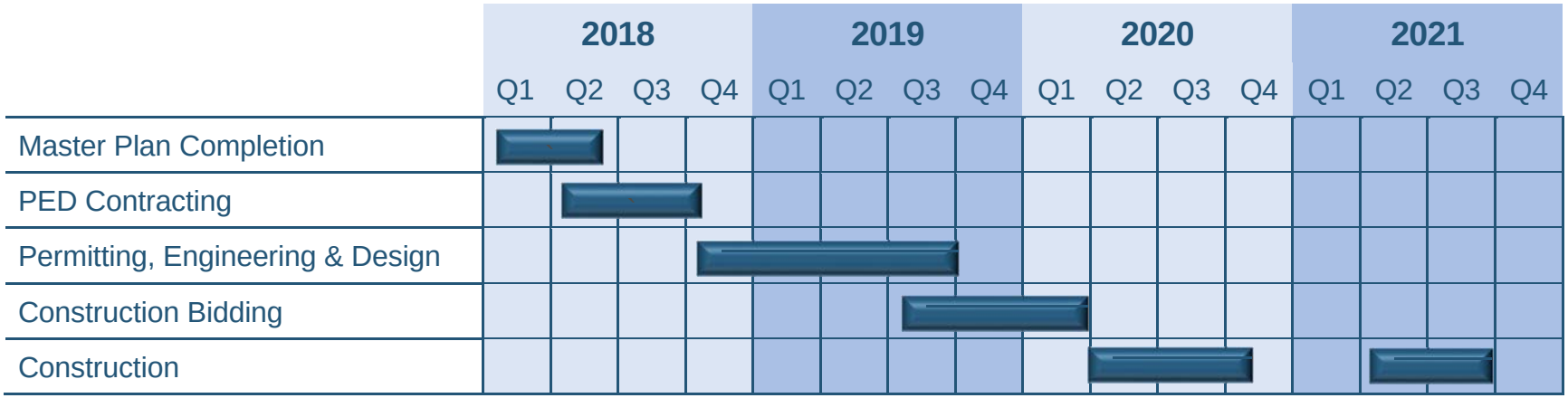

Figure 9.1: Probable Project Timeline

10. Rate and Revenue Structure

The Town Docks provide an important revenue stream for the Town. Rates should be appropriate and competitive.

10.1 Current Revenue

The Town Docks provide an important revenue stream, as shown in Figure 10.1.

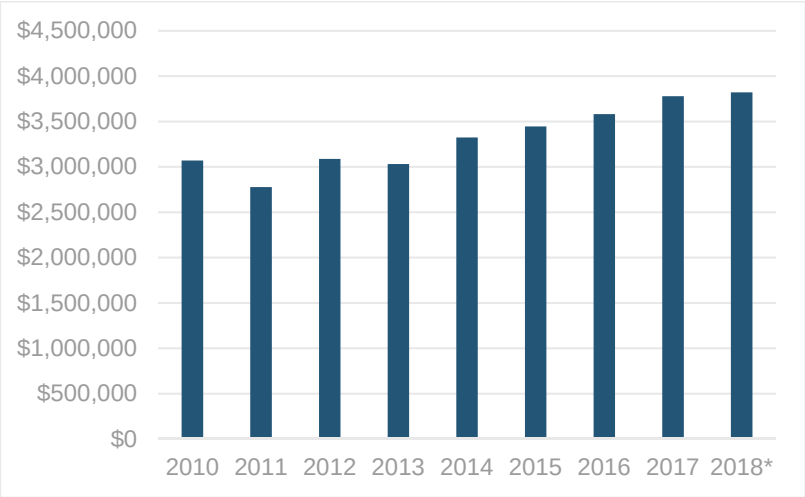

Figure 10.1: Historic Town Dock Revenue

10.2 Town Rates vs Competing Marinas

The Town currently has a rate structure (Appendix E) that varies depending on the length of lease (annual, monthly, and daily), time of year (winter and summer rates), slip size, and electrical need. Utilities are included in the rate up to a 100-amp connection. There is an additional fee for a second connection and any usage over 100 amps. Other marinas exclude utilities from their rates and charge based on usage. This can be significant as the Town incurred utility costs totaling almost $425,000 in 2017.

Each marina will have nuances and differences between their rate structure and their amenities. However, Table 10.1 attempts to provide some comparison between the Town Dock's rates and those of nearby marinas.

Table 10.1: Select Comparison of Annual Rates between the Town Docks and Nearby Marinas

Slip Size	Town Docks	Rybovich	Palm Harbor
<100±'	$1.24	$3.25	$2.15
100±' to 200±'	$1.45	$4.25	$2.40
>200±'	$1.50	$4.75	-

* Rates are per foot per day and weighted by slip size grouping

10.3 Proposed Rates and Potential Revenue

One element of the Master Plan is to determine a rate structure following the upgrades in order to estimate future revenue generation. An analysis was performed to determine fair market rates for the Town to charge dock patrons. This was based on the review of multiple competing marinas in southeast Florida including:

- Palm Harbor Marina
- Sailfish Marina
- Riviera Beach Marina
- Hall of Fame – North
- Hall of Fame – South
- Rybovich
- Bahia Mar
- Pier 66
- Las Olas
- Sunrise Harbor

As has been discussed, the current conditions at the Town Docks are dated compared to several more modern marinas in the immediate vicinity. This has and will continue to limit what the Town can fairly charge dock patrons. Upgrading the Town Docks will address these limitations.

The Town Docks' competitive advantage is its location and the implicit elegance and security of being located in the Town of Palm Beach.

While each of the surrounding marinas is unique and has its own character, the Town of Palm Beach Docks have several elements that truly distinguish it from the competition. First and foremost, is the cache that comes from the docks being located within the Town of Palm Beach. Implicit with that is a stated level of elegance and security. As such, the Town Docks should be able to command a premium rate once a premium facility is provided.

Table 10.2 summarizes the proposed rates for the Town Docks following the proposed rehabilitation and upgrade.

Table 10.2: Proposed Rate Structure

Slip Size (ft)	Daily Rate	Monthly Rate	Annual Rate
<100'	$3.95	$3.35	$3.25
101-200'	$4.95	$4.35	$4.25
>200'	$5.95	$5.50	$5.25

*Rates are per foot per day and exclude utilities

Table 10.3: Projected Revenue by Alternative

Alternative	Expected Annual Revenue
Existing Conditions	$3.8M
Alternative 1	$13.5M
Alternative 2	$16.3M
Alternative 3	$16.4M

11. Grant Assistance Funding Opportunities

The Town can apply for grants to defray the design and construction costs of various elements of the dock rehabilitation through matching grants.

There are two agencies that assist local governments with funding assistance for water access projects, including docks, boat ramps, and some support facilities:

- Florida Inland Navigation District (FIND)
- Florida Fish & Wildlife Conservation Commission (FWC)

The grants are completive in nature, are issued annually, and are open to the public on a first come first serve basis. The grants require a cash match by the applicant.

11.1 Florida Inland Navigation District

FIND is the sponsor of the Atlantic Intracoastal Waterway (ICW). They receive their funding from ad valorem taxes. The district developed the Waterway Assistance Program (WAP), which assists local governments to plan and design projects, construct docks, boat ramps, dredging, and other amenities for the benefit of waterway users. Key elements of the WAP include:

- Funding for the program is based on a percentage of revenue of each of the 12 counties.
- The annual available funding for each application is driven by three elements: the ranking score, the number of projects for that year, and the amounts requested by each applicant.
- Applications for 2018 are due March 31st.

Projects similar to the one proposed by the Town have received up to $1.5M for construction assistance.

The Town is currently applying for a grant to help fund the engineering and design of the selected plan.

The Town Council is in the process of applying for a Tier 1 grant for permitting, engineering, and final design required for rehabilitation of the Town Docks, seawall, and dredging. If approved, the Town should obtain funding by mid-October 2018. Tier 1 funding is reimbursed when the planned activity planned has been contracted.

Once the Town has a design, bid package, and permit, the Town can apply for construction grants on a yearly basis.

11.2 Florida Fish & Wildlife Conservation Commission

The FWC administers two grant assistance programs. Details of these are provided below.

11.2.1 Florida Boating Improvement Program

This program distributes money annually from vessel registration dollars as well as marine fuel tax. This program primarily funds docks and boat ramps, as well as channel markers and other support activities.

- The State Game Trust Fund contributes $1,250,000 to this program annually.
- The Marine Resources Conservation Trust Fund also provides funding from two sources.
  - One dollar from each vessel registration goes to funding for boat ramps.
  - A small percentage of fuel tax coming from marinas.
- Grants for this program are due April 3rd.

Funding from this grant has been unpredictable the last several years due to cutbacks in the agency budget. There is also high demand for available grant funding due to the number of boat ramps and marinas.

11.2.2 Boating Infrastructure Grant Program

This program is part of the Federal US Fish & Wildlife Service (FWS) Sport Fish Restoration program. The State Fish and Wildlife agency reviews the applications, selects the grant winners, and administers the program. The program has the following requirements:

- Provides funding for transient dockage assistance for non-trailerable vessels 26 ft and longer.
- Vessel can only stay 15 days or less.
- Maximum grant amount is $1,500,000.
- The annual grant opens late spring to early summer and are typically awarded in February or March of the following year

These are highly competitive grants that are available to every marina in the country. However, there are generally only 10 projects funded annually.

12. Operating & Construction Costs

12.1 Operating Costs

There are four components of the operating cost:

- Employee salaries, wages, and benefits
- Maintenance
- Utilities and incidentals
- Sovereign Submerged Lands Lease (SSLL) fee

12.1.1 Employee Salaries, Wages, and Benefits

The Town Docks currently operate with one full-time dock master and two part-time assistants. It is recommended that one full-time dock assistant be added to the staff to address increased service needs of trash and oil collection as well as manage an increase in the number of vessels. This cost will be covered by the increase in revenue. Salaries, wages and employee benefit costs are approximately 25% of the current dock operating costs. Total employee costs are anticipated to increase between 20 and 30%.

12.1.2 Maintenance

It is anticipated that above ground maintenance costs will remain similar. While an expanded marina will require additional maintenance, this will be offset by having a new facility. Floating docks should be pressure cleaned each year to remove marine growth at a cost of $10K-$15k/year.

Sediment may shoal within the dock footprint following the proposed dredging. Sediment transport is not well known or documented this far along the Lake Worth Lagoon. Rather than estimate infilling rates, a deeper dredge depth was included in the initial construction. The Town may want to conduct a bathymetric survey five years after construction to monitor sedimentation within the mooring basin.

12.1.3 Utilities and Incidentals

Utilities associated with the dock buildings are expected to remain similar (electrical, water, cable TV, internet, solid waste disposal).

It is anticipated that there will be greater utility demand with an upgraded facility. However, utilities can be metered by individual slip, so that this cost can be accurately passed on to the dock patron.

Meter utilities by slip and pass this cost on to the patron, as is done at other marinas.

Incidentals are also expected to remain relatively unchanged. This includes items such as contracted security, promotional materials, office supplies, marina supplies, computer equipment, etc.

The one incidental cost that is likely to increase is the bank service charge (credit card company fee). This is expected to increase proportionally with revenue.

12.1.4 Sovereign Submerged Lands Lease

The Sovereign Submerged Lands Lease (SSLL) is the third largest individual cost to the Town Docks after electricity and employees. The fee is paid to the State of Florida and is comprised of two parts: a base fee based on the area of the lease and a supplemental payment based on marina revenue. This results in the Town paying a 6% fee on gross revenue minus the utilities costs.

It is anticipated that since gross revenue will increase following rehabilitation of the docks, the SSLL fee will increase. The Town currently qualifies for a 30% discount on these fees, and it is recommended that they continue to adhere to these regulations.

12.2 Opinion of Probable Construction Cost

There are several elements within this Master Plan that can be implemented individually, such that the Town can stage construction to facilitate cash flow and grant funding potential. Thus, opinions of probable construction cost have been separated by each of these elements. Table 12.1 summarizes each of the major elements. All of these costs include a 15% contingency and represent current material pricing.

Table 12.1: Opinion of Probable Construction Cost

Item	Alternative 1	Alternative 2	Alternative 3
Dock Improvement	$17.5M	$20.7M	$21.3M
Dredging	$2.7M	$3.7M	$4.1M
Building Improvement	$1.2M	$1.2M	$1.2M
Bulkhead Replacement	$3.2M	$3.2M	$3.2M
Parking Lot Improvement	$0.3M	$0.3M	$0.3M
Permitting, Engineering, & Design	$1.4M	$1.6M	$1.7M
Total	$26.3M	$30.7M	$31.8M

12.2.1 Dock Improvements

This element includes all aspects related to demolishing the old docks and installing the new docks, including piles, utilities, and all appurtenances required for operation of the new dock.

Demolition costs are based on the number of piles and pile caps to be removed and the anticipated time for this removal. Mobilization and demobilization is included along with a

remobilization cost for the second year of construction. This was assumed to be 5% of the construction cost value given the high total construction value.

Upland disposal of the concrete debris was assumed, though a lower cost option could be Palm Beach County's artificial reef program.

The cost for purchase and installation of the docks is based on a square footage basis. This includes the purchase and installation of piles. It is recommended to install steel piles with sleeves. While steel piles are more expensive than concrete, they can be installed more quickly and thus offset the cost. Sleeves are important for long-term aesthetic and maintenance of the piles.

An additional 10% was added to the cost to allow for telescoping piles. Additional engineering and design details will be required to ensure the efficacy of this concept at the Town Docks, which should be performed during the PED phase.

Utilities (electrical, water, fire suppression, and sanitary) have been based on costs for similar systems at other floating dock marinas.

The cost for the gangway and gangway abutments has been included in the cost.

The Town is currently upgrading the Wi-Fi system at the docks, but a cost has been included as reinstallation may be warranted.

Costs for a video security system have also been included.

The cost for revising the SSLL has been included in the dock. This is dependent on the alternative selected but is estimated to be less than $5,000.

12.2.2 Dredging

As discussed in Section 5, dredging is recommended to facilitate safe navigation and sufficient under keel clearance for the vessels. The cost of dredging is based on the volume of material to be dredged, the type of material being dredged (silt vs sand vs rock), and the distance that the dredged material must be transported for disposal. It has been assumed that the material to be dredged will be sandy and used to fill deeper areas of Lake Worth Lagoon within a two-mile radius of the project area.

The cost for a turbidity screen has been included in the cost. The need for this will depend on the permit conditions.

A major cost to the project will be to remobilize the dredge for the second summer to dredge a relatively small volume of sediment located underneath the Peruvian Dock. The potential savings could be close to $2M. Given the smaller volume remaining, especially if some dredging can be performed between the slips, it may be possible to mobilize less expensive equipment to the site in the second year. These options should be fully vetted in the PED phase.

12.2.3 Building Improvements

The concepts for the various buildings are discussed in Section 8. The cost was based on the square footage of each building and a cost per square foot, which ranged from $150/sf for the Peruvian building to $200/sf for the Brazilian

office. The supporting columns and pads are in poor condition (Kimley-Horn, 2008), so an additional $100/sf has been included to address the base.

12.2.4 Bulkhead Replacement

The bulkhead replacement assumed that a new sheet pile bulkhead with a concrete cap would be constructed in front of the existing bulkhead. See Appendix B for greater detail on the existing bulkhead and proposed rehabilitation. This can be performed separately from the dock replacement. However, there are synergies and costs savings from constructing the bulkhead and dock upgrades simultaneously. The opinion of probable construction cost for the bulkhead presented in this Master Plan are based on the cost for the rehabilitation of similar bulkheads in southeast Florida.

12.2.5 Parking Lot Replacement

The parking lot replacement costs are based on:

- More extensive alterations to the Brazilian Dock parking lot
- Minimal repairs and repaving of the Australian Dock parking lot and conversion of the current trash and oil facility to green space
- Repaving the Peruvian Dock parking lot
- Installation of remote controlled lift-arm gates

12.2.6 Permitting, Engineering, and Design

The next step in the process to upgrade the Town Dock facility is to select an alternative and start PED on the various elements. The cost of this effort has been estimated at 8% of the total construction cost minus the cost expended to date. The opportunity for grants to fund the next steps has begun and will continue throughout the PED phase.

12.2.7 Construction Opportunity Cost

During construction, the Town will not be able to charge patrons for use of the dock. This will almost entirely affect patrons with annual leases. While the majority of vessels are absent during the summer months proposed for construction, the Town should credit patrons for this portion of their annual lease. Approximately 1/3 of the vessels remain at the Town Docks during summer, and these will be accommodated. The opportunity cost of construction for the first year of construction is approximated at $1.2M. The opportunity cost during the second year of construction would be less at approximately $400,000.

The sequence whereby the Peruvian Docks are demolished in 2020 and then reinstalled in 2021 would have an opportunity cost of approximately $1M. This should be weighed against the possible cost of remobilizing a dredge ($2M) and the negative goodwill of the displaced dock patrons.

13. Acknowledgements

Town of Palm Beach Town Council

Mayor Gail. L. Coniglio
President Danielle. H. Moore
President Pro Tem Margaret A. Zeidman
Council Member Julie Araskog
Council Member Lewis S.W. Crampton
Council Member Bobbie Lindsay

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Town of Palm Beach

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Dock Patrons

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Appendix A

Compendium of Public Meeting Comments

Baird.

A.1 Docks Dated - Upgrades Needed

- Extremely successful as is.
- Vision is for a state-of-the-art facility with wi-fi, power, wave attenuation, probably a floating dock.
- Docks are obsolete.
- Need new docks and upgrade.
- Upgrade dock.
- The docks need to be modernized.
- At point for extensive repairs.
- Docks are old. By industry standard they're not terrible but reflects poorly on Town of Palm Beach.
- General agreement that we need new docks.
- Docks reaching end of life.
- Slip owners want an update.
- This is an opportunity for the Town.
- Don't increase capacity but just upgrade the docks.
- Common theme is to improve aging facility.
- The docks need to be update and renovated. No shops.
- Docks are great the way they are - Not a financial prostitute - Previous iteration wanted a convenience store, parking lot in name of a financial boon - The Town Docks are not a financial savior - Don't expand the docks. Improve enhance but don't enlarge.
- Our amenities don't match up to other facilities. We need to step up our game.
- Depth of slip is adequate.
- Recommend three-year phased renovation.

A.1.1.1 Electrical

- They upgraded their slip to meet their electrical needs. Larger electrical need is an ongoing trend along with larger vessels.
- Lighting is obsolete and electrical fails.
- Increase power – need 480V 200 amp.
- Electricity drawn from boats is huge.
- Lady Kathyryn V paid for the upgrade to the slip they use - Recommend providing sufficient electrical – removes noise and odor - Large boats need more power.
- Electrical needs to be 3-phase. Currently provide 1-phase.
- Definitely have to increase amperage and increase water pressure.

A.1.1.2 Lighting

- Lighting is an issue – no posts or glow to upland residents

A.1.1.3 Sewage

- Sanitary is up to date.
- Sewage pump out/ fire main. Works well here. Potential issue with fire line being dislocated from dock during king tides. This would be addressed through floating docks

- Will the docks provide sewage service or a fuel service?

A.1.1.4 Trash Collection

- Look at green area marinas. Maybe a trash compactor. How loud are they?
- Trash needs to be put somewhere prettier

A.1.1.5 Wi-Fi

- No Wi-fi.
- Wi-Fi and infrastructure is under the dock. Look at Wi-fi and new technology.
- Need to address Wi-fi and parking.
- The dock needs high speed internet, mail delivery from Fed Ex etc.
- High speed Internet plug in and Wi-Fi - cell tower in new Dockmaster building.
- Upgrade it (internet)

A.1.1.6 Buildings

- Office space is totally insufficient Don't need to worry about pump station
- Need improved facilities for Dock Master and Police
- Build a new dock master office. You can restructure it.
- Do we need the building at Mike's current office location? Could we move Mike's office to the Brazilian dock? We should consider tinted glass sloping in.
- Recommend a new/improved Dockmaster building and office. The building should be higher so that the dockmaster can see the entire marina.
- The office could be anywhere? Is there a need to have it at the marina? Maybe locate the office where it is less expensive.
- The last time they torpedoed the lounge.
- "No bread, no butter, no bait" (reference to not having a grocery store or bait shop).
- No convenience store. Don't even bring it up.
- Rumor of a convenience store – don't want to see that.
- Have showers for smaller vessels.
- Attractive - Ok now, but need a new building, expansive planters. Do we need recreational facilities for the crew?

A.1.1.7 Bulkhead/Seawall

- Seawall looks terrible – needs addressing
- Bulkhead/seawall needs to increase in elevation. USACE predicts between 11" and 22" rise in sea level over next 40 years. Need to address this at this time. If we repair or replace the seawall, then do it now.
- Opportunity to raise the seawall/bulkhead to address sea level rise: Raise the height of the seawall; Town should consider doing this everywhere. Phase it in. Good opportunity to start now.
- Water came over the top of the seawall during Hurricane Irma. Consider addressing flooding.

- Reflection off the wall can be a problem.

A.2 Keep Feel of Town Docks

- The marina provides some panache.
- Tranquil, safe, quiet and non-commercial
- Leave it alone, but make it wonderful
- It is identified with the pulse beat of the Town and it should stay that way
- Palm Harbor is the main competitor, but it has a different atmosphere.
- Doesn't see current docks as over bearing
- Lot of density along Lake block; More peaceful and enjoyable; Don't change aesthetic
- Should be equal or lower intensity – no more traffic or trash
- Concentrate on facilities but don't think about a convenience store
- Doesn't want a packet of cigarettes to be sold, or a loaf of bread, or beer.
- HOA stopped 2 to 3 story parking lot and underground building for pump station
- Keep it bike friendly; don't worry about passing cars.
- The previous plan included a convenience store, laundry facility and enlarged parking lot. Stop trying to do something with the grass.
- There was a movement to redo the Town Docks in 2007. The homeowners were not happy. They didn't want "another Disney World" with visitors coming to look at the boats and have a concession stand etc. Avoid repeating that mistake. Don't create a public draw.
- When the previous effort put up a photo of the Fort Lauderdale marina next to the Town of Palm Beach, the residents didn't like it. We are not looking to compete or become a commercial operation.

A.3 Vessel Sizes

- No lack of interest for boaters wanting space
- More slips for smaller boats, add smaller slips
- Like to see a mix of boats
- Keep a mixture of boats
- Great compromise of large and small vessels
- Recommends accommodating multiple size vessels. There is an appeal for a range of vessels at a marina
- Trend is towards larger vessels.
- Can we extend the docks?
- Is the goal to increase revenue? If so, what happens when you change one large vessel. It isn't bad the way it is. Different boats mean different people - Keep same size wise.
- Not sure if the marina should be only for mega-yachts even if it made more money. The business model may not support that anyway. If only mega-yacht, it might not be seen as a service to the residents.
- He's aware of demand for a couple more for that 70m size

- Allow more slips to accommodate 75m vessels. The Town can make more money from larger vessels. The industry is moving towards larger vessels
- Heard rumblings about mega-yachts. Lady Kathyryn V should be the largest vessel. Don't need bigger boats.
- Avoid making it Rybovich
- Doesn't think that superyachts will bring business to the Town. There's a charm to the current size of yachts. Super yachts will bring a different environment. Don't go there as the docks will lose their charm.
- Wants a marina that the very best money can buy based on a solid financial model. However, it doesn't need to be exclusively mega-yachts.
- Larger vessels mean more crew, power draw and utility needs
- Vessels at 160' and up have an unlimited budget. You can get locals that own boats this size. Sailfish Club has only 2 slips that can accommodate this size vessel. There should be room for 70m vessels.
- More crew on bigger vessels, need crew accommodations - lounge; ablution facilities.
- Rybovich has over 300 boats but they want to be over at Town of Palm Beach. At Rybovich, the average stay is 60 days. Rybovich said that the 120' to 180' market is full. They can't accommodate more though there is a demand.
- Keep big boat owners
- Dock more mega-yachts
- Is there a chance for a dry dock? Small boats?
- Some like to sail down for a Lunch Boat Special. Businesses and restaurants would like a courtesy boat.
- Would be beneficial to have space for dinghies.
- Maybe have a platform for a dinghy.

A.4 Docks Should Serve Town Residents

- The marina adds value to the Town.
- There is a benefit to the non-boater.
- Residents use the park area and as such it's a service for the residents.
- Make residents aware that there are bigger slips available.
- Potential for synergies between the community and the docks.
- Have to deal with fishing from the bridge
- Reciprocity with Recreation Department facilities would be good for crew
- The Town Docks are the only public access to the lake
- Are the Town docks a Town service?
- Recreation facilities would be an enhancement. Would draw more.
- Doesn't view the dock as an amenity. Better viewed as the Town is an amenity for the dock.
- It is close enough to the Recreation Center that patrons can use that?
- Is the marina like other amenities? More people use the Recreation Center, tennis and golf facilities.

- The marina does not fulfill a general public need. It's not really used by the general public.
- Wants to see boats, we're on the water.
- Can't have a town like this without boats.
- Brings people in to Town for shopping.
- Serves a public need beyond the boaters.
- The marina add value and is an asset. It's a selling point for the Town. Some residents operate from their yacht.
- The docks are more than an amenity. People want to visit or live in Palm Beach because of Lake Worth, tennis, golf.

A.5 Parking

- Haven't experienced any difficulty with parking
- Parking needs to be addressed.
- Parking is an issue.
- Parking is insufficient.
- Parking lot is an issue – should not be commercial, remain as assigned parking.
- Can't increase capacity without increasing parking.
- When designed, boats didn't have as many crew. The Patrons work it out. Some of the parking issues are unaffiliated with dock patrons. Difficult to ticket people because trying to maintain harmony.
- Parking doesn't work now because angled parking along Australian Avenue sticks out. It needs to be addressed. Eliminating that parking would be the ideal and look at parallel parking would be their ideal.
- Diagonal parking is a problem. Remove it, expand the grass out and put in parallel parking.
- Parking lot: Trees are a battle; Need better enforcement of parking violations; People coming in from outside to fish
- Not much room for parking or amenities
- No increase in parking - Screen the parking lot better
- Remove angled parking
- Can DPW *(ed. Dept of Public Works)* be used to address parking shortfall?
- Removing angled parking would be a significant decrease in parking
- Remove angled parking. Too congested. In the Bonci plan, they moved the grass out 8' full length of park. More green but expand existing parking.
- No less green space but parking is a challenge
- If we could take away the diagonal parking along South lake Drive that would be appreciated. They would prefer parallel parking along South Lake Drive. This was detailed in the 2007 Lake Park Master Plan. (Bonci Plan)
- Can you implement a 10-year old plan? *(ed. Refers to Bonsi Plan.)*
- Change random parking on South Lake Drive
- Change parking times
- Parking lot is unsightly – would prefer it not be asphalt.

- Park should remain “primitive” with green scape. Don’t have crew working in the park.
- How do you show revenue increase? Parking sticker; Gate with clicker
- Stick with an asphalt pavement
- Parking – the little streets need a permit
- Increased parking is needed. Utilize parking in WPB? They have permits for 5 spots but some of their crew parks at the West Palm Beach garage. Maybe use a mesh and allow grass to grow through it.
- For parties, they’ll bring in valet.

A.6 Floating Docks vs. Fixed Docks

- Prefers floating docks
- Floating docks are preferable
- Prefers floating docks with an in-slip pumpout
- Floating docks are preferable with piles on the inside of the dock. This helps to increase slip size - Understand maximum storm surge to avoid the docks rising above the height of the pile
- Need floating docks. Stationary docks are obsolete.
- The North Bridge had pilings that didn’t even touch the bottom.
- Boat patron died many years back because of fixed dock. Had to climb down but fell and drowned. Good reason for floating dock
- Floating docks are the way to go. Have the piles on the inside of the docks. West Palm has their piles on the outside. That is not the way to go.
- Disagree that floating docks are a panacea. There were 8’ seas in Lake Worth. Who pays for replacement?
- Majority of patrons want floating docks
- Sailfish Club is putting in floating docks - this is where the industry is going.
- Install floating docks if that is the state-of-the-art.
- Definitely have to have Floating docks
- Floating docks are essential

A.7 Kayak Launch

- This should be a recreational area for kayaks and canoes. The only current access is through private clubs. Residents should come first and there should be a Town kayak dock.
- Can’t put a kayak next to a bow thruster.
- It is important to address the concept of kayakers within the Master plan whether we facilitate kayakers or not. Kayakers currently use Bingham Island (Southern Blvd Bridge) as a launch point. Kayakers also launch at the Sailfish Club but they need to be members. There is a concern with providing a launch spot for kayaks at the Town Docks due to the boats and the strong currents. There is also limited parking. Could we place storage at the pump station at the north end?
- There is kayaking at Sailfish Club. Avoid making the dock a county-wide launch point for kayaks.

- Request for kayaks: Not an ideal place for kayaks; No launch place except for Sailfish Club; People would love having a kayak launch; Kayak launch would have to be for residents only.
- Put a letter in the Shiny Sheet. It's a small segment, doesn't know how big.
- Lives in southern end and there is a small beach that he uses. Would need storage space. Can't lift 50lb to roof of car. Launching point no good without secure storage.

A.8 Green Space

- Keep green grass.
- Increase the green space
- Keep it open and airy.
- Don't move trees but more green space under trees
- Green space is an important part of the community.
- Repurpose and rebuild the existing structures without affecting the footprint of the green space.
- Trees – is it possible to trim those back? Used to have a view of the docks but it's now blocked.
- Chose to live close to the docks because of the park.
- Will the Master Plan reduce paved width of South Park Drive: Could put in shade trees; Improve lake trail – it's a true gem; Improve sidewalk connections; Examine ADA requirements.
- Keep Lake Park peaceful.
- Preserve and protect Royal Park and neighborhood.
- While the Bonci Plan and Master Plan for Dock may be separate, when complete should complement each other.
- Suggest looking at both projects as one. Residents look at it as one project.
- Bonci Plan was a good one. Town Council authorized and voted on it. Agreed to the long range plan and adopted it.
- For this plan, listen to the people. Both the Bonci Plan and Dock Plan should work hand in glove.
- Scope too limited. Include park and trail. Include landscape architects. Encompass the findings of the Bonci report.

A.9 Resident or Non-Resident Use

- Doesn't necessarily see a difference between resident and non-resident use of the marina.
- Residents should get priority over non-residents. Higher priority is fairness vs difference in cost. Would prefer long term lease to Palm Beach residents vs. shorter term.
- He has been there for a long time and his neighbor has been there for 10 years - Annual leases are advantageous to keep docks utilized.
- We should know the country of vessel registration. Are they US Coast Guard registered?
- Boat owners haven't owned boats for 35 years. The boat owners should be less influential than the upland owners and residents in the town. Larger the boat the

less likely to be town residents. Don't increase the size to try and make money
- Transients are not a priority
- Won't get through this without non-residents: Vet who is coming in; Support having a different rate structure for resident vs non-resident
- Treat residents and non-residents the same with respect to rates. Maybe residents should get preferential treatment when on the waiting list (similar to a restaurant).
- Transient vs long-term – Trust the Recreation Dept, Dock master, and Expert
- Some believe that basing docks on seniority is not fair.

A.10 Financial Comments and Rates

- Rates should reflect highest and best use of facility.
- The rates are below market.
- Consider establishing a day dockage fee.
- Newer facilities, larger slips could provide more money.
- Add more dock space – politically controversial, some will say it's big enough. Larger slips to increase revenue.
- Profitable operation for the Town.
- Docks have been and continue to be a revenue generator.
- New docks should generate bigger revenues.
- Town relies on docks to fund activities (like a football team at universities).
- The dock is an amenity but also a revenue generator.
- The marina is an important revenue generator for the Town, so it is important.
- This is a wonderful town dock, and it shouldn't be a big sprawling marina economic cash driven event.
- Town benefits from staff aboard the vessels.
- Concerned about low bid. There's an immediate need but don't go low bid. Take care on specifications.
- Is financing going to be included in the plan?
- Residents enjoy it but users should pay for it.
- Keep control of marina (don't consign it)
- Doesn't want to see a special assessment

A.11 Security

- Security – want to applaud current security.
- Security is a key element.
- Need to improve the dock and ensure safety and security.
- Security – lights go on and off - Need plenty of bright light.
- Opportunity or space for fishing without entering the docks.
- Have to ensure no fishing violations.
- There is a Town ordinance against fishing at the dock. The docks are also gated.
- The area is safe and secure with parking and ability to walk to dinner on Worth Avenue.

- Nothing escapes Police here. Cameras on the bridge track each car entering.
- Supporting cameras is not difficult - Police Foundation could maybe support cost
- Security concept is fine. There are cameras but maybe need some more if you expand. Maybe consider a swipe lock.
- May want to consider an infra-red motion detector to turn on lights, both on water side and land side.

A.12 Construction

- Do it once, do it right.
- Consider phased construction.
- Fort Pierce rebuilt with floating concrete.

A.13 Other

- Staff does a good job keeping the area.
- Need to implement wake control – center console boats tear through the area.
- How will a fire be put out on a vessel? If there is a fire, do the vessels have insurance that will reimburse the cost for the Town to rebuild the docks?
- Admiralty law will dictate how the Town would recover money in case of a fire. Must look at it.
- Lady Kathyryn V is foreign registered. That has nothing to do with whether the owners are Town residents. The Vecellios own three properties in Town of Palm Beach. The Town requires liability insurance.
- The marina is viewed differently from the recreation center or tennis courts. It is considered a parking lot for yachts while tennis is a service. The golf course was originally a gift. It's also a service and is now starting to contribute financially to the Town.
- Grass cuttings fill up the screener.
- Discharge of phosphates into the water leads to barnacle growth.

Appendix B

Bulkhead Inspection Report

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Bulkhead Inspection

Town of Palm Beach Docks Master Plan

Prepared for:

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Revision	Date	Status	Comments	Prepared	Reviewed	Approved
0	3/13/18	Draft		GGT	KMJ	GGT

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Table of Contents

1. Bulkhead Inspection Details.....1

2. Summary Findings 2

3. Detailed Report 3

3.1 Generalized Bulkhead Details 3

3.2 Sta 0+00 to Sta 0+15.5 - Northern Return Section 7

3.3 Sta 14+55 to Sta 15+50 - Peruvian Dock Parking Lot Bulkhead 8

3.4 Sta 0+80 to Sta 0+88 - Outfall/ Cable Crossing 11

3.5 Sta 2+10 - Cracked Cap 13

3.6 Sta 10+80 - Backfill Loss 13

3.7 Sta 9+40 – Backfill Loss 13

4. Repair Options 15

Figures

Figure 1.1: Project Location 1

Figure 2.1: Sta 8+80 looking north. View of seaward face of the bulkhead at high tide. 2

Figure 3.1: Sta 8+00 looking south. View of backfill close to the bulkhead cap elevation. 3

Figure 3.2: Sta 20+00. Gap between concrete face and bottom exposing the sheet pile 4

Figure 3.3: Sta 2+90. Apparent end of a tie back. 4

Figure 3.4: Sta 2+90. Typical bulkhead face transition from exposed concrete to the concrete covered in marine growth within in the intertidal zone. 5

Figure 3.5: Typical marine growth on the concrete face of the bulkhead. 5

Figure 3.6: Sta 3+30. Infrequent rust coloration of marine growth suggestion corrosion within the bulkhead.6

Figure 3.7: Sta 0+70. Crack at an expansion joint in the vertical concrete face. 6

Figure 3.8: Sta 0+02 looking west. Corrugated face and offset cap. 7

Figure 3.9: Sta 0+03. Horizontal cracks in the concrete bulkhead. 8

Figure 3.10: Sta 15+45 looking north along the bulkhead along the Peruvian Dock Parking Lot. 9

Figure 3.11: Sta 14+55 looking south. This is the start of the different bulkhead style. 10

Figure 3.12: Sta 15+15. Gap underneath the corrugated section of the bulkhead and vague outline of a secondary sheet pile wall in the background. 10

Figure 3.13: Sta 15+00. Cracking, spalling and deterioration underneath the lip along the parapet bulkhead section. 11

Figure 3.14: Sta 0+84. Western end of outfall structure looking east. Note the cable entering the eastern opening. 12

Figure 3.15: Sta 0+88 looking north. Spalling and rebar exposure and corrosion of the walkway to the outfall structure. 12

Figure 3.16: Sta 2+10. Crack and dislocated concrete cap. 13

Figure 3.17: Sta 10+80. Area with backfill loss..... 14

Figure 3.18: Sta 9+40. Area of backfill loss in front of Australian Dock office. 14

1. Bulkhead Inspection Details

Inspector: Gordon Thomson, PE

Location: Lake Drive Park / Town of Palm Beach Docks

Royal Palm Way to Worth Avenue (Figure 1.1)

Date: Tuesday, November 28, 2017

Time: 10:00 to 14:30

Weather: Sunny, 80°F

Tide: Low tide of 0.72' MLLW at 08:57
High tide of 2.64' MLLW at 15:09

Equipment: GoPro Hero V video camera (plus accompanying lights and mounting system)
iPhone 5S still camera
Tape measure

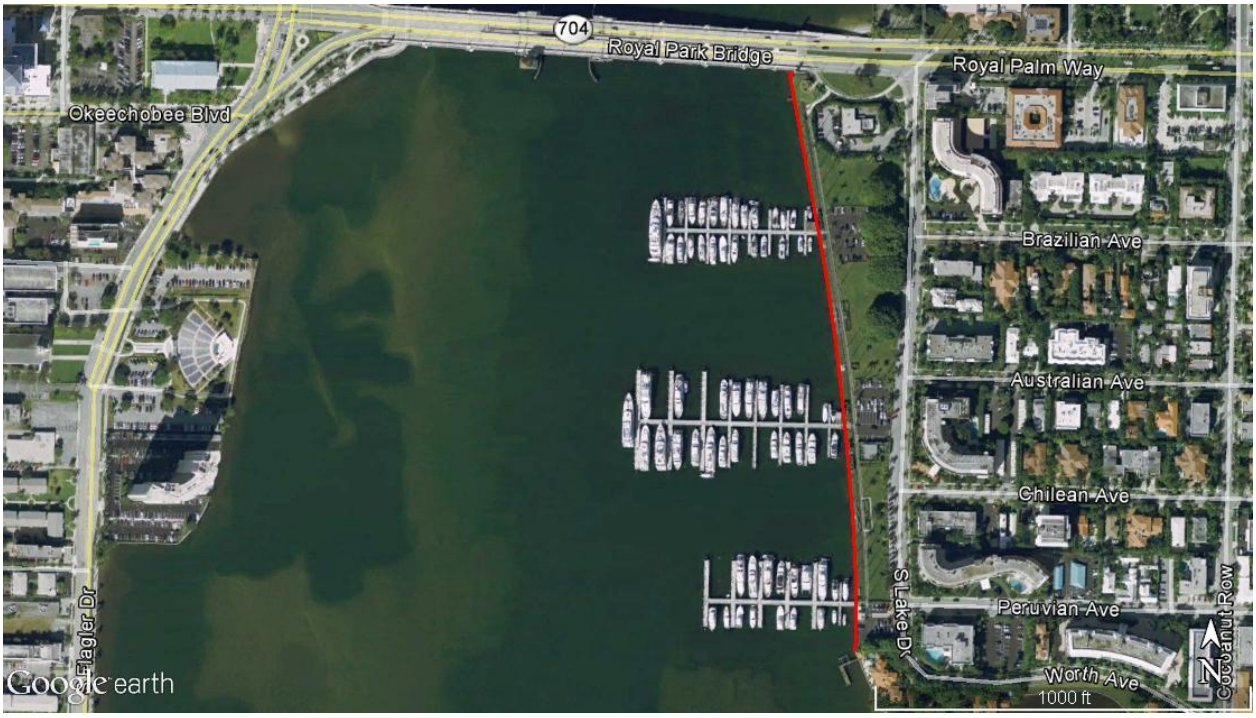

Figure 1.1: Project Location

2. Summary Findings

A continuous bulkhead extends 1,550 feet along the length of the Town Docks from the Royal Park Bridge to the southern extent of the Peruvian Dock parking lot. The bulkhead is in reasonably good shape but is showing its age. Original construction plans are not available, and the age of the bulkhead is unknown. It is estimated that the bulkhead is at least 30 to 40 years old based on lack of availability of records, discussions with Town of Palm Beach staff, and the general condition of the bulkhead.

The bulkhead appears to be a sheet pile with an extended concrete cap and face. The concrete face descends approximately seven feet from the cap. The cap typically stops between three and six inches above grade, though in some areas this is as much as two feet. It is hypothesized that the concrete face would have extended to grade at construction, and the gap between the base of the concrete and grade is due to scour.

The outlines of deadmen on the seaward face of the bulkhead (inferred because of heavy marine growth but approximate in location and size) suggest that deadmen assist in structural support of the wall. This would be expected for a wall of this type and height.

While, there are a few areas where the concrete cap has cracked and spalled, overall, the concrete cap is in good shape though frequently pitted. There were two areas where loss of backfill was evident. It was not clear from video footage of the face of the bulkhead where the backfill was being lost.

Marine growth is prevalent below the high tide mark. While it does not appear that this growth is impacting the structural stability of the bulkhead, its presence may be obscuring sites of damage on the bulkhead. Rust staining is also common in the marine growth, possibly from exposure of rebar.

In summary, the bulkhead appears to be fair condition though in need of spot repairs where the cap is cracked and backfill is being lost. Continued deterioration of the bulkhead is expected over time with repairs being required more frequently. The Town should consider rehabilitating the bulkhead within the next several years.

Figure 2.1: Sta 8+80 looking north. View of seaward face of the bulkhead at high tide.

3. Detailed Report

A continuous bulkhead extends 1,550 feet along the length of the Town Docks from the Royal Park Bridge to the southern extent of the Peruvian Dock parking lot (Figure 1.1). The bulkhead is mostly uniform in construction style, except for the northern return wall that joins into the Royal Park Bridge abutment and the bulkhead south of the Peruvian Dock walkway. Given that the majority of the bulkhead is uniform, this uniform section is described in detail first, and then areas that are different or have areas of concern are described. Stationing starts at the Royal Park Bridge Abutment and extends to the south.

3.1 Generalized Bulkhead Details

The bulkhead from Sta 0+16 to Sta 14+00 is uniform in construction style. It is comprised of an 11-inch wide concrete cap with 1.5-inch chamfers. Overall, the cap is in fair condition though showing its age with pitting and cracking. Backfill extends to the cap in some areas, while in others, there is approximately a six-inch lip between the grass and the seawall (Figure 3.1).

Figure 3.1: Sta 8+00 looking south. View of backfill close to the bulkhead cap elevation.

The cap is uniform in elevation along the entire length, except between Sta 6+27 to Sta 7+17 and Sta 11+45 to Sta 12+35 where the cap elevation raises to accommodate the storm water outfalls. The cap is typically between elevation 3.1 to 3.2 feet, NAVD ’88 (5.5’ MLLW) based on surveys conducted by Sea Diversified. At the storm water outfalls, the cap increases in elevation to 5.5 feet or 5.6 feet NAVD ’88. The bathymetry at the

base of the bulkhead varies from approximately -5 feet, NAVD ’88 (-2.6 feet, MLLW) to -7 feet, NAVD ’88 (-4.6’ MLLW).

A smooth concrete face extends down the seaward face of the bulkhead. The concrete face stops between six inches and 24 inches above the bottom along almost the entire length of the bulkhead. Steel sheet piling (Figure 3.2) with periodic tie backs (Figure 3.3) are visible within this gap. It is unknown whether the concrete was initially poured to grade and then the bottom was eroded or whether it was designed and constructed with this gap intentionally.

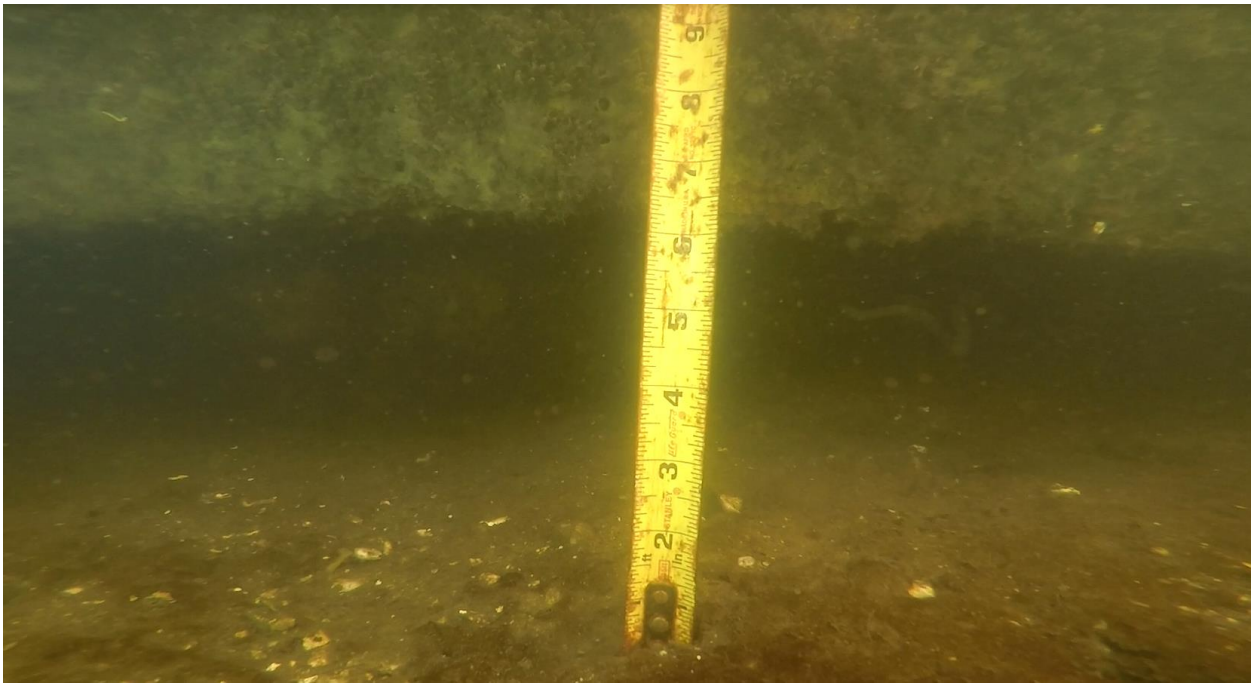

Figure 3.2: Sta 20+00. Gap between concrete face and bottom exposing the sheet pile

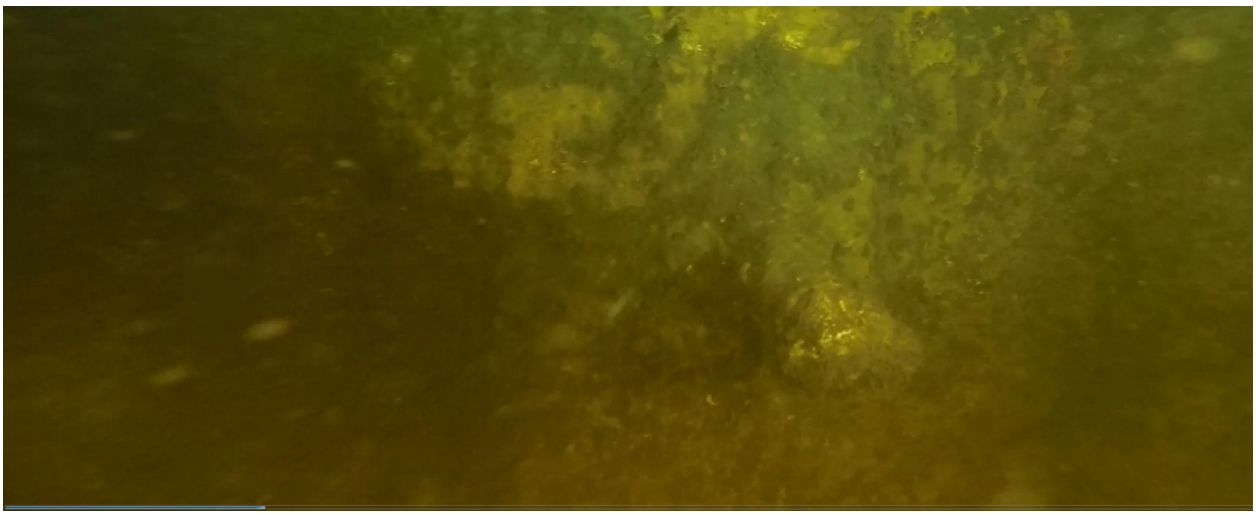

Figure 3.3: Sta 2+90. Apparent end of a tie back.

The concrete face has marine growth starting close to the high water mark (Figure 3.4), though the marine growth is more dense below the mean low water elevation (Figure 3.5). Some rust coloration is visible around some marine growth suggesting that the sheet pile extends into the concrete cap portion of the bulkhead, but it was not possible to determine the top elevation of the sheet piling (Figure 3.6).

Figure 3.4: Sta 2+90. Typical bulkhead face transition from exposed concrete to the concrete covered in marine growth within in the intertidal zone.

Figure 3.5: Typical marine growth on the concrete face of the bulkhead.

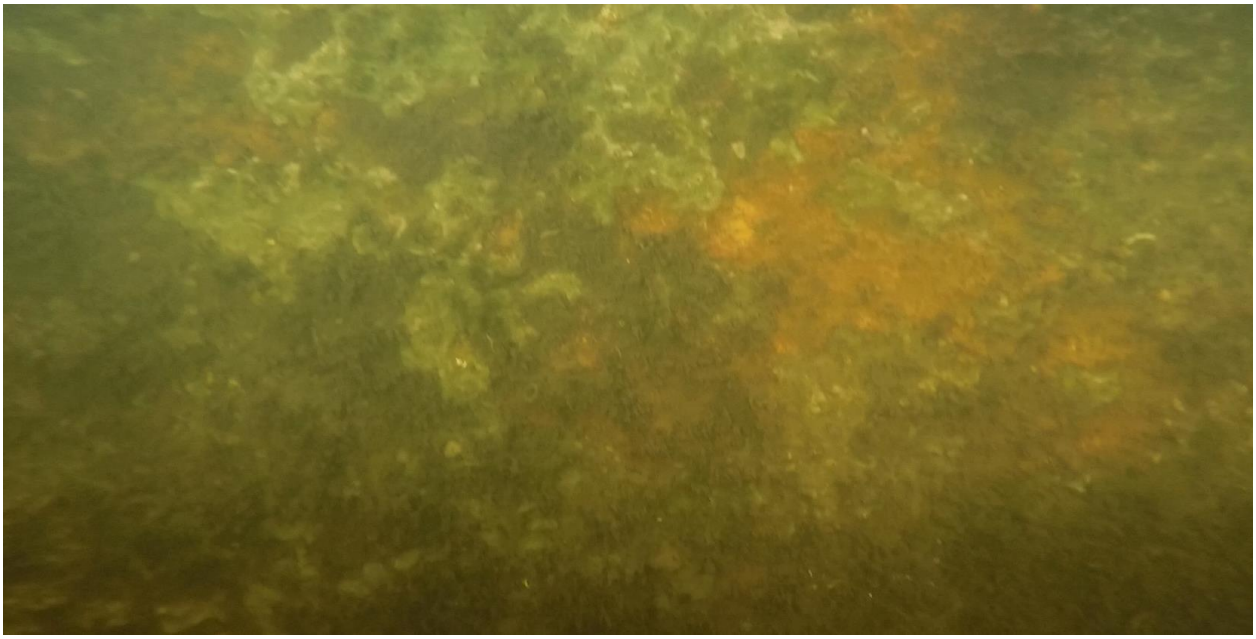

Figure 3.6: Sta 3+30. Infrequent rust coloration of marine growth suggestion corrosion within the bulkhead.

There are expansion joints in the concrete every 20 feet. Filler has been placed in these joints, but in many instances the filler has been degraded, and joint between two adjacent concrete sections extends back to the sheet pile (Figure 3.7).

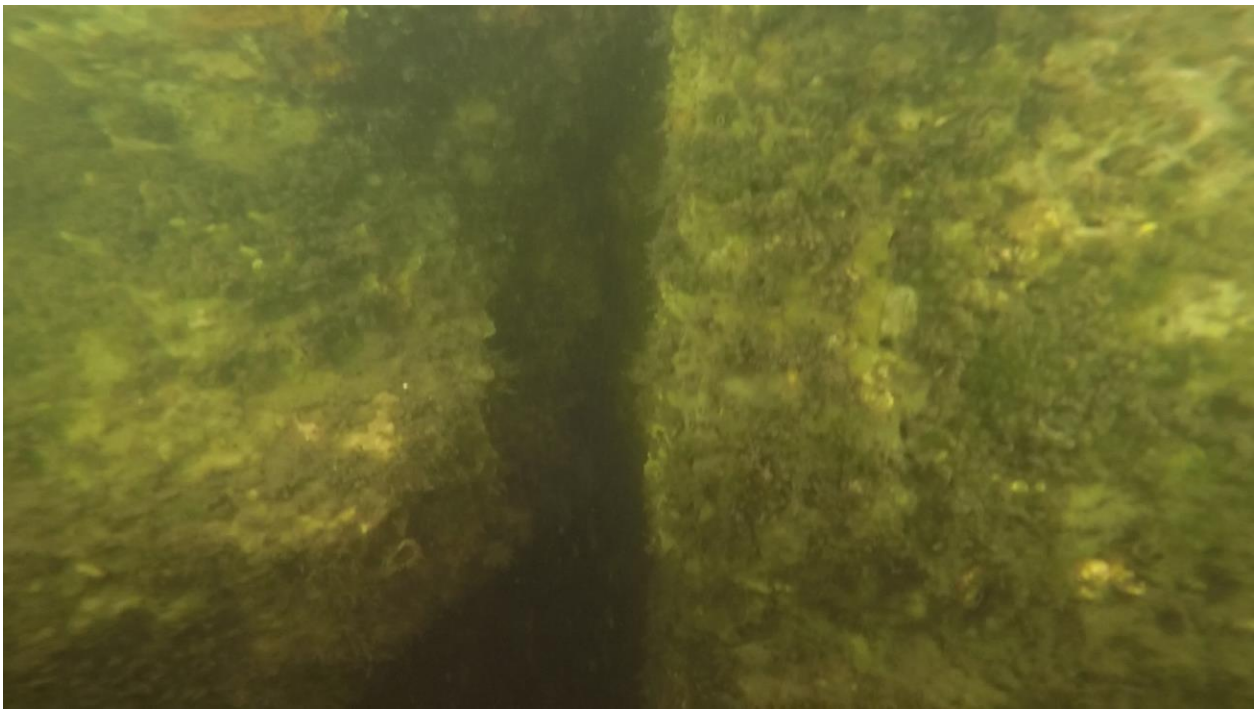

Figure 3.7: Sta 0+70. Crack at an expansion joint in the vertical concrete face.

3.2 Sta 0+00 to Sta 0+15.5 - Northern Return Section

This section of the bulkhead is different in construction style from the majority of the bulkhead fronting Lake Drive Park. This section extends 15.5 feet due west from the Royal Park Bridge abutment to the main north/south section of the bulkhead. It appears that this bulkhead has been repaired multiple times, though none of the repairs appear to be recent. This section of the bulkhead is comprised of a concrete bulkhead with a deep (six-inch wide, six-inch deep) corrugated face (Figure 3.8). There are some remnants of a sheet pile face, though it looks as though this has been removed while leaving concrete fill behind it. There is concrete rubble in front of the vertical face. There is a newer six-inch wide, two-foot high concrete cap that is offset from the lower face of the wall by 1.5-feet.

There are numerous cracks in the lower face of the bulkhead, though there was no apparent loss of backfill to indicate that these cracks extend far enough back to violate the integrity of the bulkhead.

Figure 3.8: Sta 0+02 looking west. Corrugated face and offset cap.

Figure 3.9: Sta 0+03. Horizontal cracks in the concrete bulkhead.

3.3 Sta 14+55 to Sta 15+50 - Peruvian Dock Parking Lot Bulkhead

The bulkhead structure in front of the Peruvian Dock parking lot from Sta 14+55 to Sta 15+50 (Figure 3.10) is different in construction style from the bulkhead fronting Lake Drive Park, though similar to the return wall between Sta 0+00 and Sta 0+16. It is a comprised of sheet pile with concrete back fill that doesn't breach the surface at low tide. A concrete parapet, offset approximately one-foot from the landward edge of the corrugated face, serves as the remainder of the bulkhead. When viewed from above the water line, the change from the bulkhead style extending the majority of Lake Drive Park to this new bulkhead is best approximated by the start of a three-inch wide, horizontally oriented lip that extends from Sta 14+55 to the southern end of the seawall.

The bulkhead ties into the neighbor's wall at the south side of the property, which is higher than the crest of the Town's bulkhead.

Figure 3.10: Sta 15+45 looking north along the bulkhead along the Peruvian Dock Parking Lot.

Figure 3.11 shows the start of the different style of bulkhead. A few elements can be observed in this picture, including that this is a sheet pile face, shown by the rounded edge of the sheet pile and seam. A tie back can also be viewed in this frame and, while less clear, the joint between the extruded bulkhead section and the vertical face of the bulkhead to the north.

Along the southern half of this section, the corrugated section has been undermined, which is a concern for the continued stability of the bulkhead. However, it looks as though this has been the condition of the seawall for a considerable time. It is strange that the sheet pile wasn't extended further into the seabed to avoid this undermining. While unclear due to marine growth, it may be possible that the sheet pile was discontinued or removed.

While not clear, it appears that there is a second wall behind the corrugated section.

There is cracking, spalling, and deterioration underneath the "lip" that extends from Sta 14+55 (Figure 3.13). This is not a critical element of the bulkhead so not in need of imminent repair.

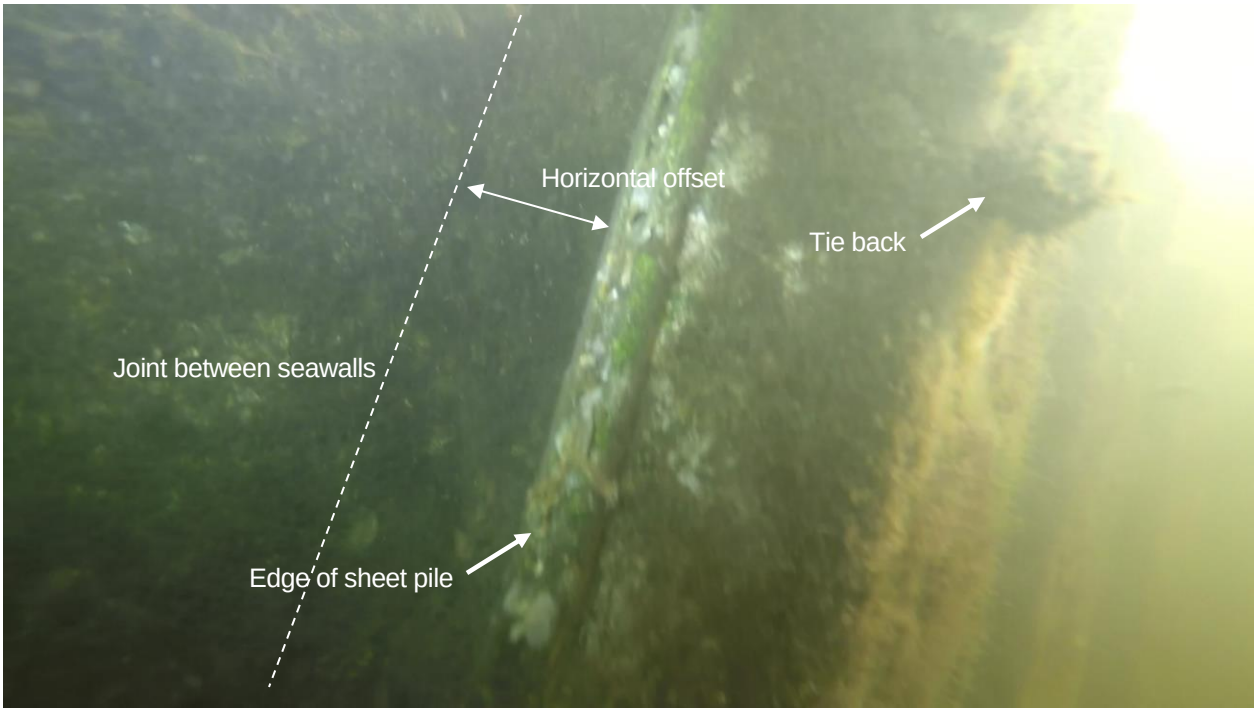

Figure 3.11: Sta 14+55 looking south. This is the start of the different bulkhead style.

Figure 3.12: Sta 15+15. Gap underneath the corrugated section of the bulkhead and vague outline of a secondary sheet pile wall in the background.

Figure 3.13: Sta 15+00. Cracking, spalling and deterioration underneath the lip along the parapet bulkhead section.

3.4 Sta 0+80 to Sta 0+88 - Outfall/ Cable Crossing

There are two outfalls located between Sta 0+80 and Sta 0+88, though these could also be cable crossings as a cable is entering/exiting one of the openings (Figure 3.14). The structure is monolithic concrete, though is covered by a metal plate suggesting that it is hollow in the center. The structure extends 18 feet into Lake Worth Lagoon from the seawall. There is spalling and rebar exposure on the small walkway to the structure (Figure 3.15).

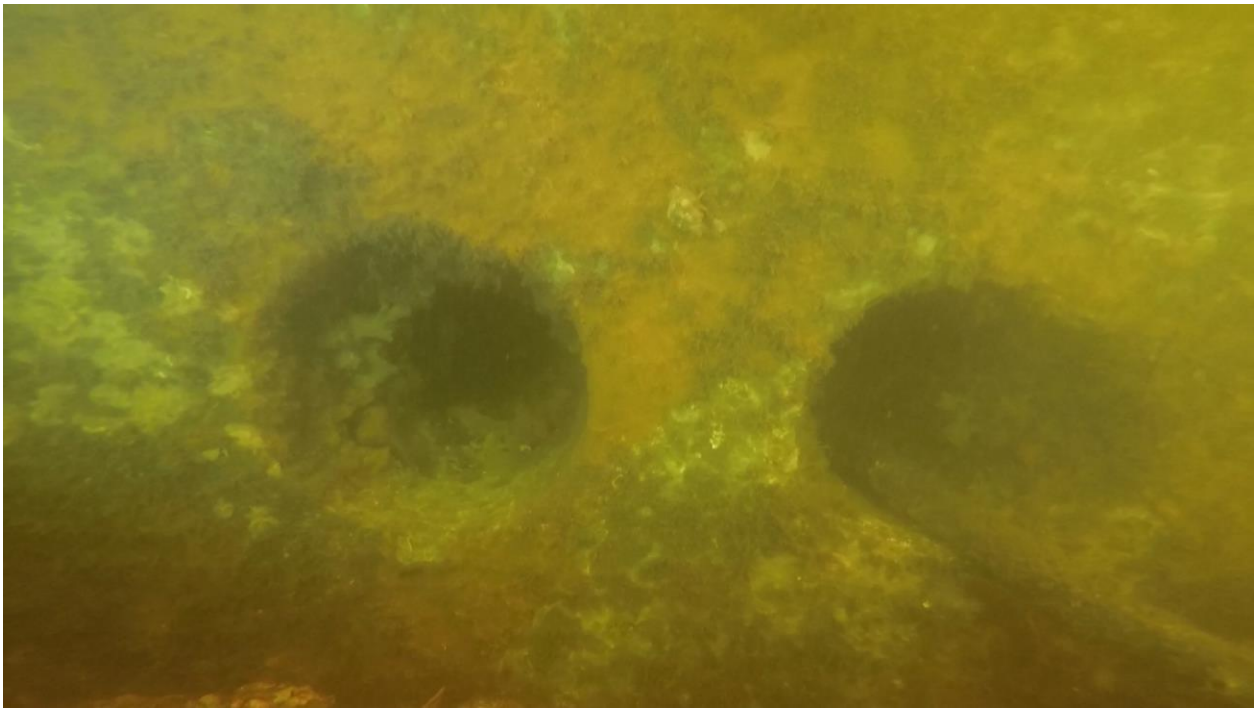

Figure 3.14: Sta 0+84. Western end of outfall structure looking east. Note the cable entering the eastern opening.

Figure 3.15: Sta 0+88 looking north. Spalling and rebar exposure and corrosion of the walkway to the outfall structure.

3.5 Sta 2+10 - Cracked Cap

There is a five-foot long section of cracked and dislocated concrete cap at Sta 2+10. The crack is arched and extends approximately one-foot below the cap, so the bottom of the crack remains above the mean high water line.

Figure 3.16: Sta 2+10. Crack and dislocated concrete cap.

3.6 Sta 10+80 - Backfill Loss

There is an area of backfill loss at Sta 10+80. The Dock Master has marked this area with a cone so that passers-by don't accidentally step in the depression and injure themselves (Figure 3.17). The depression area is approximately six feet across and just less than one foot deep. There were no visible areas of damage either on the landward or seaward side of the bulkhead.

3.7 Sta 9+40 – Backfill Loss

There is a small area of backfill loss immediately in front of the building at the Australian Dock (Figure 3.18). The seaward side of the bulkhead could not be observed with the video equipment because of the building slab blocking access. The area of backfill loss was approximately two feet wide, one-foot long and one-foot deep.

Figure 3.17: Sta 10+80. Area with backfill loss.

Figure 3.18: Sta 9+40. Area of backfill loss in front of Australian Dock office.

4. Repair Options

The existing bulkhead is starting to show its age with cracking and pitting of the concrete and localized corrosion of steel elements, including the sheet piling and concrete reinforcement. The bulkhead is not in immediate need of complete refurbishment, but it is anticipated that repairs to the bulkhead will be needed more frequently and at an increased rate.

Bulkhead structures are inherently difficult to inspect due to the fact that the majority of the structural elements cannot be visually inspected without performing excavation and underwater diving. From Figure 3.3 and Figure 3.11, the bulkhead appears to be tied back using tie rods and presumably a deadman. The condition of the tie rods and deadman are unknown and would require excavation to inspect, which if done, should be done at several random locations to better understand the overall condition. Generally, buried steel corrodes at a decreased rate when compared to steel that is exposed to seawater; however, some soils may have properties that increase the rate of corrosion of buried steel, and understanding the condition of the tie rods and deadman is important as they are primary steel members that provide lateral stability of the bulkhead. Tie rod failures are often dramatic in nature and may result in catastrophic failure of the bulkhead. As discussed below for the repair of backfill loss, it may be prudent to inspect and assess the condition of the tie rods and deadman during this repair.

Evaluating the structural integrity for the as-is condition of the bulkhead cannot be determined without performing a significant field investigation. This would involve excavation behind the bulkhead to expose tie rods and deadman. Underwater diving would also be performed to remove marine growth and measure steel thicknesses and concrete conditions that are currently hidden from view. Performing an as-is structural assessment is exacerbated by the lack of as-built drawings, as member sizes are unknown, as well as geotechnical conditions used when designing the original structure. Some members can be determined from a detailed field investigation, such as sheet pile size and thickness, tie rod sizes, whaler connections, and other exposed structural steel; however, information about rebar within concrete is very difficult to obtain from any field investigation. Thus, even if a detailed field investigation were performed, some assumptions would still need to be made when evaluating the strength of concrete members.

The most cost-efficient method to address all future issues with this bulkhead is to construct a new bulkhead in front of the old one. Sheet piles would be driven approximately one-foot in front of the toe of the old bulkhead and this area backfilled with granular fill or grout. A concrete cap would be poured that would be joined to the existing cap. New tiebacks would be installed and extended through the existing bulkhead.

The gap between the mudline and concrete cap shown in Figure 3.2 means that the concrete is being fully supported in the vertical direction (i.e. in the direction of gravity) by the steel sheet piling. Without existing drawings, it is unknown whether the sheet pile was designed to fully support the concrete cap. It is common practice to support the concrete cap on the sheet pile, but there is no way to confirm this methodology was followed at this time. Either way, the supporting sheet piling is directly exposed to seawater, and there is a potential for increased corrosion beyond what was originally considered in the design. A possible failure mechanism at these locations is the potential for the sheet pile to corrode to the point where it can no longer support the weight of the concrete cap, causing local buckling of the sheet piling and overall vertical displacement and rotation of the concrete cap. Depending on the magnitude of the displacement and rotation, the tie rods will undergo additional stress and may fail. This failure mechanism would likely be triggered by a large rainfall event, which may cause the differential water height between the landside and waterside to increase, thereby exerting additional forces on the bulkhead when compared to its normal operating conditions. Another trigger mechanism would be surcharge loading near the bulkhead, that is, live loads from vehicles, pedestrians, or equipment.

The wider bulkhead base from Sta 14+55 south makes constructing a bulkhead in front of the existing one slightly more challenging. First, the void beneath the existing bulkhead would need to be filled, or that section of the bulkhead should be removed. The former would be easier, though the latter option might be more aesthetically appealing, because it wouldn't protrude out two feet beyond the general alignment of the bulkhead to the north. One advantage of this protrusion is that it could allow the parking lot to be expanded by two feet by removing the existing bulkhead that is above the water line.

The cracked cap at Sta 2+10 should be repaired. This will require removal of the existing cracked concrete. The remaining concrete will be cleaned, with special attention to any exposed rebar. Any exposed rebar with significant section loss would be replaced in kind and doweled into existing concrete. Any new rebar that is doweled into existing concrete should be protected using galvanic anodes due significant potential difference between new and old concrete, which causes rapid corrosion. A concrete form will be erected with dowels extending from the existing concrete into the formed area. New concrete will then be poured.

The two areas currently experiencing backfill loss should be repaired before the bulkhead deteriorates further. This repair will require that the backfill be excavated until the defect in the bulkhead is located. The defect would then be patched from the landward side before backfilling the hole and laying new turf. It is recommended that the tie rods and bulkhead adjacent to the loss of fill location are exposed and inspected during the repair to assess the condition of the tie-back system. This would potentially involve performing additional excavation that is needed for the repair, but the equipment would already be mobilized, and as mentioned, the tie-back system is a critical component to the bulkhead's lateral stability.

For aesthetic purposes, the existing concrete cap could be refaced, though this is not a necessity at this time.

Appendix C

Marina Management Services Market Analysis Report

Baird.

Town of Palm Beach
Town Docks Master Plan
Market Study

PREPARED BY

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March 19, 2018

Table of Contents

Introduction 2

Positioning in the Marketplace 3

Recommendations for the Rebuild of the “Town Docks” 3

- Power Requirements 3
- Dock System 4
- Marina Dock Lighting 6
- Black Water Pump-out System 7
- Secure Dock Access 8
- Marina Parking 9
- Wi-Fi Service 10
- Trash Collection and Disposal 11
  - Recyclables and General Trash 12
  - Waste Oil Containment 12
- Restrooms/Showers 13

Kayak Launching and Docking 14

Marinas Surveyed for Market Analysis 15

Comparable Rate Analysis 19

Introduction

Marina Management Services, Inc. (MMS) was contracted to conduct a market study of comparable marina facilities that compete for the same market segment as the Palm Beach "Town Docks". MMS has completed an in depth and comprehensive Market Analysis based on information gathered from community stakeholders, city administrators, marina patrons as well as strategically targeted area marinas and yacht captains to provide a comprehensive all-inclusive plan for the revitalization of the "Town Docks" located in Palm Beach, Florida.

Seven area marinas were visited by a member of MMS's staff that met with the management of these facilities and interviewed them at great length.

The strategically targeted area marinas were selected for various reasons. Each marina that was selected has its own personality. Each marina that was selected brings to the table good qualities. And each marina that was selected has its own set of challenges. It is the goal of MMS to share as much available information as possible so the decision makers can make wise choices for the revitalization of the "Town Docks".

MMS included local West Palm Beach marinas as well as specific Ft. Lauderdale marinas that serve the same yachting market segment as the "Town Docks" in an effort to share and explore all options for the revitalization of "Town Docks".

Unlike other municipal marinas in the area MMS wanted to preserve what the "Town Docks" meant to the yacht owners and other water recreation users residing in the town of Palm Beach and balance their needs with those of the community at large. MMS has made every effort to blend the two factions to come up with a plan that addresses all the concerns raised while meeting market demand.

Positioning in the Marketplace

The “Town Docks” enjoys a unique reputation in the boating community similar to that of the Town of Palm Beach. Thus the marina should command dockage rates commensurate with the reputation of the town. With that being said the quality of the facility, level of services provided and competency of the staff has to be a cut above other marina facilities in the area. It is MMS’s position that the “Town Docks” do not compete directly with other marinas in the marketplace but the “Town Docks” management needs to be cognizant of changes taking place in other area marinas. The goal should be that the “Town Docks” sets the standard in the marketplace. Once that level of service is achieved dockage rates and increased profitability will follow.

Recommendations for the Rebuild of the “Town Docks”

During the various meetings with different stakeholders and visiting comparable marinas in the marketplace serving a similar segment of the yachting community as those yachts docked at the “Town Docks” MMS has addressed issues it believes important when decisions are being made as to the rebuilding of the “Town Docks”. The order in which these items are presented below in this report are not conducive as to their relevance as each items stands on its own.

Power Requirements

The “Town Docks” will have a variety of slip sizes and thus attract yachts that will require different shore-side power requirements. The goal in rebuilding the “Town Docks” is to provide as many shore-side power options as possible in the rebuild of the marina thus minimizing the need for yachts to run on board generating equipment. This is much more cost-effective for the yacht owner as well as an environmentally friendly solution. It is also the one preferred by both yacht captains and yacht owners.

MMS is recommending that the “Town Docks” provided a range of power options to its customers. In order to do this it is necessary to balance cost with demand. For slips that can accommodate yachts up to sixty feet each slip should be equipped with power pedestals that can accommodate two 50 amp 240 volt receptacles. Typically these types of pedestals as shown here are placed between slips and one pedestal provides an electrical hookup for two adjoining slips. For the larger yachts MMS recommends power distribution

centers that can provide a variety of power options which includes 480v, 240v and 208v 3 phase with up to 200 amps of service as shown below. The exact configuration will be determined based on final marina design. To reduce the size of wire runs needed from the shore side to these units each unit contains step down transformers to provide the power options mentioned above. This type of installation typically will reduce the overall cost of the electrical infrastructure by as much as eight percent.

These power distribution units contain sub meters which allows the marina to pass through the cost of electricity used by each yacht but the marina is not allowed to mark up the per kilowatt cost to the yacht. The marina owner must look to other means in order to recoup the electrical infrastructure cost. Two ways the marinas typically address this issue is one, they charge a monthly connection fee based on the amperage. The second method is based on a straight monthly administration fee. MMS recommends the connection fee method as it presents the fairest way to charge the yacht.

Both the power pedestals and the power distribution centers contain the sub metering that can be remotely monitored and the information is automatically uploaded into most computerized marina management software systems eliminating the need to have dock attendants physically record each meter reading. This also allows the marina's staff to remotely disconnect the power should the need arise.

Dock System

Marina's are what is considered to be "reactionary" by that it means that marina design does not drive the industry but a marina must react to the types of boats being built and bought in the local market. In the case of the "Town Docks" there is another factor to be considered and that is the primary focus should be on satisfying the needs of the local boating community followed by maximizing the income potential from the seasonal transient boat market. When faced with this challenge the marina's design must be as versatile as possible to accommodate an ever-changing market and avoid becoming obsolete.

To meet this challenge MMS is recommending floating concrete double loaded slips without dolphin pilings and using telescoping piles that can accommodate yachts ranging in length from 65 feet to 150 feet as well as at least two end ties that can accommodate yachts of 200+ feet in length. In the final design of the marina there should be considerations given to locations in the marina where smaller slips in the forty to fifty foot range can be placed without compromising the number of larger slips. Slips in this size range will accommodate local residents that currently keep their boats in surrounding marinas but does not constitute the majority in the primary market. The fairways between docks should be 1.5 times the width of the longest yacht that can be accommodated in a slip on that fairway. This type of construction and configuration will provide the greatest flexibility to accommodate the local market demand as well as attract transient yachts ranging in these sizes.

Yacht owners and captains prefer to moor to floating docks as compared to fixed docks for two reasons. First, once secured to the dock, the dock and yacht become a single unit and rise and fall with the tide eliminating the need to continually adjust fenders and mooring lines to keep the yacht secure to the dock. It has been MMS's experience that because the dock and yacht fluctuate with the tide as a single unit overall maintenance cost of docks is significantly reduced. Second, once boarding steps or ramp is in place no further adjustments have to be made to board or disembark the yacht reducing the risk of personal injury. From the marina owners perspective floating docks will always keep sensitive electrical equipment above the water even in extreme tidal conditions when fixed docks could become submerged. MMS is also recommending the use of telescoping pilings as shown here in conjunction with floating concrete docks.

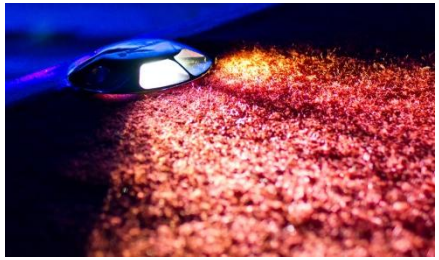
Telescoping piles consist of two steel pilings the outer piling is driven into the bed rock and acts as a sleeve for the inner piling which is fitted in a socket affixed to the dock structure. There are several benefits to this

type of pile system. First, there is not a vertical piling above the dock surface to impede the mooring of a yacht. Notice in the adjoining picture the pilings and the stern of the yacht could swing over the dock and come in contact with a piling causing damage to both the dock as well as the yacht. Second, the usable surface area of the docks is extended providing a safer operating environment and third when no yachts are in the marina the residences have a clear and unobstructed view over the water as compared to the typical floating dock marinas both are pictured here.

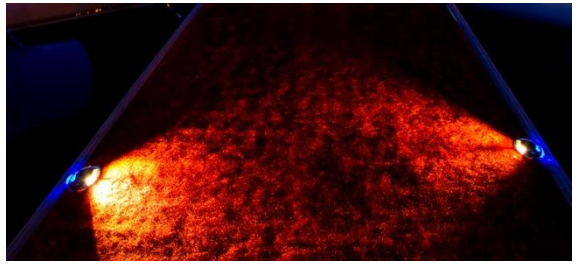
Marina Dock Lighting

A marina's lights serve two main functions. The first and most important function is safety. The second function is that of aesthetics and user comfort. MMS is sensitive to the fact that the "Town Docks" marina patrons and the surrounding neighbors will appreciate a tastefully well-lit facility that is not overstated yet offers safety and a sense of security.

MMS strongly recommends environmentally friendly and energy efficient LED lights for dock lighting of the "Town Docks" similar to the one shown here. The objective is to avoid down lighting or lighting of the water as these types of light can become very obtrusive to the marina customer when on their yacht at night.as well as to the surrounding neighborhood.



The pathway lighting pictured here are two examples of the type of beam the pathway light projects. The light fixture is made from die cast stainless steel designed for a harsh marine environment and casts a flat wide beam of light onto the dock walkway without glare or any upward projection of light. The physical dimensions of the light fixture is less than one inch high and approximately four inches in diameter with no sharp edges minimizing the chance of snagging dock lines or tripping over the fixture. Combinations of light colors can be customized for specific applications. This type of light fixture should also be considered for other applications on the landside walkways and parking areas of the marina.as well. Depending upon the surface the light is projected upon can provide different effects.



Black Water Pump-out System

The marina should be plumbed to be able to receive black water discharged from every yacht berthed in the marina. The plumbing throughout the marina should be passive and in order for a yacht to discharge black water the marina's staff should be contacted and a portable connection should be made. MMS recommends an in-slip centralized pump out system that is comprised of three main components, a land side suction pump shown here on the left and multiple on dock connection points strategically located throughout the marina to minimize the distance from the yachts holding tank discharge connection to the dockside connection point and a transition cart shown here on the right necessary to connect the yacht to the marina's centralized pump-out system. MMS is

recommending the components that should be considered. Design of the system's specific requirements should be a decision left to the engineers and the selected manufacture of pump out equipment.

Under the Clean Vessel Act Grant Program there may be federal monies available to offset the installation cost of this type of system. MMS believes the Town Docks would not qualify since there will not be a general pump out location where any boater may avail themselves to this service. This type of installation is usually in conjunction with a operating fuel dock and imposes a multitude of governmental compliance restrictions. Since the Town Docks will not have a fuel dock nor slips for short term courtesy docking, this is the reason MMS believes the Town Docks will not qualify for grant funding as the system is designed for marina patrons only. MMS does not recommend any change in that policy.

Secure Dock Access

Access to docks in the marina should be limited to yacht owners and crew. All others who request access to the docks should be controlled by the marina's management and security staff. The goal is to create a barrier that is aesthetically pleasing yet highly secure. MMS is recommending a glass barrier as shown here. This type of secured entry does not create a visual barrier between the landside and the waterside yet will keep unauthorized individuals off the docks. MMS is recommending that each entry point have the capability of being remotely controlled from the marina office. Each entry point should be equipped with a video camera, two way voice communications to the marina office, a keyless entry/exit system that has recording capabilities to identify each user and a warning system should the entry gate be left open for any extended length of time.

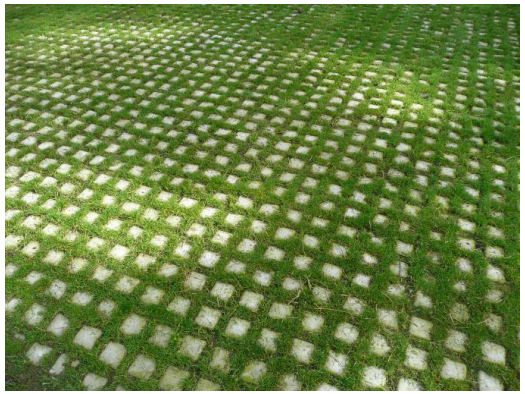
Marina Parking

Parking at the “Town Docks” for marina patrons requires a balance between satisfying the needs of the marina patrons and the aesthetics and inconvenience to local upland residences. This is not unique to the “Town Docks but something almost every marina faces. To satisfy both parties requires compromise and an understanding of the needs of both those parties.

It has been MMS’s experience that the biggest challenge to resolve parking issues is how you accommodate the service provider. Whether it is a service provider called to repair an air conditioner in an upland residence or on a yacht the need to park a service vehicle while the work is being performed is the same. The need for this type of parking is normally during regular business hours. Often time’s equipment is required to be taken on board the yacht therefore dedicated loading and unloading areas be established and restricted to fifteen minute parking. After that the vendor should be required to move his vehicle to either a dedicated marina parking area or street parking the same as any upland vendor.

For those parking lots dedicated to the marina MMS is recommending a parking gate and fob system with remote monitoring to control parking. Each fob should be identifiable as to who it is assigned to and the number of fobs issued for each lot should be one hundred and twenty five percent of the parking spaces available. For example if there are forty dedicated parking spaces in the lot then fifty fobs would be issued. By using this system the marina’s management can monitor the usage and adjust the number of fobs issued for each parking lot based on the utilization of the parking lot. This system will also require setting a limit as to how many fobs each birth holder is entitled to. Over time a pattern will develop and the initial one hundred and twenty five percent rule may be adjusted upward or downward to obtain maximum utilization of the parking spaces dedicated to berths.

Whenever a yacht owner is holding a special party or event for a number of guests on his yacht he should be required to hire a company to provide valet parking for his guests and staged through the loading and unloading areas and not in the gated parking area. This should not be the responsibility of the marina’s management other than to monitor the situation to make sure marina rules are being followed.



Enforcement of any rules regarding parking is the responsibility of the marina's management and must be vigilant at all times because if rules are not consistently enforced uniformly the system will not work.

Lighting in parking areas is important for safety reasons. MMS is suggesting using the same LED puck lights as recommended for dock walkways with limited down lighting preserving the ambiance for the marina patrons and nearby residences.

To keep a park like atmosphere MMS is recommending permeable grass paver parking lots rather than asphalt. Permanent parking spaces can be defined as well as a number of patterns can be imbedded to compliment the application as well as the amount of green grass showing. Using this approach to parking could expand the parking options to accommodate those peak periods without infringing on other public parking. The areas could be sectioned off using a removable bollard and chain approach as shown here to restrict parking to certain areas and only open up those areas as the need arises while keeping the park like atmosphere.

Wi-Fi Service

During interviews with marina customers and stakeholders it became apparent that the current Wi-Fi network for the "Town Docks" is not of the quality or standard expected and needs to be upgraded. Internet access today in a marina is no longer a nice to have, it is a must have. The marina environment requires extra care when planning internet Wi-Fi deployment because each yacht typically has their own Wi-Fi network on board which competes for the same set of reserved radio channels that all Wi-Fi operates on. Additionally, the metal hulls and super-structures of many yachts are not Wi-Fi 'friendly' making the locations of the shore based marina Access Points which provide the internet service to the customers of critical importance. System redundancy, reliability and manageability must be factored into the design and

implementation in order to provide a quality system and thus a quality experience for marina guests. Lastly it must be simple for the guest to use while still providing controls over who has access to the system to prevent unwanted people from using the service. Because of the diversity of yachts that the Town Docks can accommodate the Wi-Fi network should be custom made to address the technical challenges posed by these yachts. Particularly on crewed yachts where the internet may be the only form of entertainment for these crew members the marina must retain control over the bandwidth each user is allowed to use free of charge. MMS recommends the marina impose a charge for excessive use of Wi-Fi bandwidth. A good monitoring system should record the amount of bandwidth each user uses in a twenty-four hour period. If management does not control usage it will be impossible to satisfy the majority of marina customers using the network. MMS recommends using an IT person to design the system who has specific knowledge of system design with a customer base similar to that of the "Town Docks". It has been MMS's experience the system design is based on the individual not a company name.

Trash Collection and Disposal

Trash Collection and Disposal procedures at the "Town Docks" are important to the overall satisfaction of the marina patrons as well as the surrounding upland residences. Convenience and aesthetics play a major role in the success of this process. No matter what procedure is put into place there must be participation and cooperation on the part of the "Town Dock" patrons and marina staff for satisfactory results.

MMS recommends the location of the trash and recycle services are consolidated into a single enclosed area utilizing landscaping to make the area as invisible as possible from the general public and marina customers. This area needs to be secured with access limited to marina employees and yacht owners and or yacht crew. Similar to other gated areas in the marina with restricted access this area should be camera monitored and card access controlled.

Because of the general layout of the property there is not a convenient location for all marina customers to dispose of their own trash or recyclables without creating an issue with parking and adjoining residences therefore MMS is recommending the marina's management implement a program to collect trash dockside and designate an area close to the Public Works property at the north end of the property for the marina's enclosed trash area.

MMS does not recommend placing any kind of permanent trash or recyclable containers on the docks but recommends implementing a policy to pick up these items dockside as they are removed from a yacht and placed on the dock. MMS considers this type of policy as “a value added service” where the marina recoups any additional costs plus recognizes a profit to provide this service. The image the “Town Docks” projects throughout the boating community lends itself to expecting this level of service. MMS is not proposing implementation of any specific policy at this time but it is important to understand how an efficiently designed facility will reduce ongoing operating cost therefore both design and operations should be taken into consideration when planning a new facility.

There are three types of trash that should be accommodated in the designated area, recyclables, general trash and petroleum waste. MMS recommends that the marina’s management contact the Palm Beach Public Works Department and coordinate with them final design to determine accessibility and what receptacles should be used for trash and recyclables to meet the Public Works Department pickup requirements.

Recyclables and General Trash

The marina should implement a program to collect both recyclable waste and general trash to the same degree as the Town of Palm Beach collects such waste. Whatever program is adopted by the marina to collect recyclable waste and general trash should be compliant with the Town of Palm Beach Public Works guidelines. Once the town’s guidelines are understood MMS recommends a program where the marina provides “a value added service” as described above for the handling of both.

Waste Oil Containment

It has been MMS’s experience that regardless of the number of rules or regulations in place for the proper disposal of waste oil in a marina it will become a problem for the marina therefore MMS is recommending providing a secured waste oil disposal area reserved for yachts in the marina. MMS has found that charging a nominal fee to cover the additional labor costs to provide dockside pickup of used oil and other oil contaminated items and maintain the containment area as well as having

the waste oil removed by an approved vendor is not an issue with boaters and should be positioned as part of the marina's environmental policy..

MMS recommends a 500 gallon double-walled steel clamshell design waste oil tank that meets Spill Prevention, Control, and Countermeasure (SPCC) regulations eliminating the need for a secondary containment tank. In addition to disposing of waste oil on a yacht there are oil filters and oily pads that are also discarded. To prevent these items from ending up in the general trash the marina should provide a drum enclosure similar to the one pictured here. This drum enclosure can hold four fifty-five gallon drums and has a sump to hold any spills that can happen when handling used filters and absorbent pads.

MMS also recommends that the waste oil tank and drum enclosure be placed on a concrete pad to keep any spilled waste oil from penetrating the ground. The waste oil containers should be located in the general area along with the trash container.

Marina customers and service providers should not be permitted to dispose of their own waste oil and oil contaminated items to prevent the possibility of spills on docks and other areas of the marina. It is important that marina employees should know what is being placed in the recycle containers to assure proper disposal.

Restrooms/Showers

MMS recommends that the marina's restrooms should be placed at the entrance of each pier and restricted for the use of marina patrons and their guests. Restroom should be secured with access limited to those people with access gate passes to enter the dock. MMS recommends that outside contractors or vendors visiting yachts in the marina do not have unlimited access to the restrooms but must obtain an entry pass

from the yacht they are working on. As with other secured areas in the marina each entry is recorded as part of the security procedure. MMS also feels that showers are not necessary.

Kayak Launching and Docking

During the course of MMS's information gathering process we heard from several local individuals and groups expressing the desire to have a kayak launching and docking facility within the marina redevelopment area. MMS understands the reasons for such a facility and encourages such a facility but it is not a good idea to have it in the proximity of a marina. When a yacht is maneuvering in a marina their ability to alter course is not an option without putting their yacht or other yachts in the marina in harm's way. Similar to driving a vehicle, there is usually a "blind spot" where the driver cannot see the approaching vehicle because of the proximity of the approaching vehicle to your vehicle. This is even more pronounced on a yacht due to the beam of the yacht and height off the water of the pilothouse. A yacht that is backing down usually has no visible line of sight behind the yacht. Therefore MMS recommends that no kayaking be permitted within the marina basin due to the dangers of yachts maneuvering. This rule should apply to everyone even the marina customers who may also own kayaks.

There are a number of launching ramps specifically designed for kayaks. Pictured here is an example of such a floating launch ramp that could be placed in a park like setting where there is minimal current and boat traffic. If space permits a wash down area would be welcomed as well as lockable storage racks that could be constructed and rented eliminating the need for kayakers to have to take home their kayaks when finished. MMS believes that such a facility would be welcomed by the community.

Marinas Surveyed for Market Analysis

The questions asked were carefully crafted based on the driving factors for the revitalization of the "Town Docks" that have been identified by the decision makers and Town Dock patrons.

This Market Analysis will share accurate information on such topics as rates, electrical service, dock systems, parking, landscape, Wi-Fi, security, restrooms/showers and rubbish collection.

The marinas an MMS representative visited were Pier 66, Sunrise Harbor, Hall of Fame Marina, Bahia Mar, and Las Olas Marina in the Fort Lauderdale market and Palm Harbor Marina, and Rybovich in the Palm Beach market. MMS selected these specific marinas to survey as MMS believes these marinas cater to a similar market segment as the Palm Beach "Town Docks".

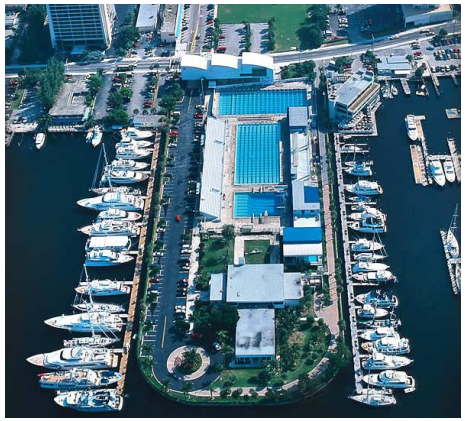
Pier 66 Marina – Ft Lauderdale, FL. – Pier 66 Marina is a full service resort with a 176 slip marina comprised of a combination of fixed and floating concrete docks for yachts up to 350 feet in length...Occupancy averages 48% in summer and 90% in season. The marina promenade and hotel grounds are nicely landscaped providing a private, secluded site within a metropolitan area. Marina customers have access to hotel facilities with designated marina patron paid parking. The marina offers complimentary Wi-Fi, 24 hour security, secured restrooms with showers and laundry, in slip pump-out, dock assistance via golf cart, dockside check in service, tie up assistance for arrivals and departures, provisioning as well as a fuel dock and in slip fuel bunkering is available for marina patrons.

Sunrise Harbor Marina – Ft Lauderdale, FL – Sunrise Harbor Marina is uniquely designed marina with 2,500 linier feet of parallel floating concrete docking that can accommodate various lengths and numbers of yachts up to 200 feet in length. The facility is part of a 352 rental apartment complex that includes 17 guest suites available to marina patrons as well as various retail outlets. Occupancy averages 70% in summer and 100% in season. A pump-out system is plumbed throughout the marina. The marina offers Wi-Fi, on-site security and a water taxi stop which allows marina patrons to visit other parts of Fort Lauderdale including the cultural arts district. Marina patrons enjoy full use of resort amenities including a fitness center, billiard room, tennis courts and club room with catering capabilities as well as concierge service. and complimentary valet parking.

Bahia Mar Yachting Center – Ft Lauderdale, FL – Bahia Mar Yachting Center is a full service Beach Resort with a 242 slip marina comprised of floating concrete docks accommodating yachts up to 300 feet in length along a 3,000 foot parallel dock. Occupancy averages 68% in summer and 85% in season. Patrons enjoy full use of the hotel facilities with designated paid marina parking. The marina offers Wi-Fi, 24 hour on-site security, restrooms, showers, laundry and 3 strategically

located pump-out stations on the headwalls' of B,G and H Docks. The facility offers high speed fueling, a marine store as well as several marine related vendors including such services as fishing and sightseeing charter boats, yacht brokers and a yacht insurance company. Golf cart assistance from the parking lots to the yacht is available on request as well as full concierge services; the "Captains Quarters Clubhouse" is a lounge equipped with billiard tables and is restricted for the enjoyment of yacht captains and crew. The marina is home of the Fort Lauderdale International Boat Show. It should be noted that the entire property s scheduled to be totally renovated within the near future.

Hall of Fame Marina – Ft Lauderdale, FL – Hall of Fame marina has 40 floating wood slips and can accommodate yachts up to 135 feet on the north dock and 70 feet on the south dock. Occupancy averages 83% in summer and 100% in season. The marina has very limited parking available with minimal landscaping as it surrounds the Swimming Hall of Fame. Wi-Fi is available and security is limited to gated access to the slips. The marina provides its patrons restrooms, showers and laundry facilities. The marina does not have a fuel dock but fuel can be delivered to yachts via truck. The marina uses portable pump-out carts. The marina is adjacent to several restaurants, the Fort Lauderdale beach promenade and an abundance of nightlife. Hall of Fame Marina for all its shortcomings as compared to other marinas in the area it prides itself for having a comfortable laidback atmosphere with a real community feel.



Las Olas Marina – Ft Lauderdale, FL – Las Olas Marina is a municipal owned and operated marina. The facility has 61 floating concrete slips that can accommodate yachts up to 129 feet in length. Occupancy averages 25% in summer and 95% in season. The complex features two smaller docks which offer daily boat dockage for boats up to about 30 feet as well as a temporary anchorage area across the inter coastal waterway from the marina. Wi-Fi is available and security is limited to gated access to the slips. The marina

provides its patrons restrooms, showers and laundry facilities. The marina does not sell or allow truck delivery of fuel. There is one pump-out location in the marina and parking is provided in a municipal parking adjacent to the marina.

Rybovich Boatyard and Marina – West Palm Beach, FL – Rybovich Boatyard and Marina is a working-style marina facility as well as a full service boatyard. The marina often acts as a staging area for the patrons of the boatyard. The marina and boatyard can accommodate yachts up to 300+ feet in length. The facility has 57 floating concrete slips. . Occupancy averages 50% in summer and 100% in season. The marina allows fuel truck in slip fueling and provides portable pump out services. Other amenities and services provided include: weekly crew-oriented events, complimentary parking, pool, fitness center, lounge, restrooms, showers, laundry, golf cart service and a complimentary shuttle service to the patron's desired location. Wi-Fi service is available. Roaming security is provided as well as a gate guard at the entrance. Although it should be noted when an MMS representative went to visit a yacht captain of a Palm Beach residences yacht the MMS representative was waved through the gate no questions asked.

Palm Harbor Marina – West Palm Beach, FL – Palm Harbor Marina Located in the heart of West Palm Beach and offers 300 floating concrete docks that can accommodate yachts up to 250 feet in length with 40% occupancy in the summer and 100% occupancy in the winter. The marina has a gated parking lot designated for the marina patrons. Wi-Fi is available

and security is limited to gated access to the slips. The marina offers a private clubroom, fitness center, business center, and game room to marina patrons. Palm Harbor Marina features an upscale deli open to the general public. The marina provides a fulltime concierge service as well as a dockside golf cart pickup and drop off service. The marina provides its patrons restrooms, showers and laundry facilities as well as having a pump-out connection at each slip. Fuel is available at the fuel dock.

Comparable Rate Analysis

MMS has prepared a comparable rate analysis on the following page for the marinas it believes will serve the same segment of the yachting community. No two marinas are exactly alike therefore when preparing a comparable rate analysis it is important to take into account non marina features that have an impact on the rates a marina can charge. A large factor in determining rates is the quality and level of service the marinas' staff provides its customers. MMS assumes that the Town of Palm Beach will demand from its marina's staff the quality and level of service commensurate with the reputation of the Town.

MMS is proposing the following opening in-season rates for the rebuilt marina. These rates may be adjusted upward or downward for preopening construction rate special, seasonality changes, special events, etc. The rates a marina typically charges particularly to larger yachts may seem high to those not familiar with the cost of operating and maintaining the yacht but annual dockage cost is usually less than 5% of the total annual costs of operating and maintaining the yacht.

(Rates are based on per foot per day)	DAILY			MONTHLY			ANNUAL		
TOWN DOCKS	0-100+/-	101--200+/-	201+	0-100+/-	101--200+/-	201+	0-100+/-	101--200+/-	201+
Proposed Rebuilt Opening Rates	**$3.95**	**$4.95**	**$5.95**	**$3.35**	**$4.35**	**$5.50**	**$3.25**	**$4.25**	**$5.25**

(Rates are based on per foot per day)	DAILY			MONTHLY			ANNUAL		
MARINA	0-100+/-	101--200+/-	201+	0-100+/-	101--200+/-	201+	0-100+/-	101--200+/-	201+
Fort Lauderdale Marinas									
PIER 66	$4.55	$7.08	$8.50	$4.04	$6.58	$8.00	$2.48	$3.58	$4.75
BAHIA MAR	$4.83	$7.00	$7.00	$3.92	$6.75	$6.75	$2.58	$4.00	$4.00
HALL OF FAME - NORTH	$3.95	$3.95	$3.95	$3.40	$3.40	$3.40	$2.45	$2.45	$2.45
HALL OF FAME - SOUTH	$2.60	$2.60	$2.60	$2.35	$2.35	$2.35	$1.40	$1.40	$1.40
LAS OLAS	$2.48	$4.15		$2.11	$3.53		$1.37	$2.28	
SUNRISE HARBOR	$4.50	$4.63	$4.75	$4.25	$4.38	$4.50	$4.02	$4.14	$4.25
West Palm Beach Marinas									
PALM HARBOR	$3.30	$3.80	$4.10	$2.28	$2.75		$2.15	$2.40	
RYBOVICH	$4.00	$4.75	$5.75	$3.25	$4.25	$5.25	$3.25	$4.25	$5.25
Average Fort Lauderdale Market	$3.82	$4.90	$5.36	$3.35	$4.50	$5.00	$2.38	$2.97	$3.37
Average West Palm Beach Market	$3.65	$4.28	$4.93	$2.77	$3.50	$5.25	$2.70	$3.33	$5.25
Average Overall Market	$3.78	$4.74	$5.24	$3.20	$4.25	$5.04	$2.46	$3.06	$3.68
TOWN DOCKS									
Current Rates	$3.34	$3.72	$4.02	$2.31	$2.55	$2.78	$1.13	$1.32	$1.47
Comparison to Average Rates									
Fort Lauderdale Market	($0.48)	($1.18)	($1.34)	($1.04)	($1.95)	($2.22)	($1.25)	($1.65)	($1.90)
West Palm Beach Market	($0.31)	($0.56)	($0.91)	($0.46)	($0.95)	($2.47)	($1.57)	($2.01)	($3.78)
Overall Market	($0.44)	($1.02)	($1.22)	($0.89)	($1.70)	($2.26)	($1.33)	($1.74)	($2.21)
Proposed Rebuilt Opening Rates	**$3.95**	**$4.95**	**$5.95**	**$3.35**	**$4.35**	**$5.50**	**$3.25**	**$4.25**	**$5.25**
Percentage Change From Current Rate	18.3%	33.1%	48.0%	45.0%	70.6%	97.8%	187.6%	222.0%	257.1%

It should be noted that current rates charged by the “Town Docks” are below comparable dockage rates for facilities accommodating the same market segment. Although there most likely will be resistance to charging the proposed rates when the marina is rebuilt the Town administrators must take into consideration the investment being made in the new marina and the level of services being provided. MMS believes even though “Town Docks” is a municipally owned and operated marina the marina should be a self sustaining operation similar to any privately owned and operated business and is entitled to a fair return on their investment with any excess funds received out of the operation can then be channeled to other community uses.

Appendix D

REG Architects Architectural Renderings

PROPOSED PALM BEACH DOCKS RENOVATION
AERIAL VIEW

02/26/18
DRAFT

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REG
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PROPOSED RENOVATION PALM BEACH DOCKS
GENERAL VIEW

02/26/18
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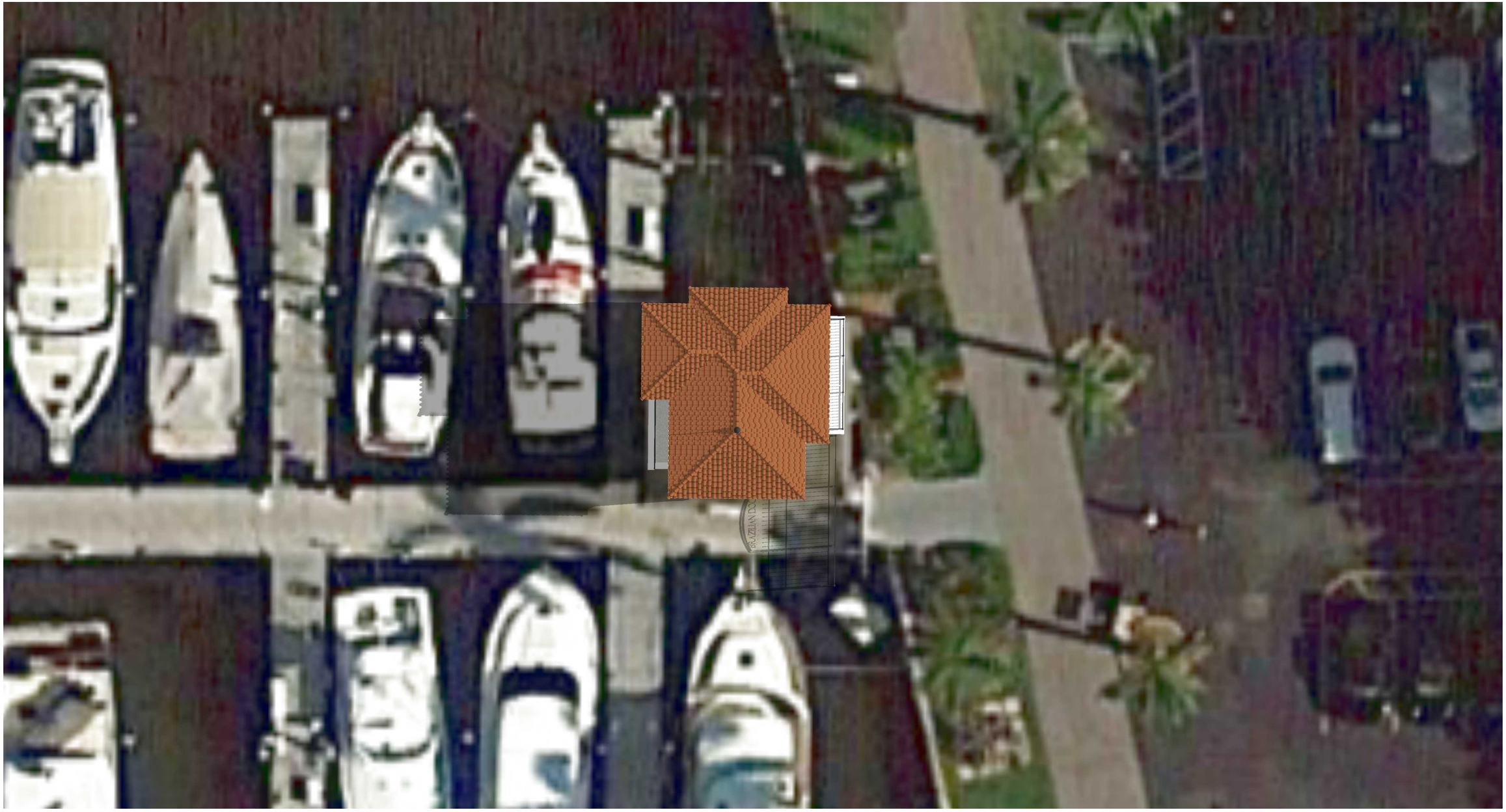

PROPOSED BRAZILIAN DOCK
ROOF PLAN

02/26/18
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Planners
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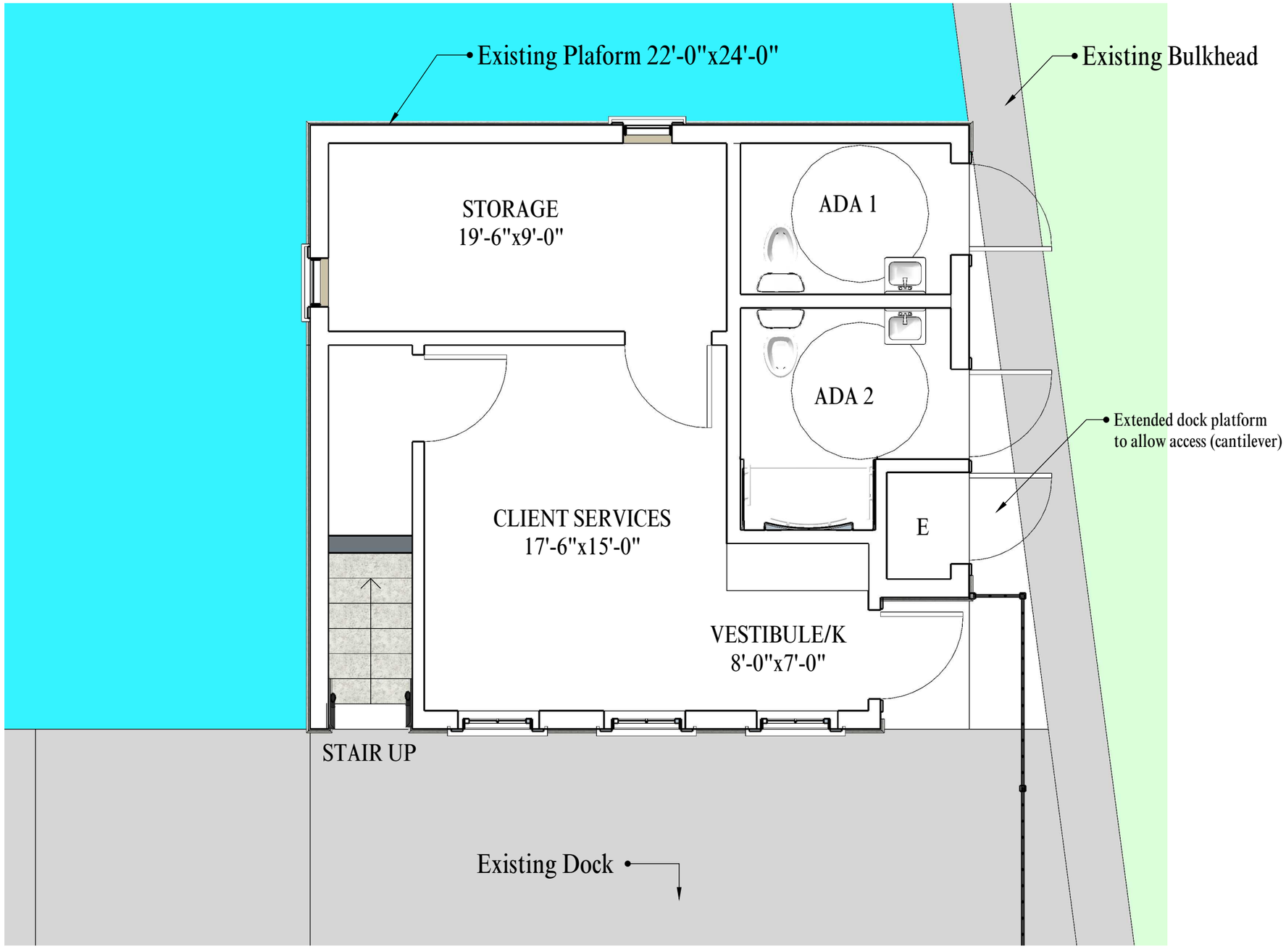

PROPOSED BRAZILIAN DOCK
FIRST FLOOR PLAN 1/4"=1'

02/26/18
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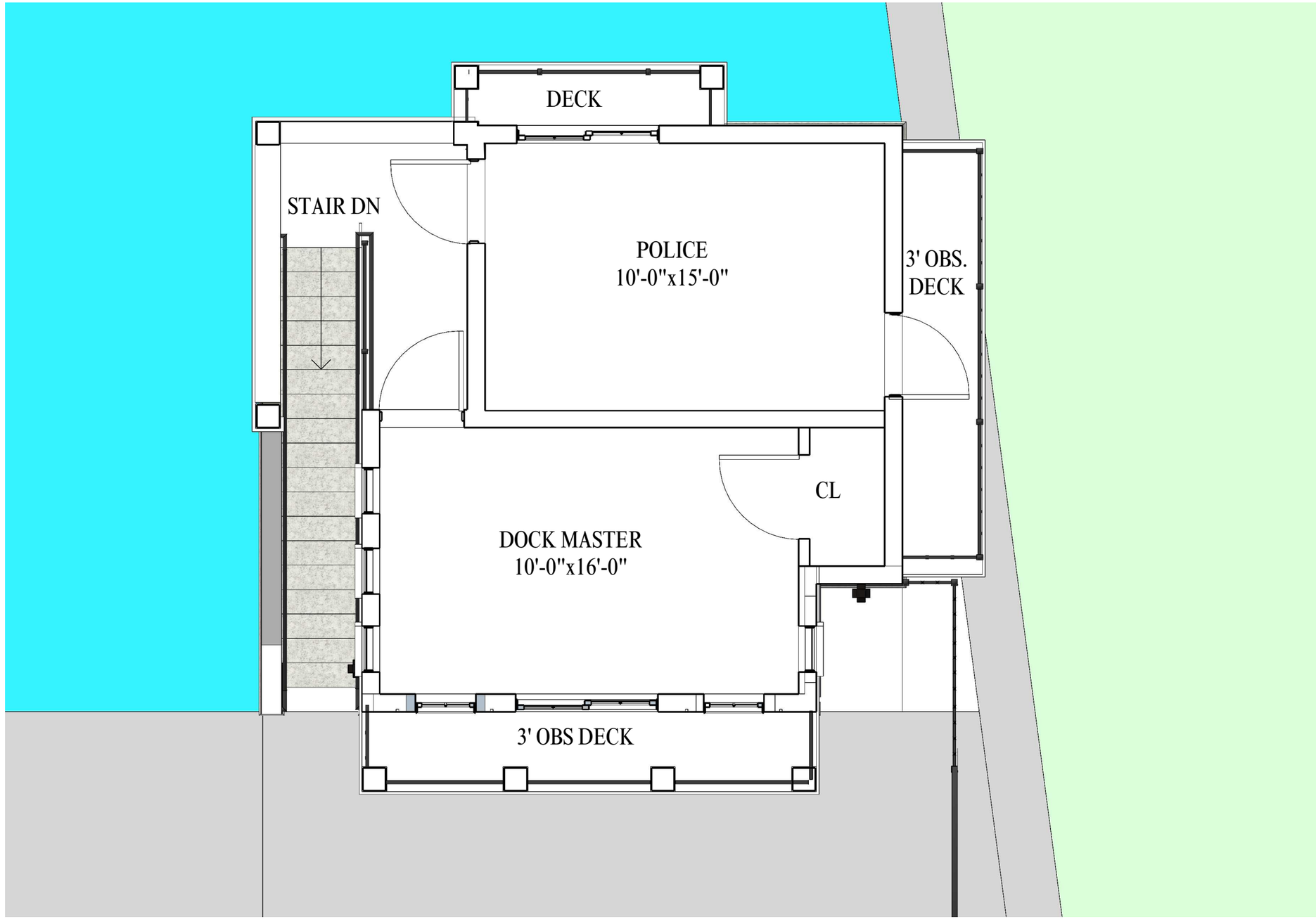

PROPOSED BRAZILIAN DOCK
SECOND FLOOR PLAN 1/4"=1'

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PROPOSED BRAZILIAN DOCK
SOUTH VIEW

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PROPOSED BRAZILIAN DOCK
NORTHWEST VIEW

02/26/18
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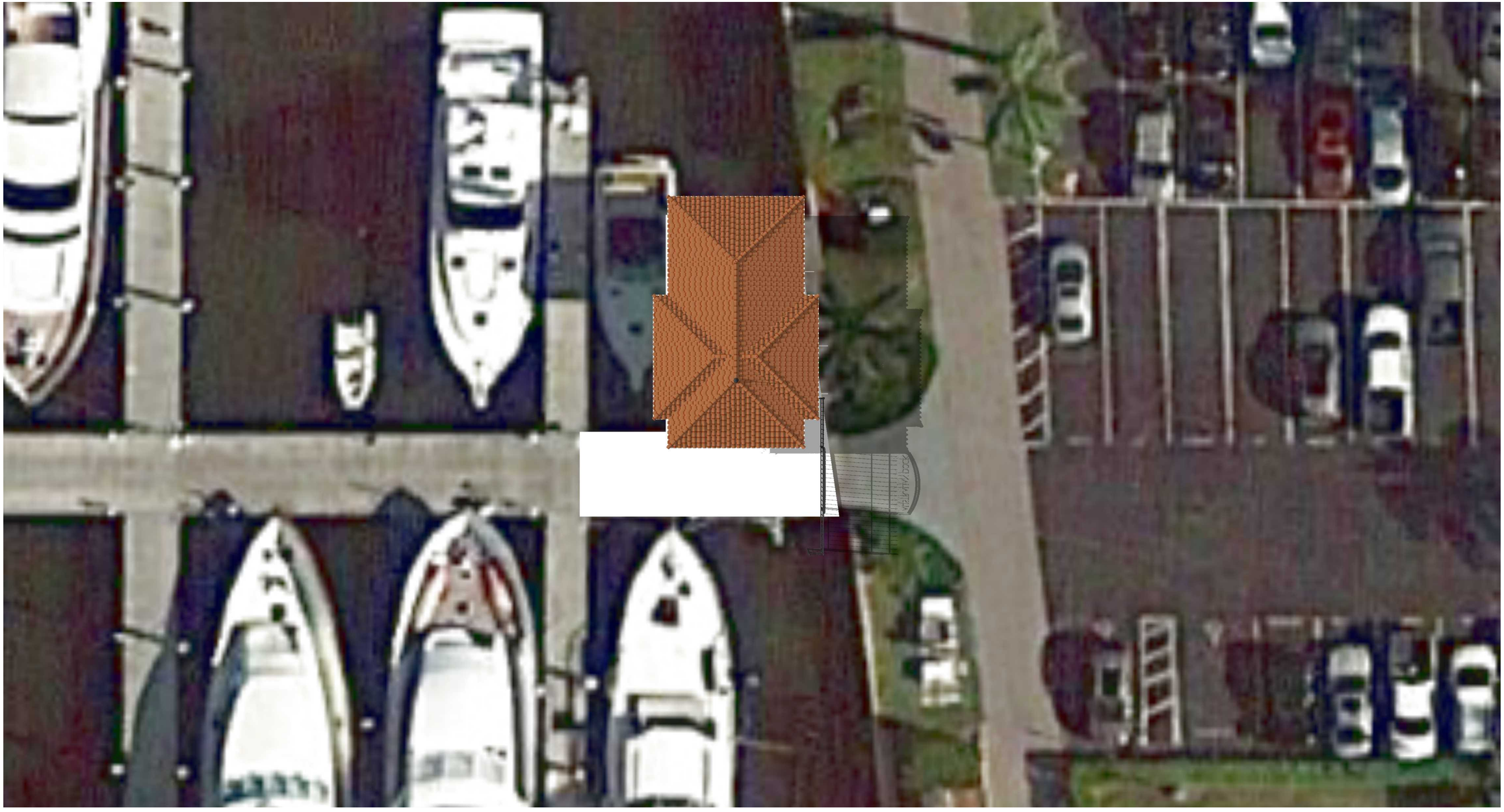
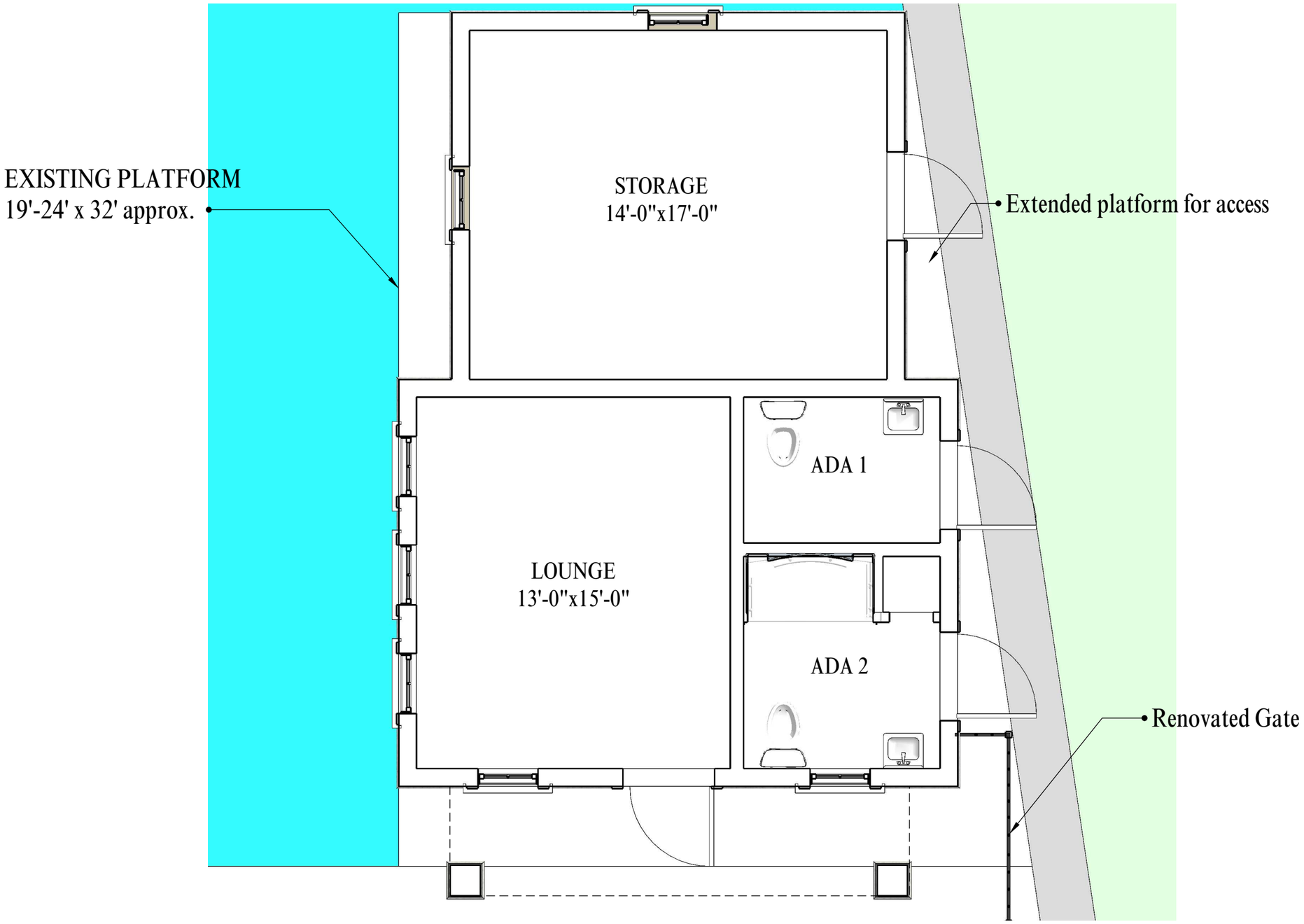


PROPOSED AUSTRALIAN DOCK
ROOF PLAN

02/26/18
DRAFT

Lic.# AA0002447
REG
Architects
Interiors
Planners
561.659.2383



PROPOSED AUSTRALIAN DOCK
FLOOR PLAN 1/4"=1'

02/26/18
DRAFT

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Interiors
Planners
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PROPOSED AUSTRALIAN DOCK
SOUTHEAST VIEW

02/26/18
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PROPOSED RENOVATION PALM BEACH DOCKS
PERUVIAN DOCK ROOF PLAN

02/26/18
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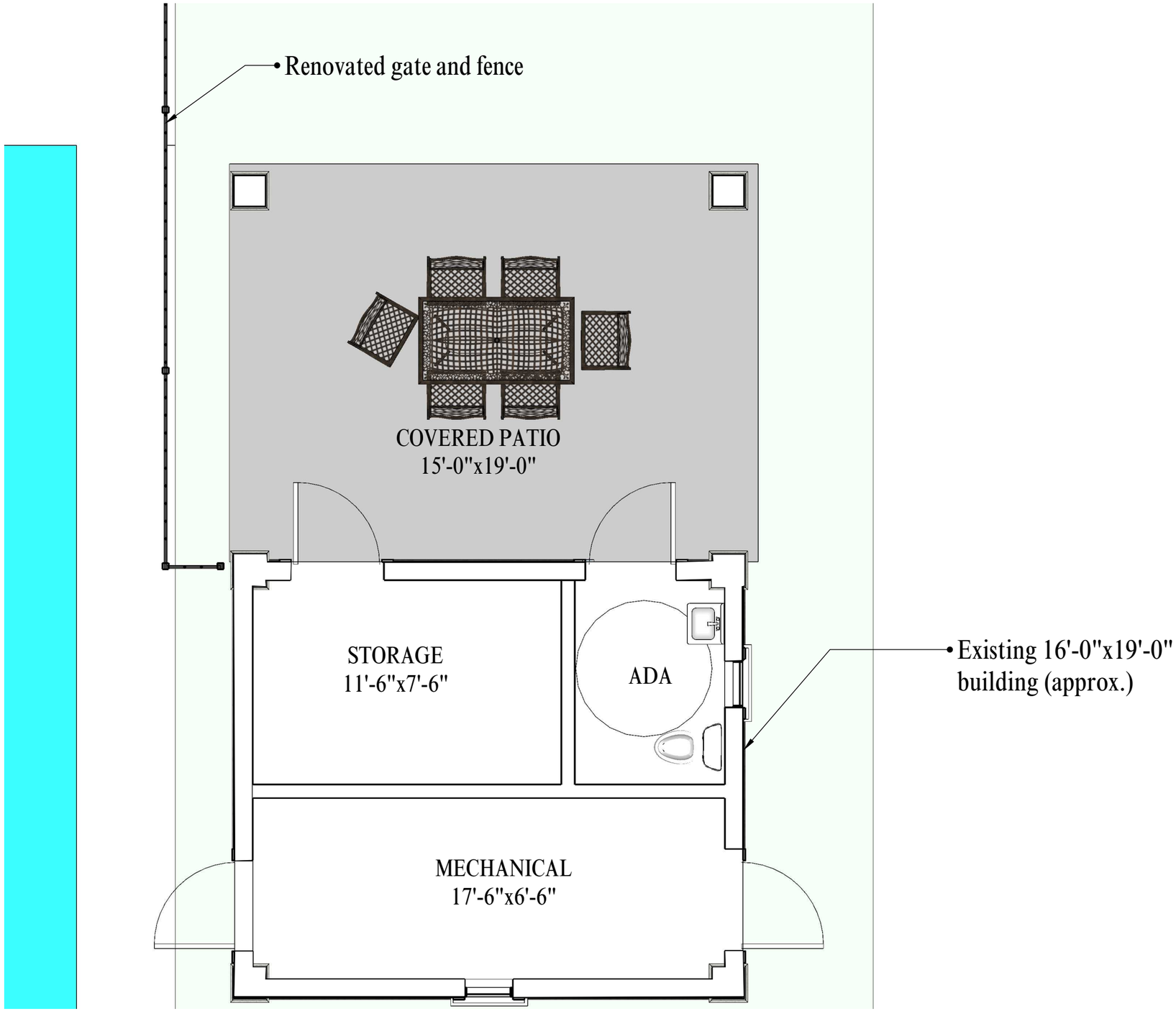

PROPOSED PERUVIAN DOCK
FLOOR PLAN 1/4"=1'

02/26/18
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PROPOSED PERUVIAN DOCK
EAST VIEW

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PROPOSED PERUVIANDOCK
NORTH VIEW

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Appendix E

2018 Town of Palm Beach Docks Fee Schedule

Baird.

Town of Palm Beach Docks
Fee Schedule

Rates include "per foot" and "total fee"

Fees listed do not include sales tax.

Annual Leases

Annual Lease (December 1 - November 30)					
Slip Size	**Per Foot**	**Sub Total**	**Utility Fee**		**Total**
50	$ 1.11	$ 20,257.50	2%	$ 405.15	$ 20,662.65
60	$ 1.11	$ 24,309.00	2%	$ 486.18	$ 24,795.18
80	$ 1.18	$ 34,456.00	2%	$ 689.12	$ 35,145.12
100	$ 1.22	$ 44,530.00	2%	$ 890.60	$ 45,420.60
110	$ 1.22	$ 48,983.00	2%	$ 979.66	$ 49,962.66
120 single phase	$ 1.26	$ 55,188.00	2%	$ 1,103.76	$ 56,291.76
120 three phase	$ 1.35	$ 59,130.00	2%	$ 1,182.60	$ 60,312.60
130 single phase	$ 1.26	$ 59,787.00	2%	$ 1,195.74	$ 60,982.74
130 three phase	$ 1.35	$ 64,057.50	2%	$ 1,281.15	$ 65,338.65
150	$ 1.40	$ 76,650.00	2%	$ 1,533.00	$ 78,183.00
160	$ 1.40	$ 81,760.00	2%	$ 1,635.20	$ 83,395.20
172	$ 1.42	$ 89,147.60	3%	$ 2,674.43	$ 91,822.03
262	$ 1.47	$ 140,576.10	4%	$ 5,623.04	$ 146,199.14

Fees for additional cord for shore power	
100 amp single phase	$.25 per foot/day
100 amp three phase	$.40 per foot/day
200 amp three phase	$.70 per foot/day

Town of Palm Beach Docks
Fee Schedule

Rates include "per foot" and "total fee"

Fees listed do not include sales tax.

Daily Transient Fees

Winter (October 1 - May 31)			Summer (June 1 - September 30)		
Slip Size	Per Foot	Total	Slip Size	Per Foot	Total
50	$ 3.33	$ 166.50	50	$ 1.76	$ 88.00
60	$ 3.33	$ 199.80	60	$ 1.76	$ 105.60
80	$ 3.35	$ 268.00	80	$ 1.91	$ 152.80
100	$ 3.48	$ 348.00	100	$ 1.98	$ 198.00
110	$ 3.48	$ 382.80	110	$ 1.98	$ 217.80
120	$ 3.75	$ 450.00	120	$ 2.12	$ 254.40
130	$ 3.75	$ 487.50	130	$ 2.12	$ 275.60
150	$ 3.83	$ 574.50	150	$ 2.18	$ 327.00
160	$ 3.83	$ 612.80	160	$ 2.18	$ 348.80
172	$ 3.90	$ 670.80	172	$ 2.19	$ 376.68
262	$ 4.02	$ 1,053.24	262	$ 2.26	$ 592.12

Monthly Transient Fees

Winter (October 1 - May 31)			Summer (June 1 - September 30)		
Slip Size	Per Foot	Total	Slip Size	Per Foot	Total
50	$ 2.29	$ 3,435.00	50	$ 1.46	$ 2,190.00
60	$ 2.29	$ 4,122.00	60	$ 1.46	$ 2,628.00
80	$ 2.34	$ 5,616.00	80	$ 1.48	$ 3,552.00
100	$ 2.42	$ 7,260.00	100	$ 1.55	$ 4,650.00
110	$ 2.42	$ 7,986.00	110	$ 1.55	$ 5,115.00
120	$ 2.55	$ 9,180.00	120	$ 1.66	$ 5,976.00
130	$ 2.55	$ 9,945.00	130	$ 1.66	$ 6,474.00
150	$ 2.62	$ 11,790.00	150	$ 1.70	$ 7,650.00
160	$ 2.62	$ 12,576.00	160	$ 1.70	$ 8,160.00
172	$ 2.68	$ 13,828.80	172	$ 1.71	$ 8,823.60
262	$ 2.78	$ 21,850.80	262	$ 1.79	$ 14,069.40

Utility Fees			
50 amp	$10 per day / per cord	100 amp three phase	$50 per day / per cord
100 amp single phase	$20 per day/per cord	200 amp three phase 480V	$150 per day/per cord