


City of Alexandria, Virginia

MEMORANDUM

DATE: MARCH 23, 2017
TO: THE HONORABLE MAYOR AND MEMBERS OF CITY COUNCIL
FROM: MARK JINKS, CITY MANAGER 
SUBJECT: 2017 MARINA FEASIBILITY STUDY

In adopting the Waterfront Plan implementation priorities, City Council received public comments on the effect the Waterfront Plan and the agreement with the Old Dominion Boat Club would have on recreational boating and docking facilities. Public comments were largely from leisure boaters who rent boat slips at the City Marina from the City, and who felt at risk for the Waterfront Plan where buildout would reduce the number of leisure slips available. As a result, City Council authorized the City Manager to direct the Department of Recreation, Parks & Cultural Activities (RPCA) to undertake a study to assess boating demand, the marina program, and opportunities of maintaining and/or expanding marina facilities along the City's waterfront.

The City, through RPCA, commissioned the marine engineering and consulting firm of Moffatt & Nichol to study and evaluate sites for the potential expansion of marina facilities. The location, size, and layout of marina facilities for the individual sites in this study is only intended to assess the potential maximum number of slips based on physical, environmental, regulatory, and operational considerations. As implementation of the Waterfront Plan progresses, if the City elects to move forward with expanded marina facilities, a more detailed study will need to be performed to finalize a marina program, including the number, size & distribution of slips, the waterside & upland amenities, and facility access requirements. It should be noted that the 10-year City CIP does not fund the building of new large docks contemplated in the Waterfront Plan (foot of King, new commercial piers just north of the Chart House), and as a result there is little risk that the leisure slips will be eliminated or substantially reduced in the foreseeable future.

Attachment: February 2017 Marina Feasibility Study

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MARINA FEASIBILITY STUDY

CITY OF ALEXANDRIA, VA

Prepared for:

CITY OF ALEXANDRIA

Department of Recreation, Parks & Cultural Activities

Park Planning, Design, and Capital Development

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February 2017

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FOREWARD

The City of Alexandria commissioned Moffatt & Nichol to study and evaluate sites for the potential expansion of marina facilities. The location, size, and layout of marina facilities for the individual sites in this study is only intended to assess the potential maximum number of slips based on physical, environmental, regulatory, and operational considerations. As implementation of the Waterfront Small Area Plan progresses and the City elects to move forward with expanded marina facilities, a more detailed study will need to be performed to finalize a marina program, including the number, size & distribution of slips, the waterside & upland amenities, and facility access requirements.

1. EXECUTIVE SUMMARY

The City of Alexandria has historically embraced its active waterfront, from its pivotal role in supporting waterborne commerce during America’s colonial period to shipping machines and equipment to support the war efforts in the mid-20th century. Over the past 40 plus years, the City has continued to support its active waterfront, with land and water based recreational, educational, and entertainment activities supplanting commercial uses. The City Marina is one of the primary anchors of this active waterfront.

The City’s waterfront is at the precipice of change once more, with the planned implementation of the Waterfront Small Area Plan (WSAP). The WSAP will relocate existing water-based facilities including the City Marina to align with the passive and active improvements planned on the land side. This realignment will reduce the size of the City Marina; however the WSAP identified opportunities to offset the reduction by constructing new public and/or private marina facilities in other areas along the City’s core waterfront. The settlement agreement between the Old Dominion Boat Club (ODBC) and the City, however, may further reduce the size of the City Marina in the short-term and affect long-term opportunities to add boat slips in the core waterfront area.

A marina feasibility study was conducted to assess boating demand, the marina program, and opportunities of maintaining and/or expanding marina facilities along the City’s waterfront.



Existing City Marina Piers A/B and E/F

Marina Site Selection

A siting analysis was performed based on market, physical, environmental, and operational criterion to identify suitable marina locations along the City’s core waterfront; from Robinson Terminal South (RTS) to Robinson Terminal North (RTN). The siting analysis utilized the results of the marina market study, which indicated a demand of an additional 550 wet slips in the NOVA/DC market over the next 10 to 15 years due to underserved population, population growth and new developments along the Alexandria Waterfront. Comments and feedback from boaters were also factored into site selection process. Four potential sites were identified within the core waterfront area.

City Marina – King Street Pier – A marina providing long-term slip leases may be constructed in an expanded marina basin seaward of the Torpedo

CITY MARINA-KING STREET PIER

Strengths

- *Maintains current location with convenient access to parking and entertainment/retail/restaurants.*
- *The 56 wet slips, 10 transient wet slips, and 200 linear feet of transient dock replaces current marina in kind.*
- *Site is more sheltered from waves, ice, and debris.*

Weaknesses

- *Limited expansion potential in future.*
- *Short and long-term use affected by ODBC settlement agreement.*
- *Commercial and recreational boating competing for limited space.*

Construction Cost

- *May range from \$7,500,000 to \$9,000,000.*

Factory. This location provides long-term boaters a direct link to the historical and entertainment districts of the City. A total of 56 slips and 200 linear feet of transient side-tie docking may be constructed at this location without significant revisions to the WSAP or commercial slips east of the Charthouse Restaurant. A pier north of the commercial slips may berth up to 10 vessels and can be operated as transient or long-term leasable slips. The total number of proposed leasable slips in this area is commensurate with the total number of leased slips in the existing City Marina. Transient space is increased. The site would likely require a wave/debris structure to provide protection against waves, currents, and debris and to minimize sediment infilling.

Point Lumley Facility - Marina facilities seaward of the proposed renovated Waterfront Park are not planned due to the stated goals of the WSAP but ODBC has a 10-year option period to construct 56 wet slips in front of the adjoining City owned property (204 Strand Parcel D/208 Stand Parcel B)

POINT LUMLEY FACILITY

Strengths

- *Potential for 56 wet slips of varying slip size; slightly less than City marina slip count.*
- *Ability to expand to the south in connection with RTS parcel.*

Weaknesses

- *Water area riparian rights to ODBC for 10-years (2025).*
- *Dredging and debris/wave deflector required, in conjunction with ODBC facility.*
- *Limited land side connection affecting parking and access.*

Construction Cost

- *May range from \$4,250,000 - \$5,500,000.*

referred to as the Expanded Pier Area. If the Expanded Pier Area reverts back to City, the City may construct the 56 wet slips. This location may require initial dredging and a future maintenance dredging program to achieve water depths to support marina operations. Permanent and temporary wave/debris deflectors are recommended at this site.

Robinson Terminal South (RTS) - Approximately 65 to 70 slips may be berthed on three main piers between Point Lumley and the south end of the RTS pier. This site had sufficient water space and water depth with infrastructure to support the marina. Potential public parking may be available nearby but may be limited. A series of fixed wave/debris deflectors supplemented by floating deflectors is recommended.

ROBINSON TERMINAL SOUTH (RTS)

Strengths

- Potential 70 wet slips accommodating boats up to 60+ feet.
- Minor to no dredging required to prepare site.
- Marina operations centralized to one area.
- Potential parking and access to RTS development

Weaknesses

- Debris/wave deflector required to protect site.
- Current distance from entertainment, retail and recreational activities.

Construction Cost

- May range from 9,500,000 to \$11,000,000.

Robinson Terminal North (RTN) - A transient boating facility is proposed at RTN to support the mixed use development and docking of festival ships and transient commercial vessels. From a management perspective, a

marina facility at RTN is more challenging to operate due to distance from core area, requiring additional staffing and infrastructure.

ROBINSON TERMINAL NORTH (RTN)

Strengths

- Potential berthing of festival ships, commercial ships and recreational transient boats.

Weaknesses

- Challenge to manage due to distance from core boating area.
- Limited expansion potential due to Founders and Oronoco Bay Parks

Construction Cost

- Unknown due to condition of existing pier

Marina Infrastructure and Amenities

Boaters moored at any marina will expect infrastructure and amenities commensurate with current industry trends, boater needs, and site conditions. Basic amenities include those that are typically found at the marina for use by each vessel, either freely or for a fee. The primary infrastructure and amenities to be provided at the City Marina to achieve current marina industry guidelines.

- **Floating aluminum or concrete docks** in lieu of fixed timber docks. Floating docks provide better access to moored boats and minimize adjustment of mooring lines by boat owners. Debris and ice deflection is recommended if floating docks are installed along the City’s waterfront.

- **Wave/debris deflectors** to prevent damage to marine infrastructure and to minimize debris cleanup and maintenance, Wave/debris deflectors should be incorporated into the marina facilities.
- **Electric services** should range from 30 amp 120 volt for vessels up 40 feet, 50 amp 240 volt service for slips up to 60 ft, and 100 amp service 240 volt for slips up to 100 feet.
- **Drop-Off zones** should be provided in close proximity to the slips. Drop-off zones and short term (<20 minute) parking spaces (minimum 2 per area) along Union Street and the Strand should be provided to facilitate loading/unloading of passengers and cargo.

Operational Overview

There are two operational management scenarios that are most advantageous to the City. One option is the Expand Pier Area reverts back to City use, allowing the City to create one large facility from RTS to Point Lumley. The other scenario is the City assist ODBC in acquiring regulatory authorization so that the Piers A/B are retained by the City in the long term, creating a revamped City Marina. The City may expand at the RTS facility in this option as demand warrants to supplement the City Marina operation.

The management of a marina requires a minimum number of staff in order to operate effectively. The addition of 40 to 60 slips, either at the City Marina or the Point Lumley, may require 7 to 8 full time and seasonal staff to operate and maintain facilities located between Duke and Queen Streets. The City may elect to continue to manage the marina with or without assistance from

a company specializing in marina oversight or place the management of the marina in the hands of a marina management company.

An evaluation of potential operating revenues and costs for replacement and expansion of the City Marina indicate that the combined facilities may operate at a profit or operating at a deficit depending on the number of slips constructed at the RTS facility to either baseline facility.

Marina Implementation

There are cost and scheduling advantages to constructing the marina at the City Marina or at Point Lumley in conjunction with the flood mitigation project or WSAP. Since the cost to mobilize equipment and labor for the flood mitigation and WSAP projects is included in their respective construction budgets, the cost to construct the marina at the City Marina or Point Lumley may be less as mobilization cost would be shared between projects. In addition, construction timeframes may be reduced if the two projects were performed at the same time as landside infrastructure improvements for access, security, and utilities could be performed simultaneously, avoiding the potential need for interim infrastructure as well as minimizing overlapping coordination.

There are several phasing options for construction of the marina facilities at the City Marina or Point Lumley depending on timing of the flood mitigation/ WSAP projects and the relocation of ODBC. These scenarios are based on the receipt of federal and state regulatory authorization to relocate the bulkhead/ pier headlines.

2. MARINA SITING

The Waterfront Small Area Plan (WSAP) in Figure 2-1 was developed and shaped to unify the waterfront to provide contiguous land and water spaces for public access and use. The water space along the core area of the WSAP; the waterfront between Queen and Duke Streets, will see a significant restructuring of commercial and recreational uses. The relocation of the commercial vessels to the waterfront directly north and east of the Chart House and Blackwall Hitch Restaurants will adversely affect the City Marina and the City's support of recreational boating. In addition, the settlement agreement with ODBC may further reduce in the short term recreational boating facilities in the City.



Figure 2-1: Waterfront Small Area Plan (WSAP)

To offset the potential adverse effects to City Marina, opportunities to enhance or expand recreational boating facilities in the City is a primary goal of this evaluation. The potential expansion of boating facilities shall take into consideration the following primary factors:

- Boating market drivers.
- Relationship of upland infrastructure, access and parking to the facilities.
- Navigation and relationship with Federal navigation channel.
- Physical and environmental conditions such as wind, waves, water levels, debris, and aquatic resources.
- Marina operations and long term maintenance.

2.1 EVALUATION CRITERIA

2.1.1 STAKEHOLDER INPUT

Boaters leasing wet slips at the City Marina chose this facility over competing facilities for several reasons including the proximity of the marina to their homes and the recreational and entertainment establishments along King Street and the Strand. The marina also provides basic amenities and affordable lease terms. These end users have vocalized their concern with the potential loss of wet slips along the City's waterfront in various communications. At the initiation of this study, a stakeholder meeting was held with the existing marina slip holders to discuss concerns and identify opportunities to expand and improve the facility.

CITY OF ALEXANDRIA
MARINA FEASIBILITY STUDY

Please complete this form and email to: Ms. Jodi Hunsell, PORT@alexandria.gov, or J.Hunsell@alexandria.gov. Individual survey responses will remain confidential. <http://www.alexandria.gov/36086>

Please submit survey form by October 25, 2013

Community Engagement Survey

The City of Alexandria has initiated a marina feasibility study to identify opportunities to expand boating facilities along the City's waterfront. This survey will be used to assist the City in identifying locations, facilities and amenities to enhance recreational boating along the City's waterfront.

Please respond to the following questions. Provide as much detail as possible.

1. How do you currently utilize the City's waterfront (check all that apply)?

Boater
 User of the "Public Spaces" - which ones _____
 Shop and eat at the cafes and restaurants - which ones _____
 Don't use the waterfront

2. If you are a boater, what type and where do you currently keep your boat (check one)?

Canal/King/Union St. Home/boat In boat
 Dock/Launch / Dock/Dump _____
 Trailer/Driveaway Marina _____ Other _____ (please list search location)

2a. Frequency of Boat Use (check one): Monthly Weekly Daily

2b. Where is your typical boating area? Is this a specific waterfront destination? _____

2c. What is your usual boating activity? (E.g. fishing, etc.) _____

2d. If the City adds new boating facilities along the City's waterfront, where would these facilities be located? _____

2e. What type of boating facilities should be added (e.g. ramps, transient, launch, organized)? _____

2f. What additional and/or unapproved boater services/amenities would you like to see at City's boating facilities? _____

3. Provide your primary likes and dislikes about the current boating facility? _____

4. Provide any back of page for additional comments

Figure 2-2: Boater Engagement Survey

The existing slip holders stressed maintaining the existing marina’s location at the foot of King Street, with possible expansion opportunities between King and Duke Streets where existing parking garages are in close proximity to the waterfront. The slip holders highlighted the need to maintain the same number of long-term lease boat slips, replace the fixed docks with floating docks, increase security but maintain public access, and implement a marina debris management system.

The slip holders also commented on the need for improved utility services and marina amenities, with the former concern being the inadequate electrical service. The City indicated at the meeting that marina electrical

service upgrades were currently planned. Several individuals suggested expanding the existing City Marina Piers A/B seaward and adding wave and debris protection to accomplish the desire for more slips. A few slip holders suggested adding marina slips at RTS as identified in the WSAP. There was little support for a marina at RTN, except to add human-powered watercraft launch facilities.

In addition to the stakeholder meeting, a boater engagement survey (Figure 2-2) was posted to allow individuals with an interest in City’s recreational boating facilities to comment on the existing and proposed facilities. The responses received from the boater engagement survey generally paralleled the comments received during the stakeholder meeting. The majority of the responders were boaters that leased a slip at the City Marina though a few individuals moored their boats at nearby yacht clubs or trailered their boats. One respondent berthed their boat near Solomon Island, Maryland.

The majority of the boaters cruise on the Potomac River between Georgetown and Occoquan/ Woodbridge area. The attraction of the existing marina is its location, both to Old Town Alexandria as well as the marina’s relationship to Washington DC and destinations on the lower Potomac River. Respondents also praised marina management and staff. There was almost near universal preference to have the marina facilities as close to the foot of King Street. The consensus from the survey is this location provides quick access to restaurants and retail on King and Union Streets as well as Founders and Waterfront Parks. The King Street preference also highlighted boater

concern of the lack of a temporary loading/unloading zone for marina users. Designated or discounted parking for boaters was also identified.



Figure 2-3: Boating Destinations

Respondents strongly stated their desire for floating docks with full length finger piers, improved security, dock storage, improved electrical service, and debris management. There was less consensus on the need for additional

sanitary sewer pump-out facilities or a dedicated fueling station. Responses also varied as to the need for more boat slips (long-term or transient) with several commenting that the existing slip count is sufficient. Maintaining the long-term slip to transient slip ratio was recommended by half the respondents.

2.1.2 PHYSICAL AND ENVIRONMENTAL

The following siting factors considered when evaluating potential enhancement or expansion opportunities to the City Marina. Marina should be sited to work with existing physical and environmental conditions without adverse impact or the need for the expense of additional infrastructure or ongoing maintenance activities.

Bathymetry

Water depths in the existing marina are authorized by state and federal governments at -6 feet Mean Low Water (MLW) north of the Torpedo Factory and -9 feet MLW within the main basin (Piers A/B). Water depths transition to -20 feet MLW seaward of the existing pier head line. Between King Street and Duke Street, water depths within 100 feet of the shoreline average 4 to 6 feet referenced to MLW. The water depths at the pier head line is approximately 10 feet. AT RTN and RTS, water depth seaward of the wharf face are greater than 15 feet referenced to MLW.

Currents

Typical peak tidal current velocities are moderate at about 0.6 knots. Current measurements taken for a month at Ronald Reagan National Airport in 2011

indicate ebb currents may approach 4 knots. Currents higher than 2 knots are more challenging for berthing.

Water Levels

The mean tide range along the City's waterfront is 2.8 ft, with a spring tide range of 3.2 ft. The 100-year flood elevation is 10.2 ft NAVD88. The water level recorded during Hurricane Isabel was 8.6 ft NAVD.

Wave Conditions

Along the City's core waterfront, waves can approach from the north or south directions. Boats traveling north or south on the federal channel also generated wakes that affect the waterfront. The highest waves are estimated to approach from the north direction owing to the longest fetch distance. Significant wave heights up to 3.5 feet may occur during the 100 year storm event. Significant wave heights up to 1.5 feet may occur annually.

Wind Speeds

Wind speeds range from 38 knots for 5-year return period events to 106 knots for 100-year return period events.

Debris

The riverbanks of the Potomac and Anacostia Rivers north of DC are generally undisturbed and hence are subject to erosion. Fallen trees and large branches are conveyed downstream where the debris accumulates at structures (piers, docks, wharfs) or quiescent coves or embayments as shown in Figure 2-4. The City has implemented debris management for the City Marina for the past 5 years. Expansion of marina may require temporary

measures such as floating booms or more permanent measures such fixed debris screens or deflectors.



Figure 2-4: Debris Accumulation City Marina
Ice

Ice may form in the Potomac River during the coldest winter months of January and February. Stagnant and flowing ice can hamper navigation and accumulate at dock structures, leading to damage of vessels and infrastructure. Wave/debris break structures and/or a bubbler system may be required to protect marina infrastructure.

Aquatic Resources

Preliminary surveys of the City's waterfront from Queen to Duke Streets indicates only sporadic coverage of submerged aquatic vegetation, primarily along the Founder's Park waterfront.

2.2 MARINA ACCESS AND OPERATION CONSIDERATIONS

Access – Marina and Destinations

Walking distances from a parking lot to the wet slips are typically commensurate with walking distances between parking and retail establishment; with a preferred distance no greater than 700 feet. Access to tourist destinations attracts boaters to marinas. Wet slips with convenient access to upland destinations at King and Union Streets and the Strand is preferred.

Parking

Convenient parking is necessary for marinas that serve local boaters that come to the marina via car. Boaters may park at the public or public-private garages at Thompson Alley, N. Union Street, S. Union Street, and Altmans and Solo Garages. Industry guidelines for parking suggest 1 parking spot for every 2 boat slips though this range may extend up to 1 parking spot for every 3 to 4 boat slips depending on marina usage. Drop-off zones are to unload provisions are preferred by boaters.

Marina Operations

Efficient marina operations typically occurs if management and support staff are located central to the wet slips. When wet slips are spread out over long distances of the waterfront, additional staff and equipment may be necessary to support marina patrons and maintenance activities.

Commercial Boating Activities

The dinner/excursion boat activities are an integral aspect of the City's current working waterfront. The WSAP will consolidate all commercial activities immediately east and north of the Chart House Restaurant. Siting of marina facilities considers the navigational safety between recreational and commercial boating activities.

2.3 REGULATORY AND OTHER CONSIDERATIONS

Pier Head Line

The pier head line is located approximately 125 to 300 feet offshore of the existing shoreline. Marine infrastructure such as docks and piers may not extend past the pier head line without regulatory approval. If regulatory approval occurs, then the seaward extent of structure will be determined by the allowable setback from the Federal Channel.

Federal Channel

The west boundary of the federal navigation channel is approximately 400 feet seaward of the Pier Head Line. Allowable structure setbacks from federal channels vary with authorized water depth and channel widths but 75 to 100 foot setbacks are typical.

Viewshed

One of the key elements of the WSAP is to restore the water views at Queen, King, Prince, Duke, and Wolfe Streets terminuses and maintain an obstructed view of the river at Founders, Waterfront, and Point. Lumley Parks. The siting of wet slips may be limited by defined viewshed corridors.

3. DESIGNATED MARINA SITES

Potential marina sites were initially identified by the Marina Committee of the Waterfront Commission along the City’s shoreline from RTS to Oronoco Bay. Subsequent meetings with City representatives, stakeholders and the comments received from the boater questionnaire resulted in a narrowing of potential sites suitable for expansion of existing facilities or creation of new marina facilities to the City’s core waterfront; from RTS to RTN. Figure 3-1 shows an overall master plan of marina facilities along the City’s waterfront. The planned marina facilities would extend from the City Marina to Robinson Terminal South and includes the proposed ODBC marina facilities at the former Beachcomber site per the settlement agreement. A total of 180 wet slips may be constructed along the waterfront, excluding wet slips that may be constructed by the ODBC.

Each site was evaluated using the siting criteria discussed in Sections 2.2 through 2.4. The methodology used to weigh the siting criteria is based on assigning a numerical value to 18 factors. Factors were ranked on the appropriate scale from 1 to 5 as shown in Table 3-1. A weighting factor of the factors within the four general categories were then applied to arrive at a single numeric value as shown in Table 3-2. For this evaluation, the following weighted values were assigned to four general categories:

- 25% - Physical and Environmental Factors
- 25% - Marina Access and Operation Considerations

- 25% - Regulatory and Other Considerations
- 25% - Estimated Construction Cost

Table 3-1: Factor Rating Values

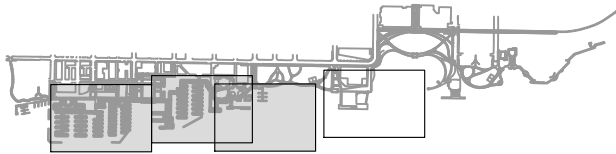
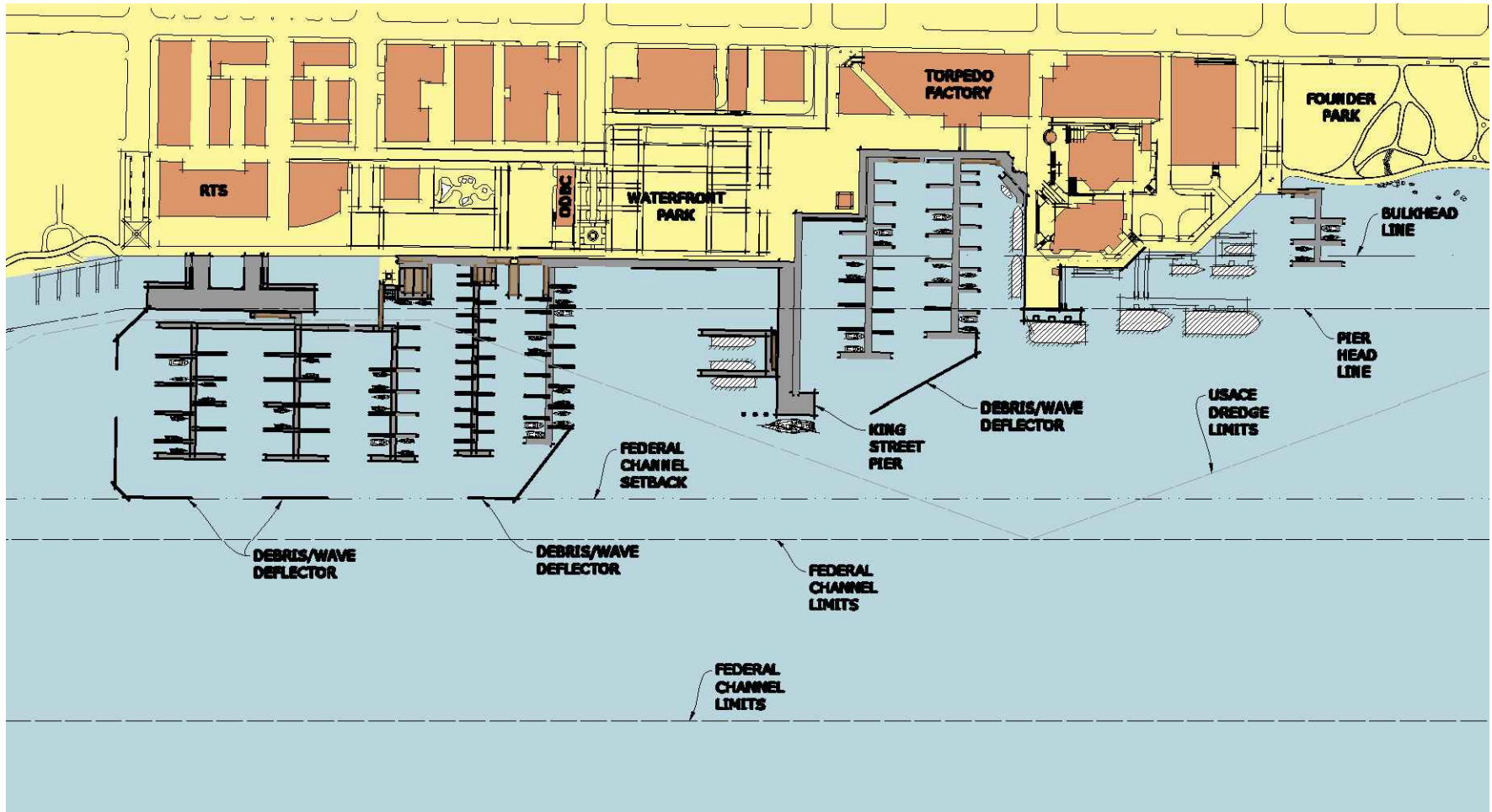
1.	Low/Positive Benefit
2.	Moderate/Positive Benefit
3.	Moderate/Neutral
4.	Moderate/Negative Benefit
5.	High/ Negative Benefit

Weighted Average of the Impact Rating for Physical and Environmental Factors	=	Sum of Ratings 8 (Physical and Environmental Factors)
Weighted Average of the Impact Rating for Marina Access and Operation Factors	=	Sum of Ratings 4 (Marina Access and Operation Factors)
Weighted Average of the Impact Rating for Regulatory and Other Considerations	=	Sum of Ratings 5 (Regulatory and Other Considerations)
Weighted Average of the Impact Rating for Estimated Construction Costs	=	Sum of Ratings 1 (Estimated Construction Costs)

Table 3-2: Summary of Site Evaluation

Factors	City Marina/ King Street Pier	Point Lumley Facility	RTS Facility	RTN Facility
Physical and Environmental Factors (Weighted Average = 25%)				
Bathymetry	1	5	2	4
Currents	2	3	3	3
Water Levels	3	3	3	3
Wave Conditions	3	5	5	4
Wind Speeds	3	4	4	4
Debris	4	5	5	5
Ice	4	5	5	5
Aquatic Resources	2	4	2	2
Marina Access and Operation Considerations (Weighted Average = 25%)				
Access – Marina and Destinations	1	4	2	5
Parking	2	4	4*	5*
Marina Operations	1	4	2	5
Commercial Boating Activities	5	1	1	1
Regulatory and Other Considerations (Weighted Average = 25%)				
Pier Head Line	4	5	5	1
Federal Channel	4	5	5	1
Viewshed	2	2	1	1
Enhances or Expands Existing Marina Facilities	3	2	1	5
Desirable Location to Attract Boaters	1	3	4	5
Construction Cost (Weighted Average = 25%)				
Estimated Construction Costs	4	3	5	5†
Weighted Average	2.95	3.48	3.51	3.77

*Public parking may be limited near RTS and RTN developments. † Existing pier condition unknown. Cost to refurbish may be high.



300' 0' 300' 600'



SCALE: 1"=300'

OVERALL MARINA MASTER PLAN

CITY OF ALEXANDRIA, VIRGINIA

FIGURE

3-1



3.1 CITY MARINA/ KING STREET PIER

The existing City Marina basin east of the Torpedo Factory consists of Piers A/B, to moor recreational boats and Piers C/D to moor commercial vessels (Figure 3-2). The ODBC has two piers south of Piers A/B for recreational boats. Pier A/B can accommodate boats up to 40 feet in length though slip widths are narrow for some of today's wider beamed boats. The wet slips in this basin are generally preferred by boaters for their accessibility to parking, distance to main attractions on King/Union Streets, and adequate sheltering from waves and floating debris.



Figure 3-2: Existing City Marina

Piers E/F and G/H to the north of the commercial slips comprise the majority of wet slips but are less preferred by boaters due to shallower water depths, more exposure to wave, current, and debris, and the dominance of smaller and narrower slips.

The WSAP identified a reconstructed waterfront in this area. The south shoreline of the main basin will be altered and the water area expanded for the construction of Fitzgerald Square and the King Street Pier. This expanded water area will facilitate the construction of a new pier at the former north ODBC dock (North Pier). The new pier supports a reduced number of larger and wider wet slips. The existing Pier A/B would remain in its current configuration. Both piers would not extend seaward of the pier head line. Pier E/F would be eliminated to accommodate the expansion of the commercial docks. Pier G/H would be reconfigured to moor up to 10 smaller wet slips (maximum 35 foot vessels) north of the newly expanded commercial docks. A transient pier would remain on the north side of the King Street Pier.

The WSAP plan in this area may be modified to accommodate more slips with enhanced wave and debris protection as shown in Figure 3-3 and Figure 3-4. By extending King Street Pier approximately 50 feet seaward of the limit shown on the WSAP (200 feet north of the pier head line), newly designated Pier A/B and North Pier can be extended up to 90 feet, providing an additional 12 wet slips (total of 56 slips) from that shown in the WSAP. The North Pier and Pier A/B can accommodate a mix of 35-, 40- and 45-foot boats. The fairway distance between Pier A/B and the commercial slips in the basin does not change from current condition.

Pier G/H north of the commercial slips may berth up to (10) 30 to 35-foot long vessels slips. This pier has been designated as transient wet slips but may operate as leasable west slips. The transient pier (Pier T2) at King Street

is lengthened by 50 feet and can accommodate 200 linear feet of side-tie docking.

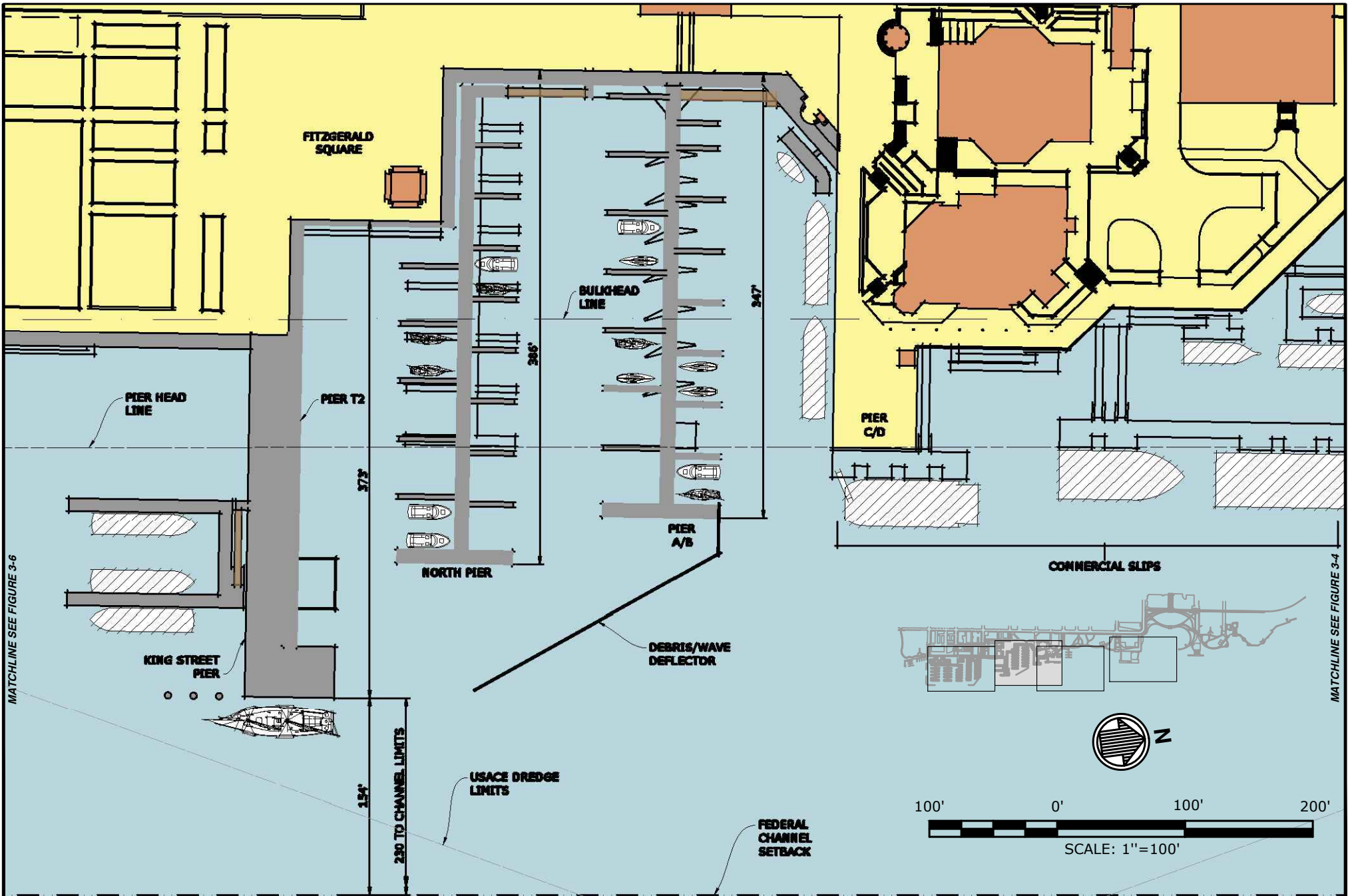
Due to departure and berthing movements of commercial vessels at the proposed commercial slips, Pier A/B cannot extend as far seaward as the North Pier. Further seaward extension of both piers would require a corresponding seaward repositioning of the commercial slips. Comments received from commercial operators during the WSAP development expressed concern with the walking distance of patrons from Union Street that board dinner and excursion boats was significant. The walking distance concern would need to be revisited if the intent was to extend the piers further seaward.

A fixed wave/ debris screen attached to the north side of the Pier A/B would afford debris and wave protection to the basin as well as the north side of the proposed King Street pier. The fixed screen alignment and geometry is based on the departure/berthing movements of commercial vessels and the minimum fairway and basin entrance widths for safe transit to the slips. The final geometry of the screen would be based on hydrodynamic modeling.

The footprint of the proposed docks lie within the existing authorized maintenance dredging area of the City Marina and therefore water depths are adequate for the boats that may berth at this location. The City may continue to maintenance dredge this water space every 5 to 7 years.

The cost to construct this facility may range from \$7,500,000 to \$9,000,000. This cost includes mobilization/ demobilization, demolition of existing fixed timber docks, installation of floating concrete docks including utilities and

gangways, dredging, and a permanent debris barrier. These costs do not reflect construction associated with the WSAP or ODBC build out including the King Street Pier, water taxi dock, commercial docks or boat ramp. These costs do include a 30% contingency.



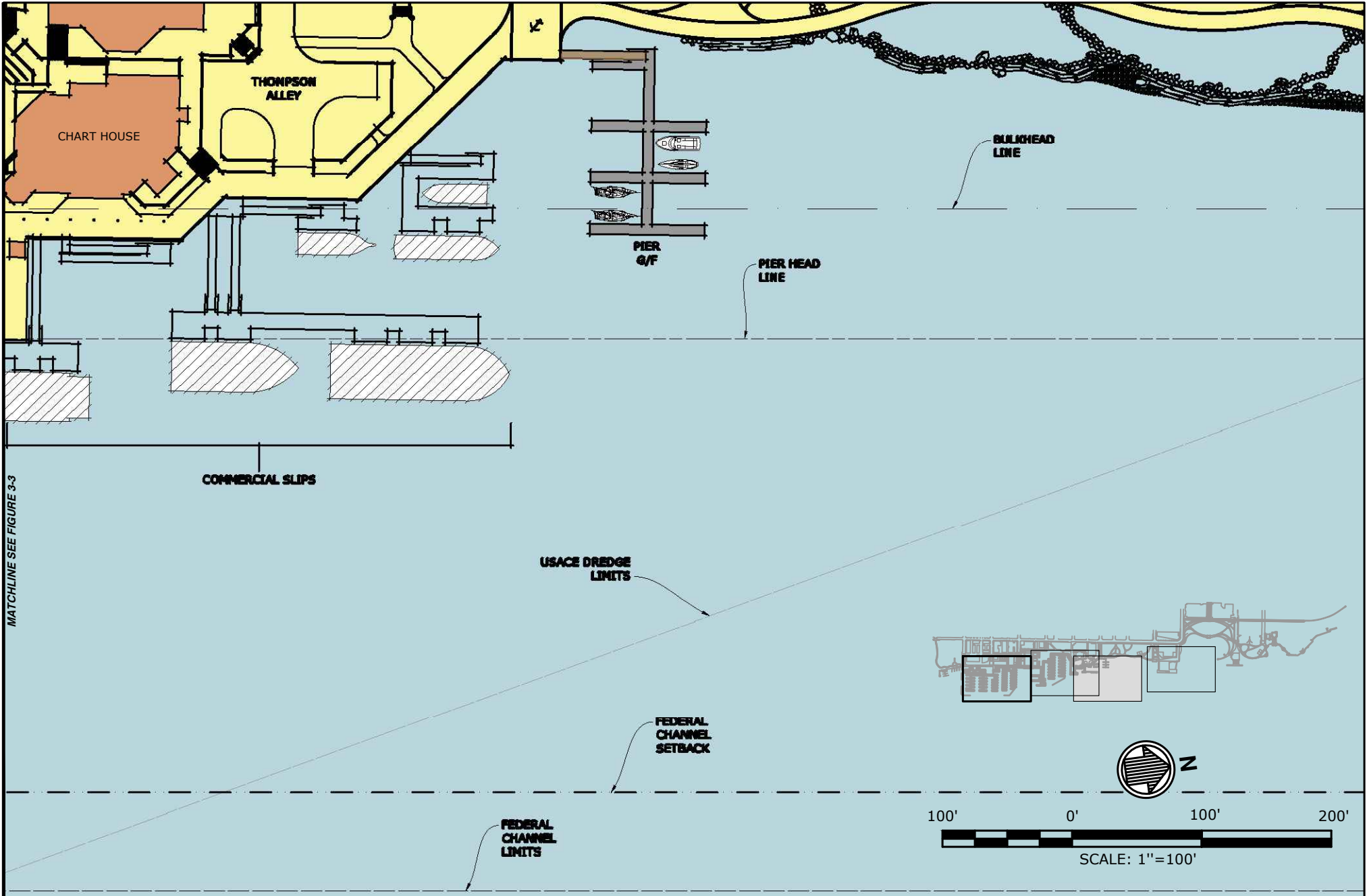
MATCHLINE SEE FIGURE 3-6

MATCHLINE SEE FIGURE 3-4

CITY MARINA & KING STREET PIER
CITY OF ALEXANDRIA, VIRGINIA

FIGURE 3-3





MATCHLINE SEE FIGURE 3-3



CITY MARINA - COMMERCIAL SLIPS
CITY OF ALEXANDRIA, VIRGINIA

FIGURE
3-4

3.2 POINT LUMLEY FACILITY

Marina facilities seaward of the proposed renovated Waterfront Park are not planned as the placement of such facilities are contrary to the stated goal of providing clear views and public access to the water's edge along this segment of the waterfront. South of the new ODBC clubhouse, the ODBC has a 10-year option period to construct 56 wet slips ranging in size from 25 to 40-feet in length in the Expanded Pier Area in accordance with the settlement agreement. To accommodate the 56 wet slips, the docks would need to extend approximately 120 feet seaward of the pier head line.



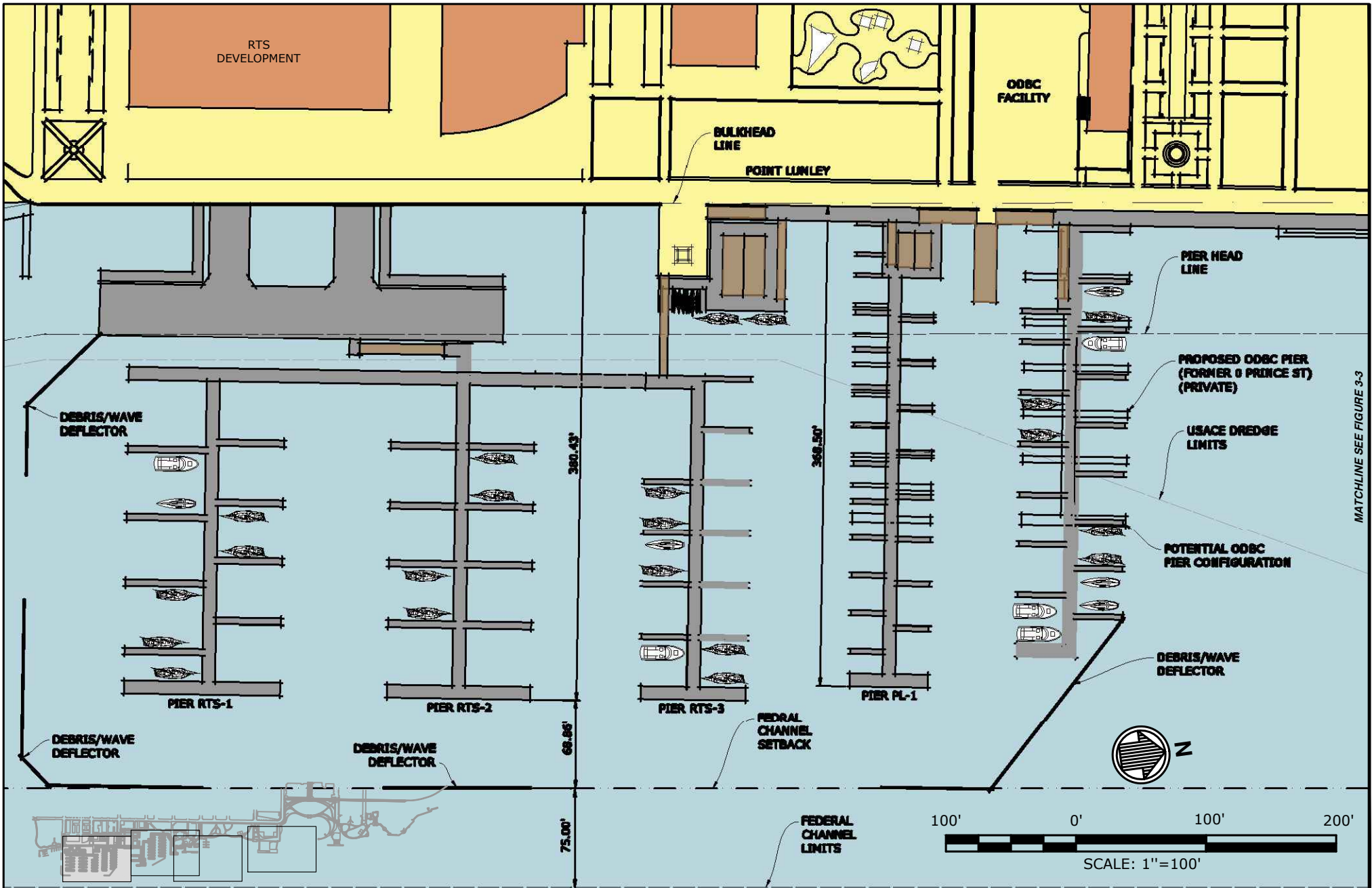
Figure 3-5: Existing Point Lumley Facility

Figure 3-6 shows a modified version of the docking facility within Expanded Pier Area described in the settlement agreement. Pier PL1 may be extended up to 130 feet seaward of the current extents before proposed structures (including wave/debris deflectors) encroach on the 75-foot

setback from the federal channel. A fixed wave/debris may be added on the 0 Prince Street Pier if the ODBC is amendable or anchored to Pier PL1 only. This wave/debris deflector may also be the anchor point for the implementation of floating wave/debris booms that can be deployed between the 0 Prince Street Pier and the King Street Pier during high flow events to minimize debris and ice in front of Waterfront Park.

Within 80 to 100 feet of the shoreline, the water depths vary from 3 feet at the shoreline to 10 feet at the pier head line. For the range of boat sizes that may utilize the wet slips, a water depth of 7 feet referenced to MLLW is the recommended minimum. An average of 2.5 feet of material over a 100-foot by 300-foot area may need to be dredged to achieve the desired water depth.

The cost to construct this facility may range from \$4,250,000 to \$5,500,000. This cost includes mobilization/ demobilization, installation of floating concrete docks including utilities and gangways, dredging, permanent debris barriers and a 30% contingency.



POINT LUMLEY FACILITY - RTS
CITY OF ALEXANDRIA, VIRGINIA

FIGURE
3-6

3.3 ROBINSON TERMINAL SOUTH

The WSAP originally identified a marina facility at RTS because the site had sufficient water space and water depth (Figure 3-7). Parking and infrastructure to support the marina were also available at or in near proximity to the site. The developer of RTS indicated early during the planning process for the site that a marina was not planned at this time but in the future, the City or third party may construct and operate such a facility.



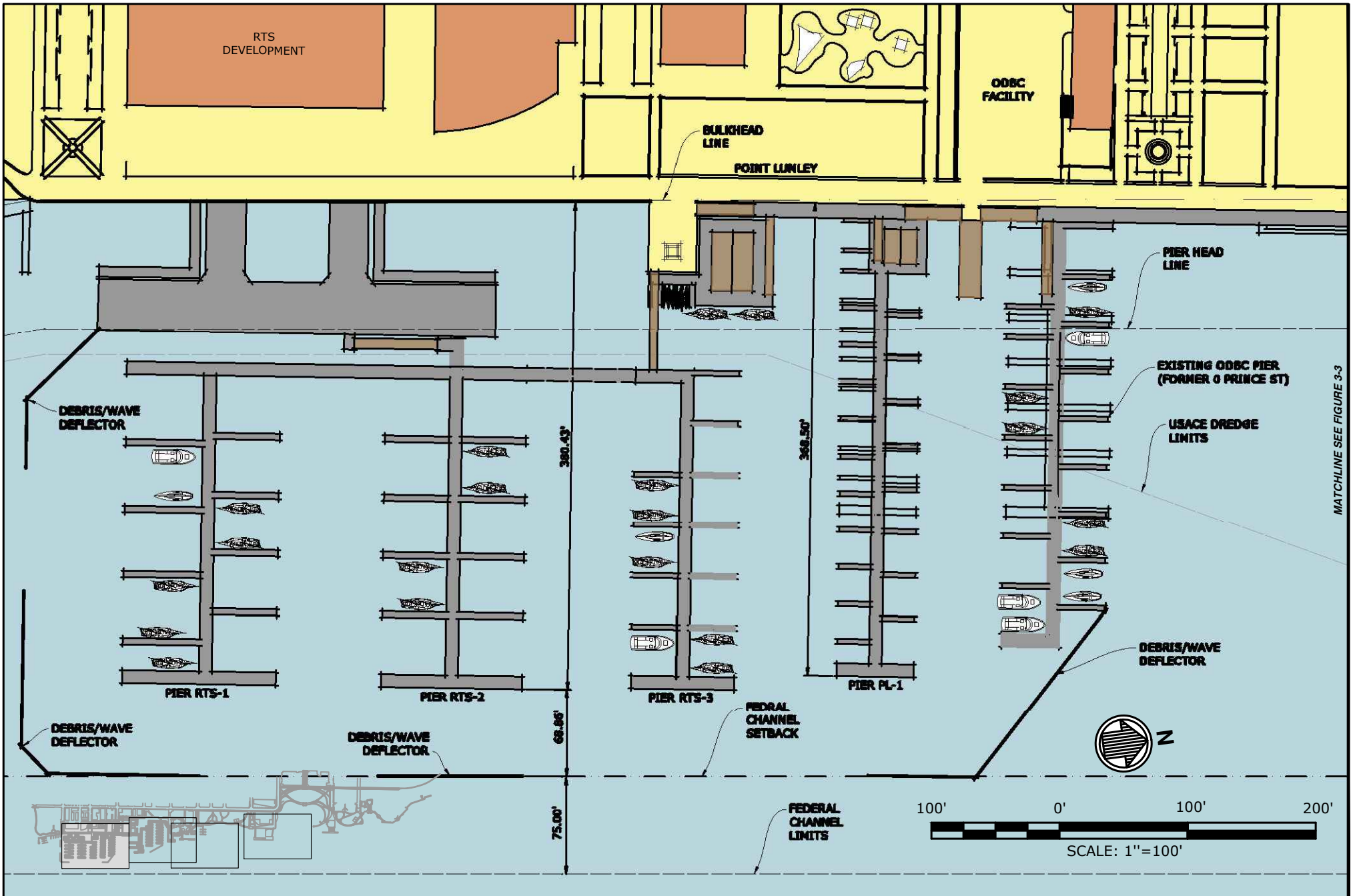
Figure 3-7: Existing RTS Facility

Figure 3-8 shows how this facility may be developed based on siting criteria. Approximately 65 to 70 slips for vessels ranging from 35 to 60 feet in length may be berthed on three main piers (Piers RTS1, RTS2, and RTS3) between Point Lumley and the south end of the RTS pier. The piers may extend up to approximately 275 feet seaward of the pier head line, with the seaward extent of the piers generally in line with the seaward extent of Pier PL1. The fairway between Pier PL1 and Pier RTS3 is oversized to facilitate the movement of the Alexandria Seaport Foundation floating building in the

future. The proposed marina does not affect the planned use of the RTS wharf as a public park and promenade but does preclude the placement of transient wet slips between Point Lumley and RTS as currently planned by the developer.

A series of fixed wave/debris deflector structures along the south side of Pier RTS1 and on the east side of Pier RTS2 may be constructed to protect the outer portions of the piers and minimize debris accumulation at the shoreline. These fixed structure may also anchor floating debris booms that can be employed during seasonal high flow events or during the winter months when ice flows are present. The water depths seaward of RTS are sufficient; dredging is not proposed.

The cost to construct this facility may range from \$9,500,000 to \$11,000,000. This cost includes mobilization/ demobilization, installation of floating concrete docks including utilities and gangways, permanent and temporary debris barriers and a 30% contingency.



3.4 ROBINSON TERMINAL NORTH

Robinson Terminal North (RTN) was identified in the early stages of the WSAP as a preferred location for marina facilities but was later discounted due to its distance from the core waterfront, potential limitation on available water space, concerns with view impacts at Founder's and Oronoco Bay Parks, and shallow water depths north and south of the site (Figure 3-9).

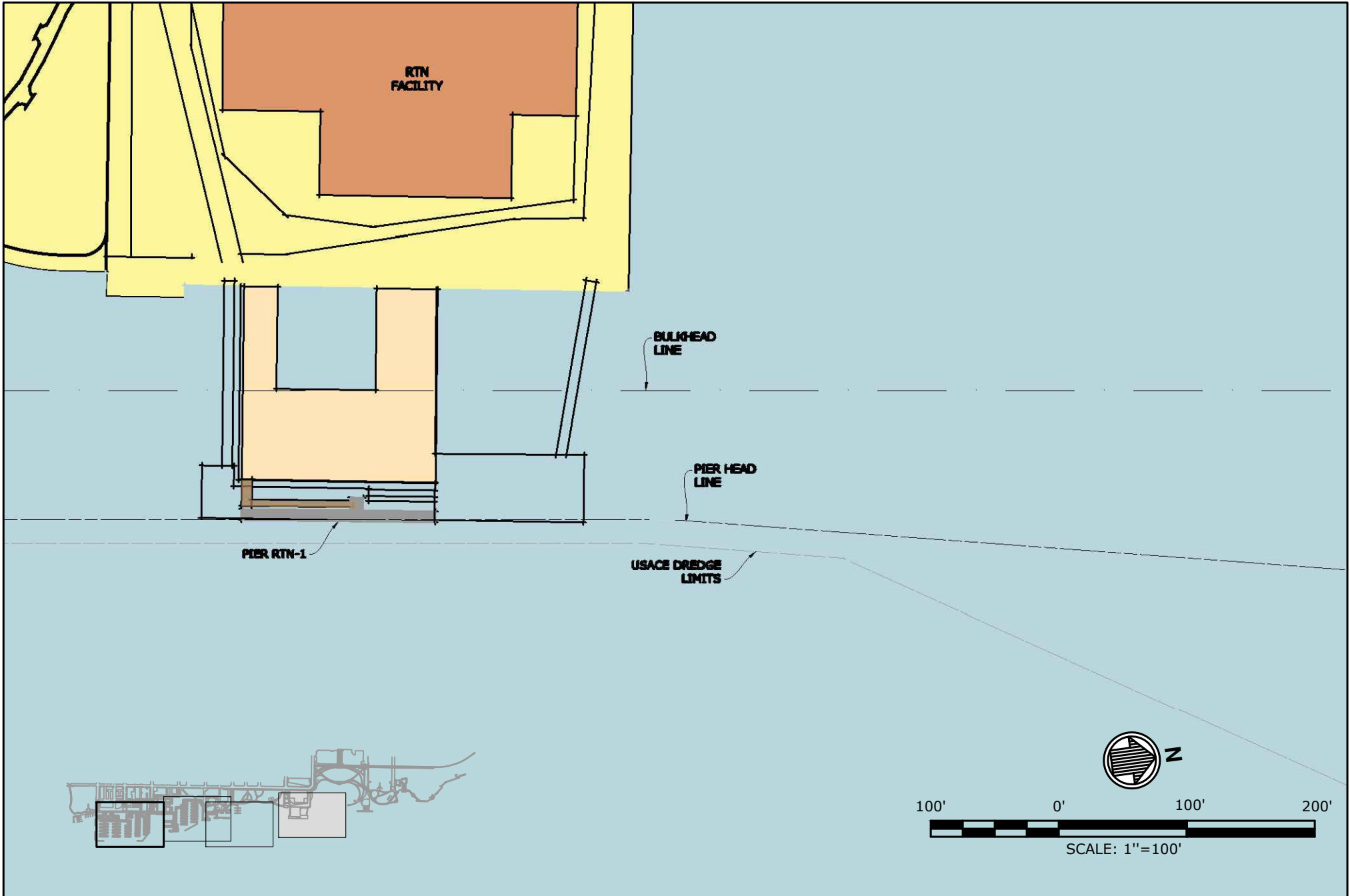


Figure 3-9: Existing RTN Facility

The developer of RTN is currently planning a mixed use project with boutique hotel, residential, and some retail/ restaurant activity and has designated the existing wharf as a public space. The developer also indicated the goal of utilizing the east face of the existing wharf to berth recreational, commercial, and festival ships up to 300 feet in length as shown in Figure 3-10. Additional transient slips are also planned on the north side the existing wharf.

The transient boating facility shown in Figure 3-10 (Pier RTN1) represents the preferred use of RTN after applying the siting criteria, input from the stakeholders, and discussions with City representatives regarding the docking of festival ships and transient commercial vessels. From a management perspective, a marina facility at RTN is more challenging to operate due to distance from core area, requiring additional staffing and infrastructure.

The cost to construct this facility is unknown due to the condition of the existing pier. Construction costs may include mobilization/ demobilization, repair and/or refurbishment of pier, installation of floating concrete docks including utilities and gangways.



4. MARINA INFRASTRUCTURE AND AMENITIES

Boaters moored at any marina will expect infrastructure and amenities commensurate with current industry trends, boater needs, and site conditions. Basic amenities include those that are typically found at the marina for use by each vessel, either freely or for a fee. The following infrastructure and amenities are considered the minimum to attract boaters, achieve occupancy at market rates, and minimize operation and maintenance for the aforementioned designated marina sites.

Floating Docks - The tidal range and wave, current, ice and debris conditions are factors when considering fixed and floating docks. As a general rule, a tidal range between 0 to 3 feet is suitable for either fixed or floating docks. Floating docks are generally applicable, depending on structure and material type, when wave heights are less than 1.5 feet annually and 3 feet during storm events. In areas where floating docks are subjected to ice and debris,

some form of mitigation system should be employed. Floating docks are recommended as replacement for the fixed wet slips as well as the expansion of



wet slips at Pt. Lumley and RTS if there are ice and debris mitigation strategies employed.

Potable Water - All dockside water should be a regulated, potable system capable of providing water at a suitable pressure to fill storage tanks without damage to boat plumbing. The system should be designed to accommodate cold weather, with an integrated drain system. Water demand is estimated to be approximately 25 gallons of water per slip per day during peak demand (Tobiasson, 2000) for vessels less than 100 feet.

Electric - Onboard amenities have increased the electrical demands of many boats. Electric services should range from 30 amp 120 volt for vessels up to 40 feet, 50 amps 240 volt service for slips up to 60 ft, and 100 amp service 240 volt for slips up to 100 feet. A 20 amp GFI courtesy outlet should be included at select locations along the pier to facilitate the use of maintenance equipment.



Service Distribution - Marina utility power pedestals may be used to provide yachts with a single source for utility hookups while also providing low-glare lighting and racks for cables and hoses. These units are also designed for easy accessibility to wires and connections while being serviced or repaired.

These units may be provided at each individual dock or shared between two adjacent docks.

Dock Lighting - Lighting along the dock is provided for safety and security reasons. This amenity can be provided as either independent lighting fixtures along the dock or as part of the power pedestal configuration.

Sanitary - Sanitary systems are designed to be either centralized or located at each slip. A centralized system is less expensive to install, can be easily staffed with marina employees and is less prone to maintenance issues caused by improper use by boat owners. The pump-outs should be centrally located and easily accessible. The City Marina currently has these independent facilities at Piers A/B and the commercial slips. The system should be expanded at the City Marina and incorporated into the marina facilities at Pt. Lumley and RTS.



Solid Waste Collection - Trash floating in the marina is unsightly and must be removed by staff and it remains an ongoing (but necessary) maintenance issue. Consequently, all boaters should be encouraged to properly dispose of trash by providing multiple large, covered, convenient trash receptacles. In addition, covered receptacles prevent birds and rodents from accessing and spreading collected trash.

Fire Protection - Modern marinas require that fire-fighting equipment be capable of combating fires quickly and effectively, while preventing the fire from spreading to other vessels within the marina. The most common types of fires in marinas are those fueled by flammable liquids, such as diesel, oil, or gasoline.

The possibility of the fire spreading to other vessels along the water surface must be considered, especially when combating such a fire with water, which may push the fire along the water’s surface. For this reason, large dry chemical fire extinguishers to suppress Class B (fuel), as well as Class A (wood/paper) and C (electrical) fire, should be readily available at key locations throughout the marina. This equipment should be provided in tandem with a centralized high volume water system that meets NFPA and City of Alexandria fire marshal requirements.



Dock Boxes – Dock boxes (fiberglass or polyethylene) provide a secured storage area for boat maintenance equipment. Dock boxes are available either rectangular in shape or triangular to fit on the corner



supports of docks. Given the limited ability to provide storage for marina patrons on land, dock boxes are recommended.

Security - Boat owners seek a sense of security from thievery and vandalism while their boat is in the marina. Security measures implemented for the marina should be visible to act as a deterrent while not being intimidating or obtrusive to marina patrons. Such examples may include security staff augmented by video surveillance, monitored vessel access alarm systems, and the creation of secure areas using physical barriers such as fences and gates. Marina security should also include the use of appropriate lighting along walkways and public areas throughout the marina, which also acts to help ensure safe access by all users of the facilities. The City has implemented many of these measures in the past while balancing the public's desire to view the water.

The WSAP increases the public access of the water with the promenade and the King Street Pier. Therefore, limiting access to the docks areas through the installation of a security gate at each access point is recommended. Floating dock system afford the opportunity to place security gates near the foot of the articulating gangway, where they are less obtrusive. Security gates controlled with key cards is preferred over mechanical pin systems.

Drop-Off Zone and Parking – Sufficient parking should be provided in close proximity to the slips. There are several public and public/private garages along Union Street corridor that boaters may use, though the walking distance to the marina facilities are longer than most competing facilities.

Drop-off zones and short term (<20 minute) parking spaces (minimum 2 per area) along Union Street and the Strand should be provided to facilitate loading/unloading of passengers and cargo as a means to offset walking distance and short term parking fees.

Wave/ Debris Deflectors – To prevent damage to marine infrastructure and minimize debris cleanup and maintenance, wave/debris deflectors should be incorporated into the marina facilities. The overall marina master plan indicates the minimum locations for the deflectors, with the final geometry to be define after the completion of hydrodynamic modeling.



There are several types of fixed wave/debris deflectors. In its most basic form, the deflector may consist of timber piles with horizontal or vertical timber elements that form the screen. This system is the most cost effective

system but may require frequent maintenance as the wood panels are more susceptible to deterioration and damage.

Other types of fixed panel systems include fixed concrete or steel panel deflectors or integrated dock and fixed panel. The crest elevation of the screen would be commensurate with the land elevation of the surrounding land (6 feet NAVD per flood mitigation).

Another variant of the wave/debris deflecting would consist of driving timber, steel or concrete piles to anchor segmented floating booms. The advantage of this system is the system reacts to changing water level conditions while minimizing impacts to views from the land.

In addition to fixed wave/debris deflectors, floating wave/debris deflectors should be employed as temporary or permanent protection in low flow areas or at entrance areas during high flow events. A floating debris deflector system can be deployed to deflect debris and ice flow in river environments similar to the Alexandria waterfront.

Aesthetics should be considered with any system to ensure the value of the water view is not diminished.



5. OPERATIONAL OVERVIEW

The current City Marina operations are consolidated where marina staff can readily manage slip holders, perform maintenance activities and oversee marina security. The results of the marina siting study may expand the footprint of the marina south to RTS. In addition, the settlement agreement with ODBC eliminates Piers A/B from the City's marina operations and precludes the City from expanding marina operations at Point Lumley in the short term. The expansion and short term restrictions may factor into the operational management structure of the marina.

There are two operational management scenarios that are most advantageous to the City. One option is the City retain the riparian rights of the Expanded Pier Area south of the new ODBC facility, allowing the City to expand the proposed RTS marina site to the north. This option would enable the operator of the marina to centralize recreational marina operations at the south end of the City's; serving as the anchor for the City's revitalized waterfront. This location has a number of benefits;

- Slip size and distribution may be maximized as there are no major physical restraints to water space.
- Pleasure craft are centralized to one location, easing navigation for commercial craft operating in the area.
- Potentially less dredging as the majority of marina facilities lie in water greater than 6 feet.

- Security may be enhanced due to having a more constrained site to monitor.

The commercial and expanded transient slips at the City Marina would remain an independent operation in this scenario.

The other scenario is the City to assist ODBC in acquiring regulatory authorization so that the Piers A/B are retained by the City in the long term. The benefits of this option are;

- A consolidated operation base including the overseeing operations at the future King Street Pier commercial and transient facilities.
- Minimal changes to current operations, including staffing location, and maintenance activities.
- The location is preferred by existing slip holders.

This option also provides the City with more flexibility to expand operations to RTS in the future as the demand warrants. In either option, additional marina office and staffing would be required to manage the dual facilities over the long term.

Irrespective of the selected option, the Pier G/H north of the commercial docks exacerbates the City's operational logistics in either scenario due to its isolated location. This pier is better suited to support transient use. As a

transient facility, the boat user would still expect levels of security and operational presence, similar to that of the operating marina.

5.1 MARINA STAFFING

The management of a marina requires a minimum number of staff in order to operate effectively. The addition of 40 to 60 slips, either at the City Marina or at RTS has limited impact on the operational expenditure of the business but can add a significant revenue improvement to the marina.

Whether the new marina is managed by a marina management company, or operated by City staff, the structure and quantity of staff remains the same. The staffing structure shown in Figure 5-1 is typical for a marina that is similar to the size and scope of an expanded City Marina. The City’s current marina management structure is similar to that shown below but specific staffing roles assigned to marina finance, maintenance, and security are shared within the Parks and Recreation Department or other City departments. In addition, the responsibilities for each of the staff roles may vary from a typical management structure. The typical responsibilities of each staff member are summarized below.

Marina Manager

The main purpose of this role is to manage a safe and profitable marina operation in accordance with the business plan. In this role, the manager provides direction and accountability to meet the goals, objectives, and sales/lease targets through planning, directing, managing and overseeing all

marina operations including maintenance, sales, finance, and coordinating/monitoring marina concessionaires/ contractors.

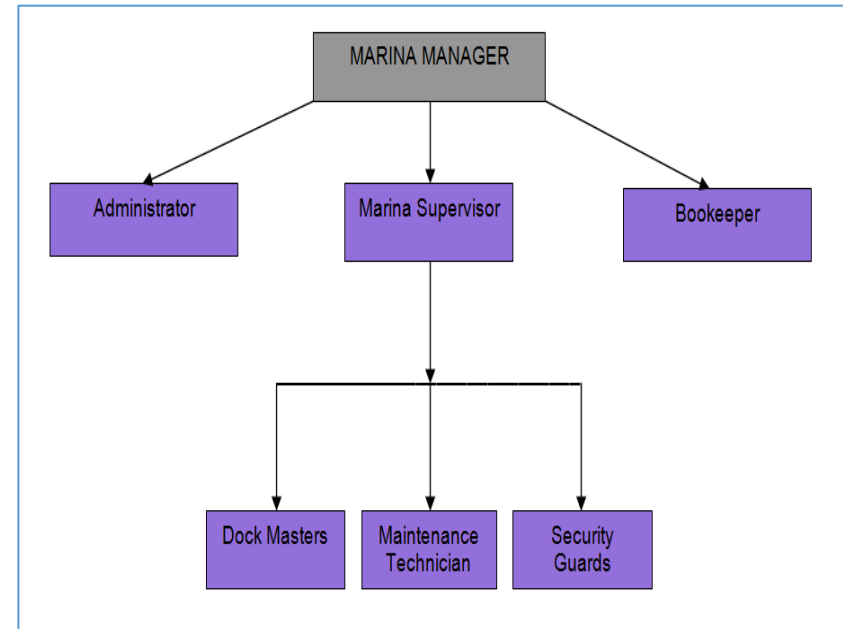


Figure 5-1: Typical Marina Management Structure

Marina Supervisor

The main purpose of this role is to support the Marina Manger with the general operation of the marina. In this capacity, the marina supervisor assists in all duties performed by the marina manager and works with the Dockmaster to maintain a healthy and professional relationship with the marina guests.

Administrator

This role supports the City's Financial Controller with the general administration at the marina including taking bookings and allocating berths producing accounting reports in conjunction with the bookkeeper, handling slip holder and visitor inquiries, and coordinating security.

Bookkeeper

This role is to support the City's Financial Controller with general accounting functions at the marina, including implementing all bookkeeping measures, collecting debts, and supporting marina front line operations.

Dockmaster and Dock Mates

A Dockmaster, with the support of one to two dock mates, is intended to support the management team in running the day to day operation of the marina. Dockmasters are the main face of the marina and provide the majority of the contact with customers. This is normally through inquiries at the Dockmaster's Office or anywhere around the marina, answering phones and communicating over the VHF. In addition, the Dockmaster uses the marina management system to produce all necessary slip documents for customers, receives and accounts for slip holder paying annual lease payments, and identifies and records maintenance issues at the marina. In addition, the Dockmaster ensures that trash is collected, keeps docks clean and clear of debris, prepares daily weather forecasts, and operates access control systems if present.

The Dockmaster duties related to slip operations may include allocating visitor slips, moving boats around the marina with a workboat, checking all safety equipment, conducting line and fendering checks on daily basis and if not automated, recording electrical meter readings from each marina slip as required for invoicing.

Maintenance Technician

The main purpose of the role is to carry out the marina's repair and maintenance requirements complying with all legal requirements for fire & life safety legislation. Duties including carrying out all routine repairs and maintenance and minor construction work both ashore and afloat, indoors and out, which may include mechanical, electrical, fitting, plumbing, and painting.

Security

Security is typically contracted to a third party or is provided by a municipal department. In a marina setting, security personnel patrol assigned areas to provide assistance to visitors, berth holders, and employees, confront and question all suspiciously acting persons present on marina property, investigate and submit reports concerning criminal offences committed against marina property, visitors, berth holders and employees, and respond to fire and security alarms on marina property.

5.2 OPERATIONAL MANAGEMENT

The two operational management scenarios available to the City of Alexandria are either;

- Place the marina in the hands of a marina management company.
- Manage the marina in house, either totally independently or with assistance from a company specializing in oversight management.

Since the City is already has an operational marina business, then if correctly implemented and overseen, marina management can be an extension to core reporting structures already in place. In situations such as new marina where there is not a business structure, then third party operational management may be an ideal solution.

5.2.1 FULL OPERATIONAL MANAGEMENT

A third party business management firm shares a similar business model to hotels, with the onus on the team to safeguard and drive a successful business. The firm is responsible for key business elements of management, sales and marketing, finance and reporting. Solutions to operational systems, IT infrastructure, reporting procedures, preventative maintenance, health and safety, and meeting customers' requirements are provided by the firm.

The key terms for a third party management firm typically require a long-term contract with marina assets remaining with the management company.

The marina company would retain all revenues from the marina and be responsible for all marina costs. The firm is paid for their services as a percentage of turnover or for a fixed fee or a combination of both.

The typical management fee structure may be based on;

- Profitability of the operational business. Normally a management fee of a % of adjusted gross revenue and a % of gross operating profit. This percentage can also be subject to annual minimum fee.
- Minimum fee – depending upon size, complexity and location, the minimum fee may range between \$120k and \$400k per year.
- Where slips are sold on long-term licenses, operator likely to receive a percentage commission of the value of the slip sale, usually 5%.

5.2.2 OVERSIGHT MANAGEMENT

An alternative to a full management contract is to employ the marina general manager directly and operate entirely internally or gain assistance through an oversight management program. Many marina owners, who have not previously operated a marina facility, will be seeking a low risk strategy to operating and growing the business in the early years. Furthermore, the operation of a marina requires in-depth knowledge of facilities management; vessels and their requirements and customer service in respect to what boat owners and their guest's prerequisites are, along with strong promotional and marketing expertise. Therefore it makes sense to take advice and guidance from someone who has done it before.

An Oversight Management program provides an independent perspective and evaluation on a marina and that ensures that the owner's interests are being protected and strengthened. The assistance provided will give the owner ongoing physical, financial, and marketing recommendations for the marina business.

These objectives are achieved through regular visits to the marina, weekly conference calls with the General Manager and staff and discussions with the owner to review the implementation of strategy. Advice and guidance is given on maintenance programs and capital expenditure considerations to reassure the owner that the property will sustain and improve its income potential. Specific financial benchmarks can be used to measure the marinas progress.

Key considerations with the oversight program:

- Oversight Management program provides independent perspective and evaluation on a marina and ensures owner's interests are protected and strengthened.
- Achieved through regular visits to marina, weekly conference calls with GM and staff, and discussions with owner to review implementation strategy.
- Advice and guidance given on maintenance programs and capital expenditure considerations to reassure owner. Specific financial benchmarks are used to measure progress as occupancy increases.
- Service can be for contracted period (eg, first 1-2 years of operation) or open-ended.

- Key to success is appointment of highly experienced marina General manager who understands business of operating marinas.
- Marina manager and all staff are employed directly by the marina company vs the City.

5.2.3 RECOMMENDATIONS

Although the expanded marina may result in upwards of 120 slips, the size is still too limiting to generate significant revenue. This limited size makes it difficult to utilize a management company and still show a return to the City. Therefore it is suggested that in-house management, with the option to engage with an oversight management company in the short term, is the best operational scenario for the City.

5.3 OPERATING REVENUE

The City Marina operates as a public facility, with slip holders leasing slips on annual, semi-annual or seasonal basis. The City also charges transient boaters a fee for short term berthing. Table 5-1 shows the revenue potential for the marina.

These costs and revenues are based on a slip lease rate of \$10 to \$12/ft/month (market median price) for 12 months, with boats under 35 feet demanding less premium than boats larger than 35 feet. Slips for boats larger than 50 feet typically command higher slip fees. The revenue potential for slip lease fees assuming an average boat length at each location over a 10-

year period as shown below, assuming 50% occupancy in year 1, 70% occupancy in Year 2, and 90 to 95%% occupancy in the remaining years.

City Marina & King Street – Revenue potential of \$165,000 in Year 1 to \$375,000 by Year 10 for the 59 annual lease slips.

Point Lumley Facility – Revenue potential of \$140,000 in Year 1 to \$325,000 in Year 10 for 56 annual lease slips.

RTS Facility – Revenue potential of \$210,000 in Year 1 to \$485,000 in Year 10 for the 65 annual lease slips.

Table 5-1: Wet Slip Potential Lease Revenue

Dock Size	Potential Annual Revenue
25 ft Dock	\$3,000
30 ft Dock	\$3,600
35 ft Dock	\$4,620
45 ft Dock	\$5,940
50 ft Dock	\$7,200
60 ft Dock	\$8,620
90 ft Dock	\$12,960

Additional revenue is generated through short term and overnight transient fees. Since RTN is proposed as a transient facility, the revenue potential may vary from \$45,000 to \$65,000 depending on the number of event ships that

use the facility. Transient revenue is assumed to increase at 2% per year once the WSAP is constructed and supporting retail and restaurants are added. Other revenue sources including fees from commercial operations and other miscellaneous sales such as technical services, storage fees, and utility surcharges depending on regulatory rules and regulations.

5.4 OPERATING COSTS

Operational costs typically include utilities, labor, maintenance, insurance, and lost revenue due to unleased slips or unpaid invoice collection efforts. For the following, all slips are assumed to be rented with no unpaid invoices.

Utility costs typically range from \$50 to \$100 per month for boats from 30 to 60 ft long. The City includes utilities as part of the lease fee though the City is presently evaluating the installation of meters on potable water and electric service. Annual utility costs are expected to be on the order of \$5,000 to \$7,500 per year at each marina facility location.

The City also has full time and seasonal staff managing the facility. The staffing costs including benefits currently ranges from \$240,000 to \$260,000 per year. In addition, maintenance, marketing, insurance, and miscellaneous costs for marina operations are approximately \$115,000. Staffing and the remaining operating costs are assumed to escalate with inflation on an average of 2.5% over the 10 year period.

The City does not currently include Capital Improvement Projects (CIP) such as maintenance dredging in the City Marina in the city’s operating budget.

The City dredges, on average, every 7 years at a cost of \$3 million. However, maintenance dredging is a true cost of operation and has been annualized over the 10-year period to evaluate the operating profit or deficit potential for the facility.

5.5 SUMMARY

Based on the projected operating revenues and costs, the City Marina may run an operating profit or an operating deficit depending on the number of slips constructed. Two scenarios at Year 10 are presented below in Table 5-2; the first scenario represents the City only operating the City Marina facility or the Pt. Lumley facility. The second scenario includes the addition of the RTS facility to either base line facility. For scenario 2, one additional full time and additional seasonal staff were assumed. Operations costs were also doubled for Scenario 2.

This operating profit/loss potential statement does not include the annualized capital cost to construct new facilities at any of these location. The addition of this cost would result in City Marina operating at a loss.

Figure 5-2 show a simplified relationship between the number of boat slips, the associated revenue generation versus the cost to construct a given number of boat slips. There is minimum construction cost for a boat slip, which includes contractor mobilization, the dock structure, and base utility infrastructure. The cost to demolish existing structures, dredge or install wave/ debris protection is not included since its site specific item. As shown, revenue is based on a slip lease and miscellaneous utility fees only.

Table 5-2: Marina Annual Cost vs. Revenue Potential

	City Marina or Point Lumley Only	City Marina/ Pt. Lumley Facility + RTS
	Cost/ year	Cost/ year
Annual Revenue		
Slip Lease	\$375,000	\$940,000
Transient Facility	\$85,000	\$85,000
Marina Fees	\$130,000	\$130,000
Revenue Potential at Year 10 Total	\$590,000	\$1,155,000
Annual Costs		
Staffing	-\$300,000	-\$385,000
Operation	-\$150,000	-\$300,000
Maintenance Dredging	-\$250,000	-\$250,000
Cost Total	-\$700,000	-\$935,000
Annual Total	-\$110,000	\$220,000

Typically the return on investment period for commercial marina operation is 5 to 7 years so the number reflects the total revenue at the end of Year 7. This graph does not take into consideration additional revenue sources such as commercial or transient slip fee from large event ships (Figure 5-3) and merchandise and food and beverage sales. Operating costs are also not included. As shown, a minimum 150 to 200 slips marina is need to generate sufficient revenue from its lease fees to offset the initial capital construction costs. Marinas with fewer than 150 slips that operate profitably have

additional revenue streams from upland and marina support services. However, marina profitability is heavily influenced by slip occupancy.

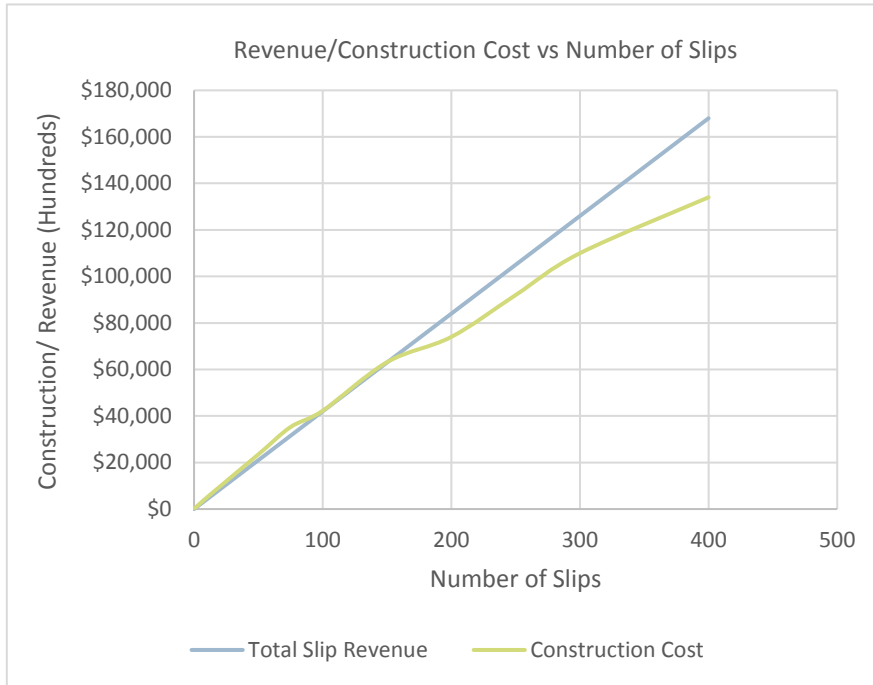


Figure 5-2: Revenue/Construction Cost vs Number of Slips



Figure 5-3: Festival Ship at City Marina

6. MARINA IMPLEMENTATION

The implementation of a portion or all of the marina facilities identified in the siting plan will depend on the schedule and financing plan that would be identified in the City's Capital Improvement Plan (CIP), the planned implementation of the flood mitigation project between Duke and Queen Streets, the shoreline and marine related improvements associated with the WSAP, and regulatory authorization from the state and federal government on the aforementioned improvements.

The City approved a CIP in 2016 for Fiscal Year 2017 through Fiscal Year 2026 that identified improvements to the City Marina facilities including seawall repairs, utility grades, and maintenance dredging through Fiscal Year 2026. The CIP did not include a line item for the replacement of marina infrastructure. However the plan did identify the schedule and funding for the construction of flood mitigation and WSAP projects. The waterside improvements to the City Marina and King Street areas in the WSAP / Flood Mitigation project include the following marine elements: a bulkhead, the King Street Pier, dredging / disposal, and floating docks for the commercial vessels, water taxi, and transient boats. The WSAP/ flood mitigation projects are to be paid by incremental tax revenues and contributions from private development.

There are cost and scheduling advantages to the City Marina in conjunction with the flood mitigation project or WSAP at this location. Piers E/F and G/H of the City Marina and portions of Pier A/B and the existing ODBC piers will

have to be removed to facilitate construction of the bulkhead. For the WSAP, the remaining portion of the ODBC would have to be removed to facilitate construction of Fitzgerald Square. Since the cost to mobilize equipment and labor for the flood mitigation and WSAP projects is included in the CIP construction budget, the cost to construct the City Marina may be less as mobilization cost would be shared between projects. In addition, construction timeframes may be reduced if the two projects were performed at the same time as landside infrastructure improvements for access, security, and utilities could be performed simultaneously, avoiding the potential need for interim infrastructure as well as minimizing overlapping coordination.

The aforementioned cost and schedule advantages may also apply to the construction of the Point Lumley facility since WSAP/Flood Mitigation project overlap. Construction of the RTS marina facility or the RTN transient dock lie outside the main elements of the WSAP/ flood mitigation project and therefore, may not experience the same cost and scheduling advantages of the other two projects.

6.1 PHASING

A phased construction approach to one or all of the marina facilities is highly probable since these facilities are intertwined with the construction of the flood mitigation and WSAP projects. The construction of all marina facilities

is also governed by federal and state regulatory approval process to redefine the federal bulkhead and pierhead lines on the Potomac River seaward from their existing locations. This regulatory review and authorization process will need to be complete prior to construction of the flood mitigation and WSAP project, and the marinas. The last factor affecting marina construction is the settlement agreement between the City and the ODBC. ODBC has 10-year to acquire regulatory authorization and construct the 56 slips in the Expanded Pier Area south of the new ODBC facility. In the interim, ODBC will be utilizing Piers A/B and their existing north pier at their former site. During this period, Pier A/B will have to be operational which would preclude their replacement unless the City can provide temporary facilities to moor vessels during the construction.

There are several phasing options for construction of the marina facilities at Point Lumley and the City Marina depending on timing of the flood mitigation/ WSAP projects and the relocation of ODBC. These scenarios are based on the receipt of federal and state regulatory authorization to relocate the bulkhead/ pier headlines.

One option is to construct the 65 slips at RTS. This marina construction has little to no impact on the construction of flood mitigation project and minimal impact on the WSAP construction associated with utility services. Once this facility is constructed, the marina can operate regardless of the timing of the flood mitigation and WSAP construction. The RTS facility may also serve as temporary mooring facility during replacement of the docks at the City Marina or the construction of new docks at the Point Lumley facility.

Another phasing option is to first construct the 56 slips (Pier PL1) at the Point Lumley facility then relocate ODBC boats to this facility from Pier A/B on a permanent or temporary basis. This construction would occur after the flood mitigation project is completed along this shoreline segment, Pier A/B has been turned over to ODBC per the settlement agreement, and City's annual lease holders have been relocated to existing Piers E-H north of the commercial slips. If ODBC decides to retain Pier PL1, then the City can move forward with completing the flood mitigation and WSAP projects within the main City Marina basin (Pier A/B). Once this area is completed, the City's annual lease holders can be moved to new Pier A/B to facilitate completion of flood mitigation and WSAP projects north of the existing commercial docks. If ODBC decides to retain Pier A/B, the City can utilize the Point Lumley facility as a temporary mooring facility for ODBC vessel during construction of the flood mitigation project in the main City Marina basin. Once the flood mitigation project is completed and the ODBC vessels are relocated, the City can move the City's annual lease holder to the new Point Lumley facility.

The construction of the transient docking facility at RTN may not require a phased approach unless the City desires to maintain a large berth for commercial vessels during construction of the RTS marina. The transient facility at RTN may also serve as temporary mooring for commercial vessels during reconstruction of the commercial slips at the City Marina.

APPENDIX

MARINA MARKET ANALYSIS

A. EXISTING MARINA MARKET

Cataloging the existing regional marina market provides insight into market capacity and local boating trends. The existing Northern Virginia/ District of Columbia (NOVA/DC) marina market consists of wet slip marinas primarily in Northern Virginia and the District of Columbia along with numerous dry storage and launch facilities, yacht clubs, and private slips. Marina facilities located on the eastern shore of the Potomac River in Prince George’s County, Maryland (MD) are considered part of this market. The existing market analysis is used to evaluate the current marina wet slip demand and to project future demand in the market region.

A.1 MARKET AREA

The NOVA/DC marina market encompasses marinas on the upper Potomac and Anacostia Rivers and serves local boaters as well as visiting transient boaters. The NOVA/DC marina market area may be defined both geographically and demographically.

Market areas are defined geographically by the expected distance that local boaters are willing to travel to use the marina facilities and include the competing marinas within that area. Studies suggest boaters are willing to travel by car up to one hour from home to reach their boat. Traffic congestion within a region heavily influences the willingness of boaters to travel to a facility. Comments received from boaters and dockmasters in the area generally agree that the geographic marina market region for NOVA/DC

encompasses boaters and marinas in the District of Columbia, Fairfax and Arlington Counties, the City of Alexandria and the eastern shore of Prince George’s County (Figure A-1). Marinas in Prince William County, Virginia are generally not considered part of the market area since they tend to attract more suburban and rural boaters that live in close proximity to those marinas. However, there is some market overlaps with marinas in the Occoquan region of Prince William County as boat owners in lower Fairfax County may elect to utilize these facilities due to short travel distance rather than urban marinas such as the City Marina in Alexandria. Market characteristics and marina program elements of this overlapping market area have been included in this study. Boaters in Montgomery and Prince George’s Counties, Maryland generally not expected to seek long-term berthing within NOVA/DC due to proximity of Annapolis/ Chesapeake boating region; however transient boaters are expected to visit from these outside market areas.

Marina market areas based on demographics are often distinguished by the type of associated upland development and the targeted vessel size classes. Different demographic types include marinas supporting home porting boats, residential developments, clubs, or transient and tourism boaters. The NOVA/DC market area can be separated into two geographic sub-markets; 1) urban marinas in DC and the City of Alexandria and 2) suburban marinas in Virginia and Maryland. These geographic sub-markets are also

demographic sub-markets as boat usage in these two sub-regions differs. Urban Marinas on the Maryland and Virginia sides of the Potomac River provide long-term slips to local, day-use boaters with no live-aboards permitted. In the D.C. area, many of the marinas, including those on

Boathouse Row along the Anacostia River are operated by social clubs. In addition, the Gangplank Marina and Capital Yacht Club allow liveaboards.

A.2 BOATING ACTIVITIES

Peak boating season coincides with the warmer weather months, generally from April to October. During the spring, summer, and fall, boaters visit DC destinations such as Georgetown and The National Mall and the historic waterfront and/or dining/entertainment activities in the City of Alexandria, National Harbor, Mt. Vernon and Occoquan as shown in Figure A-2. Fishing and watersports such as water skiing are also a common activities on the Potomac River.

Transient boaters often cruise to specific destinations, stopping at convenient locations along the way. Boaters from the upper, middle, and lower Potomac River areas visit the NOVA/DC region for day trips or short visits during the prime boat season. This group comprises the majority of transient boaters in the NOVA/DC regional area. These local transient boaters generally seek day slips to enjoy the destination but may require overnight slips as well.

Transient boaters traveling along main cruising routes in the Chesapeake Bay, mid-Atlantic region or Florida are less frequent due to travel distance to NOVA/DC region from the mouth of the Potomac River. These long distance transient boaters are not a significant portion of the existing market.

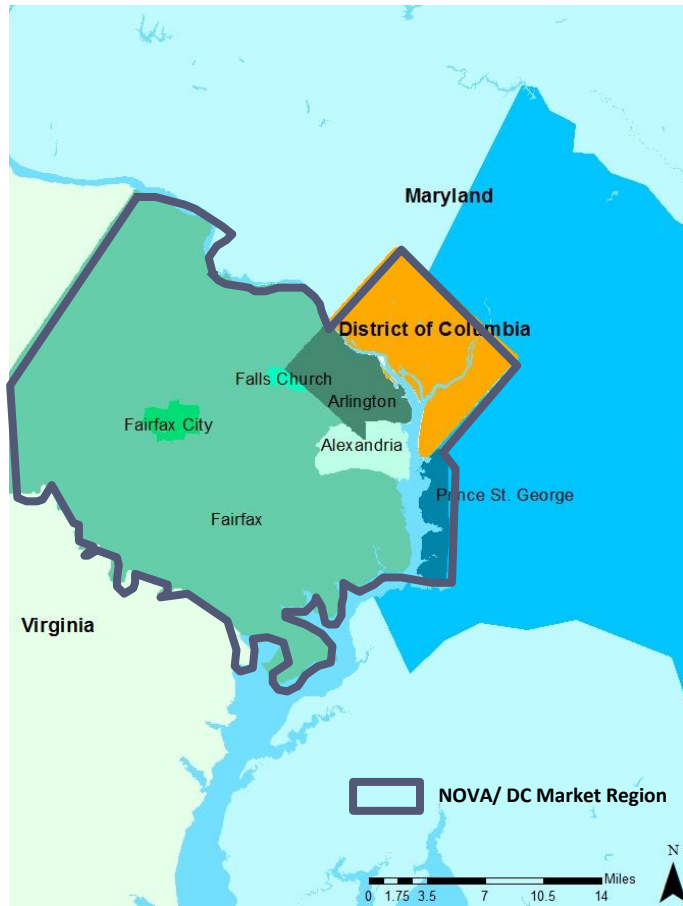


Figure A-1: NOVA/DC Market Region

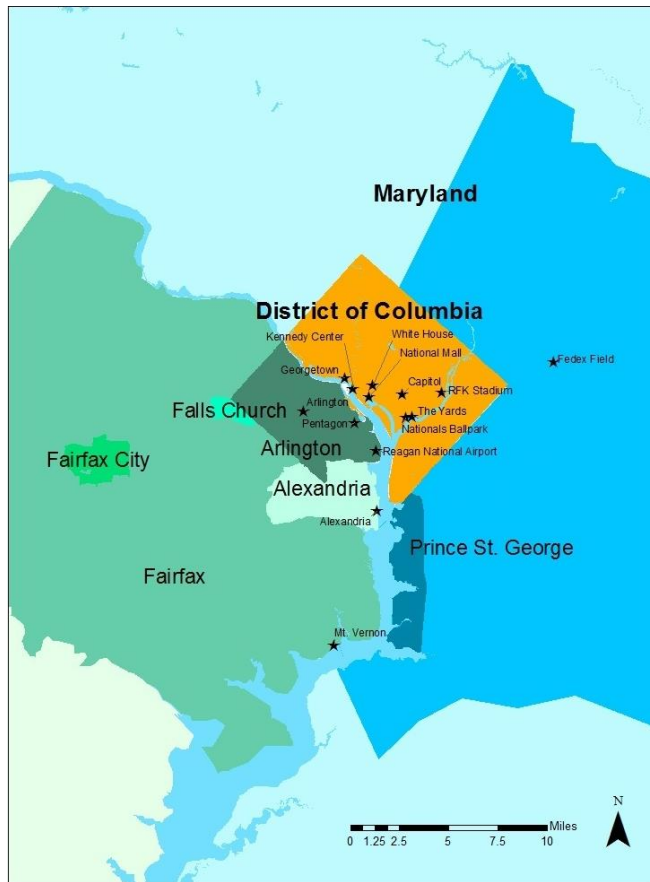


Figure A-2: Attractions

Cold weather is not conducive to the popular recreational boating activities in the market and there are fewer vessels in use during the winter. Many smaller boats (less than 40 feet) are moved from wet slips to dry storage during the winter to reduce docking costs. An additional impediment to boating during these colder months is the ice that can form in the waterways.

Ice can damage watercraft and dock structures and many smaller boats throughout the market are stored on the upland during this period to avoid damage. Although ice is a concern in the Potomac and Anacostia Rivers, some marinas counter this issue by installing a bubbler or deicing system around the slips or within the marina basin to prevent ice build-up.

A.3 MARKET SIZE

The NOVA/DC marina market, including marinas in the Occoquan area, is comprised of 25 boating facilities for a total of approximately 3,800 slips. Many of these marinas are boating clubs or dealer exclusive facilities (6+) or dry storage facilities with docks for launching and staging only. Fourteen of the marinas are considered urban marinas comparable to the City Marina. The location of the 25 wet slip marinas is shown in Figure A-3 with the number of slips for the 14 comparable facilities shown in Table A-1.

The majority of the vessels occupying slips in the NOVA/DC market are power boats and small sailboats. The Potomac River is generally too narrow for larger, deep-drafted sailboats. While weather in this area is favorable for sailing, which is a popular activity in the nearby Chesapeake Bay, river width restrictions limit the size vessel that can comfortably sail these waters. Height restrictions due to bridges are also deterrents for sailboats. The 75-foot clearance afforded by the Woodrow Wilson Bridge can accommodate a sailboat up to approximately 46 feet (Tobiasson, 2000). Larger vessels may still be accommodated through the Woodrow Wilson Bridge drawbridge opening, although the hours are restricted to off-peak times.



Figure A-3: Existing Marinas

Table A-1: Slip Counts for Comparable Facilities

Marina		Slips
1	Alexandria City Marina	64 (incl: transient)
2	Belle Haven Marina	130
3	Capital Yacht Club	116
4	Columbia Island Marina	382
5	District Yacht Club	45
6	Eastern Power Boat Club	30
7	Gangplank Marina	309
8	James Creek Marina	300
9	Old Dominion Boat Club	53
10	National Harbor	81
11	Seafarers Yacht Club	66
12	Washington Marina Company	132
13	Washington Sailing Marina	200
14	Washington Yacht Club	40
	Total	1950

A.4 SLIP SIZE

The number and size of slips for marinas in the market area is shown in Table A-2. There are more than 1350 slips less than 40 feet in length (72% of the slips) in the existing market and only 1 percent of slips capable of accommodating vessels 80 feet and longer. The City Marina represents 3.5% of the total number of slips in the market.

Table A-2: Slip Distribution for City Marina and NOVA/DC Market

Slip Size	Alexandria City Marina		NOVA and D.C. area market	
	Count	Percentage	Count	Percentage
<20ft	0	0%	0	0%
20ft-29ft	35	55.0%	790	42.2%
30ft-39ft	26	40.2%	561	30.0%
40ft-49ft	1	1.6%	330	17.6%
50ft-59ft	0	0%	95	5.1%
60ft-69ft	1	1.6%	59	3.2%
70ft-79ft	0	0%	15	0.8%
80ft-89ft	0	0%	8	0.4%
90ft-99ft	0	0%	2	0.2%
>100ft	1	1.6%	9	0.5%
Total	64	100%	1869	100%

A.5 DOCK STYLE

Marina docks may be either fixed or floating structures and can be constructed of a variety of materials including wood, concrete, metal, and composite materials. The type of dock is selected based on environmental conditions and owner preferences. Environmental factors that influence dock type include tide range, water depth, wave climate, currents, ice, and debris. Boater preferences, cost, and durability also may be considered.

Tides at the project site are on the order of 3 feet as reported at the tide gauge located at the Police and Fire Harbor Patrol Office on the Washington

Channel. In areas of tidal fluctuation exceeding 2-3 feet, floating docks are more prevalent as they provide a constant 1 to 2 foot deck elevation above the water surface, facilitating boat access.

Table A-3: Dock Types

Dock Type	
Fixed	4
Floating	9
Deck Material	
Wood	10
Concrete	2
Composite	1
Aluminum	0
Dock Style	
Single	2
Double	12

Fixed and floating dock types are represented in the market, with floating docks prevalent among the comparable facilities as shown in Table A-3. In addition to the City Marina, fixed docks are found at most yacht clubs along the Anacostia River. Some of the marina have covered fixed docks slips or lift slips. Fixed docks are constructed primarily of timber while floating docks are aluminum or steel framed with timber or composite decking. Floating concrete docks have been installed at

Capital Yacht Club, with planned installations at Gangplank Marina and The Yards Marina. Although a variety of docks are present in the market, the majority of marinas are comprised of floating docks.

The majority of slips in the market are double-loaded with a finger on one side of each slip and two adjacent slips separated by a mooring pile. The Capitol Yacht Club has single loaded slips. The majority of slips in the market have full length finger docks. Shorter fingers save construction cost but many boaters prefer the full length finger for easier boat access and maintenance.

Current yacht construction trends show that vessels are being built with wider beams. Yacht builders are increasing the usable square footage on vessels by increasing widths up to 25% without increasing the length proportionally. Many of the older slips in the market, are too narrow for current vessels using the slips, resulting in smaller vessels being forced to use longer slips to accommodate the beam. Slip holders at the City Marina have indicated that the slips are too narrow.

A.6 AMENITIES

Typical marina amenities include shore power, potable water, sewage pump-out, and communications connections located at the slips. Amenities may also include landside facilities such as parking, restrooms, showers, and laundry services. Seasonal, live-aboard and transient boaters require different amenities and the amenities that marinas provide influences the type of boater that frequents the facility.

Table A-4 shows the amenities available in the market. Potable water, sanitary pump-out and shore power are the three most provided and required amenities in the North Virginia and D.C. market. In addition to potable water, sanitary pump-outs are available at a majority of the facilities. Newly constructed or renovated marinas are often required to have pump-out available in order to obtain a permit.

Regarding power supply, as many of the marinas in the market area are older and have a predominance of smaller slips, power is generally available as

single phase 30 amp 120 volt service or 50 amp 208 Volt service. Larger or new facilities tend to offer single phase 50 amp and 100 amp 240 volt service.

Table A-4: Available Amenities

Amenity	% of Marinas
Potable Water	100.0%
Sanitary Pump-out	100.0%
Electric	92.3%
Shower	61.5%
Restaurant	46.2%
Bar	23.1%
Laundry Facilities	23.1%
Ice Machine	23.1%
Gas	15.4%
Satellite TV/Cable	13.3%
Telephone	13.3%
Diesel	7.7%
Shopping	7.7%
Water Sports	7.7%
Internet	6.7%

Dockmasters in the market reported increased power as the most necessary amenity upgrade at existing facilities. This demand is due to increased standard amenities offered on vessels, such as air conditioning, television and audio systems.

Boaters using suburban marinas as a place to park their boats did not typically require comfort amenities such as laundry, showers, and internet. However, boaters at urban marinas as well as those that serve transient and liveaboard boaters include these amenities.

Marinas in NOVA/DC market do not generally include destination amenities such as hotels, restaurants, or bars attached to the marina. These amenities are available in some marinas in downtown DC and at National Harbor.

Boat owners indicate convenient parking is important for loading and unloading. Boat users at the Alexandria City Marina indicate that parking is difficult to locate or is inconvenient based on location or fee. Dockmasters in downtown D.C. indicate a similar issue.

A.7 PRICING

Slip lease rates in the NOVA/ DC market vary and are influenced somewhat by marina location, slip size, and amenities. Table A-5 shows published maximum rates for the comparable marinas.

The existing wet slip lease range for a transient vessel is \$0.50-\$5 per foot per day. Urban marinas such as City Marina or in D.C. or marinas with larger slips and “T”-head docks command the higher prices while those with lower prices are further from the city center and have older, smaller docks. These trends carry into the monthly and yearly recreational lease slip rates. Monthly recreational slip lease rates range from \$7.35-\$17.82 per foot per month and the yearly ranges are slightly discounted from \$2.18-\$15.28 per foot per month.

Table A-5: Recreational Marina Slip Lease Rates

Marina	Rate per Foot		
	Daily	Monthly	Yearly
Alexandria City Marina	\$2.50 - \$5.00	\$7.35 - \$8.25	\$9.00 - \$11.00
Belle Haven Marina	\$1.00	\$8.25	\$8.25
Columbia Island Marina	\$1.50	\$11.24 - \$12.87	\$11.24 - \$12.87
District Yacht club			\$2.18 - \$4.80
Eastern Power Boat Club			
Old Dominion Boat Club	\$0.50 - \$2.00		
Seafarers Yacht Club			
Washington Sailing Marina		\$9.44 - \$10.26	\$8.87 - \$10.19
Washington Yacht Club			
Capital Yacht Club	\$2.50 - \$4.00		
Gangplank Marina	\$1.50	\$14.35 - \$17.82	\$11.71 - \$15.28
James Creek Marina	\$1.50	\$9.75 - \$10.75	\$9.75
Washington Marina Company	\$2.50 - \$5.00	\$9.00 - \$12.00	\$12.00 - \$13.33

B. PROJECTED MARINA MARKET

The projected marina market describes the number and size of slips expected to be supported by the market in the future. The projected market capacity also influences the rate at which slips are absorbed (occupied) and the lease price supported by the market.

The market capacity is determined by evaluating the number of slip takers projected to use boat slips. Projected slip takers for a new marina in the NOVA/ DC market area are expected to include:

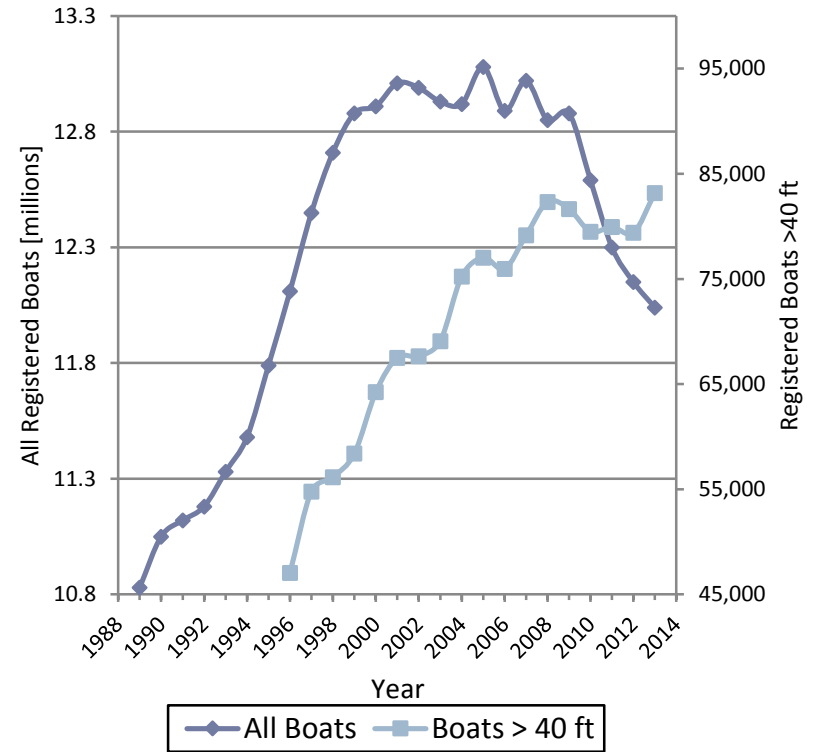
- Long-term recreational boaters
- Transient recreational boaters

In addition to identifying projected slip takers, trends in boat registrations and uses are also analyzed.

B.1 BOATING TRENDS

Boats in the U.S. are registered and licensed by the U.S. Coast Guard or the state of residence. The number of registered boats directly relates to boat ownership and boat use which affects marina slip demand.

Analysis of U.S. boat registration statistics, shown in Figure B-1, indicates that steady growth of registrations in the 1990’s was followed by a declining trend through the 2000’s. This decline is attributed to flat income growth, economic instability in the U.S. combined with rising fuel prices.



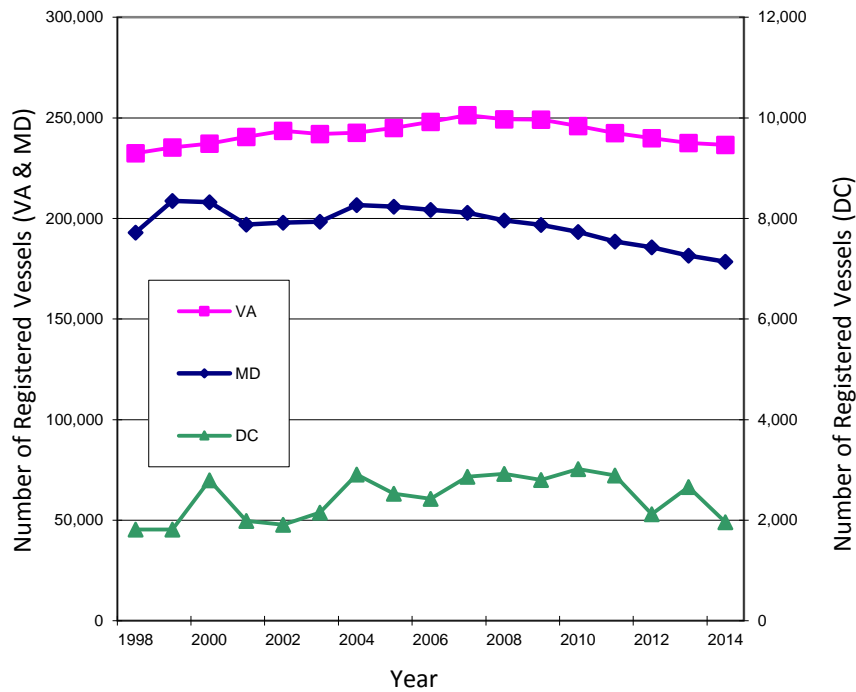
Source: U.S. Coast Guard/NMMA

Figure B-1: U.S. Boat Registration Trends

In contrast to the recent declining trend in overall boat registrations, the data also shows steady growth (2-3% per year) in the number of boats greater than 40 ft. These trends are consistent with boat slip demand throughout

the U.S. as reported by dockmasters and industry analysts who indicate that smaller slips are currently vacant or are last to be filled while wait lists exist in many marinas for larger (>40 ft) slips.

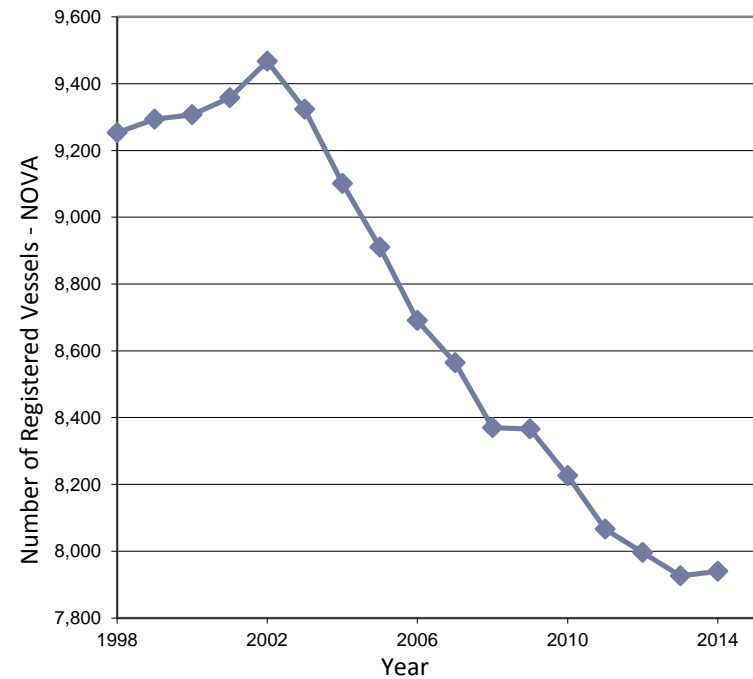
Boat registration numbers in Virginia, District of Columbia, and Maryland follow trends similar to the national trends with total boat registrations in 2014 at or below registration totals from 1998 (Figure B-2).



Source: U.S. Coast Guard/NMMA

Figure B-2: Boat Registration Trends in VA, DC, & MD

The number of boat registrations for NOVA regional area also mimic state and national trends though the past few years suggesting boat registration is stabilized as shown in Figure B-3. The number of registered boats in NOVA/DC categorized by size based on 2014 boat registration data suggests that the number of boats larger than 35 ft has remained fairly stable while the number of smaller boats has decreased.

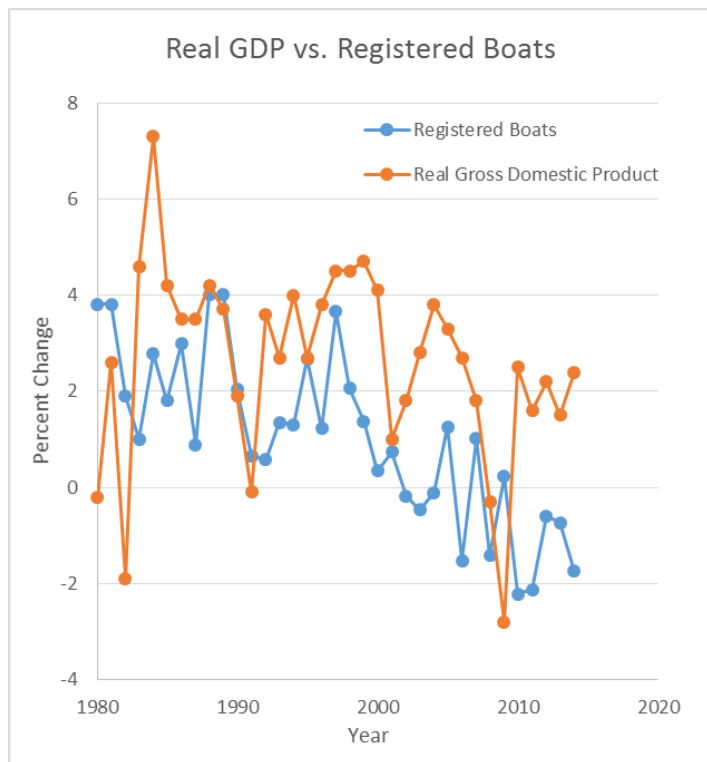


Source: DGIS, Moffatt & Nichol

Figure B-3: Northern Virginia Boat Registration Trends

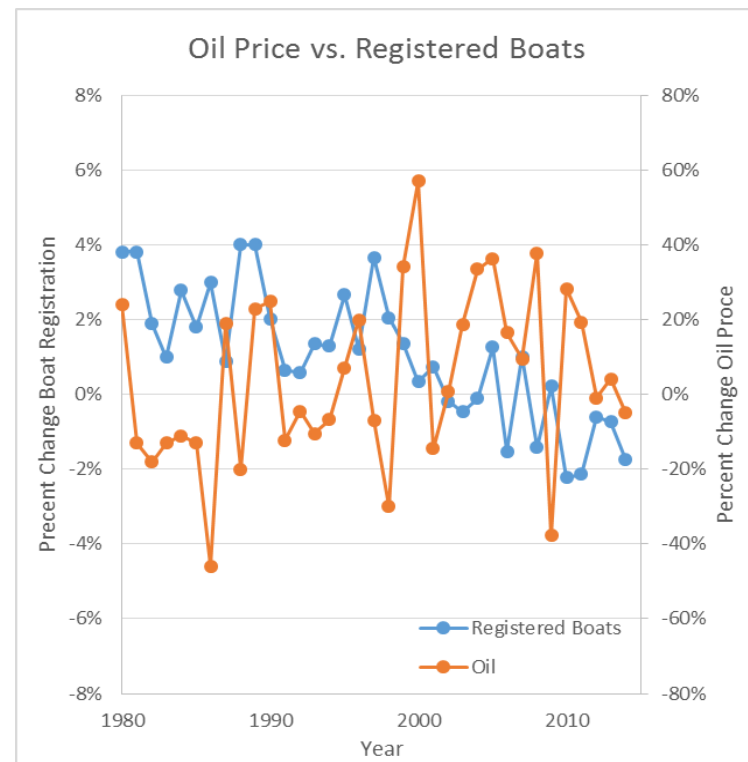
The cyclicality in boat registration rates of change is related to the overall economy and corresponds to some extent to real gross domestic product growth. Figure B-4 shows the rate of change in boat registrations vs. the rate of change in GDP. Analysis shows that boat registrations slowed significantly during and immediately following recessions or steep declines in GDP (1982, 1991, 2001).

In addition to following GDP economic trends, boat registrations trends are also related to fuel prices. Boat registration data analysis indicates that greater than 90% of boats in the United States are motorized and that significant fluctuations in oil prices may also affect boat sales. Figure B-5 shows that registered boat growth slowed following sharp oil price rises 1987, 1989-1990, 1996, 1999-2000, 2004-2005, 2008, and 2010).



Source: USCG, Department of Commerce (BEA), Moffatt & Nichol

Figure B-4: Real GDP Growth and U.S. Registered Boat % Growth



Source: USCG, Moffatt & Nichol

Figure B-5: Oil Price Fluctuations and U.S. Registered Boat Growth

Marinas are generally the last sector in the boating industry to see effects from economic volatility and are typically the first to recover. During recent economic slow-downs, many boats remained in use, although they exhibited a decrease in duration and frequency of boating trips during this time (Ross, 2008).

“...the last four recessions suggest that marinas are the last sector in the boating business to go into recession and the first to come out. ... in the first year of a recession a marina operator typically sees few changes - maybe shorter boat trips and owners staying on their boats at the docks more; in the second year, a 10 to 15 percent slip vacancy occurs, along with a decline in fuel sales, more repair work, fewer boats to fill slips that become vacant, staff reductions and shorter work weeks; in Years 2 to 3, boats move to better marinas because they no longer have a waiting list and the better marinas fill their slips and upgrade their facilities; and in Years 3 to 4, almost all marinas recover, with more than 95 percent of them surviving without a change of ownership and waiting lists fill up again.” (Ross, 2011)

Most boats are trailerable, the majority of which are not stored in marina wet slips. Wet slips are typically occupied by larger vessels that are not as easily trailered and are limited in landside storage options. These vessels typically remain in a wet slip during the boating season regardless of the amount of use.

B.2 BOATING DEMOGRAPHICS

National Marine Manufacturers Association demographics data shows American boat owners are largely “middle-class”.

- Nearly 95 percent of registered mechanically propelled boats on the water in 2014 were 26 feet or less, meaning they were affordable, entry-level, trailerable boats, not large yachts.
- Three out of four current boat owners have an average household income under \$100,000.
- More than 69 percent of boat owners are married.

In the United States, the age of the average boater has been declining in recent years. Boating participants were more likely to be male (59%), younger than age 50 (74%) and have a household income of \$25,000–\$75,000.

Table B-1: Length of Boat Operated Most Often by Age – U.S.

	Age of Operator					
	20 to 29	30 to 39	40 to 49	50 to 59	60 to 69	70 +
Under 16 feet	64.4%	49.1%	39.9%	32.0%	29.5%	34.2%
16 to 20 feet	23.7%	33.2%	37.7%	40.2%	41.3%	43.3%
20 to 25 feet	7.0%	10.6%	13.3%	14.8%	15.3%	11.8%
26 to 39 feet	3.3%	5.1%	6.9%	9.4%	9.2%	8.2%
40 to 65 feet	1.3%	1.5%	1.8%	3.3%	3.6%	2.2%
Over 65 feet	0.3%	0.4	0.4%	0.3%	1.1%	0.3%
Total	100%	100%	100%	100%	100%	100%

Table B-1 shows the length of boat operated (owned) by age group for the U.S. The percentage of boats larger than 25 feet – boats generally requiring a wet slip - increases for each increasing age group up to age 60.

These demographic data support the conclusion that the primary age group for larger boats and wet slip demand is 40 to 70 years old. Boating and slip demand are projected to grow in popularity as the “baby boom” generation ages.

Age demographics for the Norther VA/ DC area from 2010 Census, shown in Table B-2 indicate 43% of the population is in the primary boating demographic between ages 35 and 65.

Table B-2: NOVA/DC Age Demographics

Age	Total	%
20 to 24	150352	7.93%
25 to 34	372908	19.66%
35 to 44	302280	15.94%
45 to 54	294170	15.51%
55 to 64	229976	12.12%
65 and Over	205455	10.83%

B.3 PROJECTED SLIP DEMAND

The projected demand for wet slips is evaluated by identifying and analyzing potential slip takers. Identified slip takers for the NOVA/ DC marina market include:

- Underserved Existing Boaters
- Population Growth
- Upland Development
- Tourism

Growth or decline these factors are correlated to demand for additional wet slips in the market.

B.3.1 UNDERSERVED EXISTING POPULATION

Marina markets that have already reached a saturation point leave a portion of the existing boating population underserved. There are boaters that seek a slip but an insufficient number of slips are available. An underserved market results in boaters trailering their boat, keeping their boat further outside of the region, or prevents a potential boater from purchasing a boat. The extent of the underserved population may be evaluated by evaluating marina slip wait lists and evaluating trends in regional boats per capita.

Marina Slip Wait List

Dockmasters throughout the NOVA/ DC market report that their marinas are generally at or approaching full occupancy (90 to 100%) with limited or no wait lists except for liveaboard slips and larger slips (>40 feet) in and around DC. The wait list at the Alexandria City Marina has been non-existent since 2013. Prior to the recession, the wait list at the City Marina ranged from 40 to 50 city residents. Dockmasters in the region report slips in the 20 to 25-foot range are available, either on annual or seasonal basis. Boat owners of

this vessel class may have switched from wet slip storage to dry storage for their vessels. Some dry storage in the Occoquan River area report available capacity suggesting that some smaller boats may be stored at home or not in use at all.

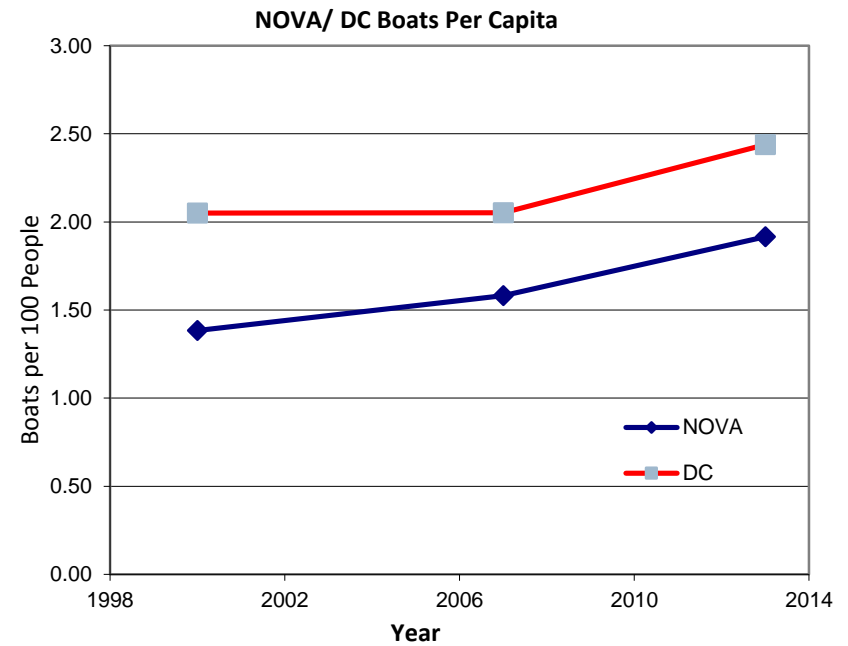
Larger wet slips, over 40 ft, were the least impacted by the 2008/2009 economic downturn and the slow recovery period from 2009 to 2014. This aspect of the market currently comprises approximately 25% of the available slips.

Larger wet slips have not seen a change in occupancy rates. However, dockmasters indicate that these boaters are not utilizing their vessels as frequently and are staying closer to the marina during boating trips.

Boats Per Capita

Market saturation and underserved boating population may be evaluated by analyzing trends in registered boats per capita in the market. Using boat registration and population data, the number of boats per capita for the NOVA/DC region is shown in Figure B-6. This figure shows that the existing number of boats per capita in the NOVA is one boat for every 52 people (1.92 boats per 100 people), an increase from one boat for every 72 people (1.38 boats per 100 people) in 2000. This increasing trend is also evident in the DC marina market as well. This increase suggests that there is latent demand for boats slips. With the exception of National Harbor and recent renovations of Capital Yacht Club, the number of boat slips in the NOVA/DC region has not significantly increased.

This suggests that the marina market is not saturated and there are underserved boaters. Analysis of this data indicates demand for an additional 300 boat slips in the existing market due to underserved population. This 300 slip demand does not take into consideration the number of owners that store their boats on a trailer. Approximately 93% to 95% of the registered vessels in the region are identified as trailerable, reducing the number of wet slips needed to support the underserved NOVA/DC market to approximately 15 to 20 slips.



Source: U.S. Census, Google, Moffatt & Nichol

Figure B-6: NOVA/DC Boats per Capita

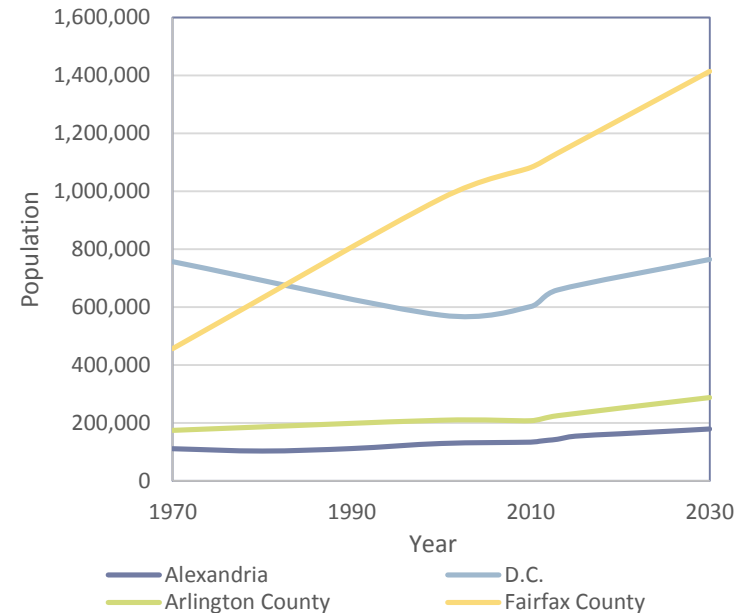
B.3.2 POPULATION GROWTH

As population grows, one can assume that the boating population will grow at a similar rate. However, there are other influences, such as demographic changes in population, that affect the growth of the boating market.

Historical population trends and future projections for the market area show an overall population increase over the period 1970-2030 (Figure B-7). The overall regional growth in the market is expected to increase 22.5% between 2010 and 2030, which equates to approximately 486,000 people. Growth in the market region population is expected to significantly increase the number of vessels in the market. Assuming a per capita boat ownership of approximately 1 boat per 50 people, an additional 9,500 vessels are expected in the market region by 2030 or an average of 650 boats per year. Based on percentage of boats that are trailerable from the 2014 boat registration data, a minimum of 500 wet slips will be needed to meet the demand from population growth.

Population growth projections can also be viewed by age distribution. Census data for NOVA region shows that a higher percentage of the anticipated population growth may be persons 55 years and older. The population in this age range is expected to increase by approximately 27 percent between 2014 and 2030 with annual increases of 10 percent over the next 10 to 15 years as the “baby boom” generation enters retirement age. Generally, a higher percentage of the retirement age demographics are boat owners with boats greater than 35 feet. These population demographic trends suggest that an

increase in this age group may lead to an increase in the number of boaters and larger vessels.



Source: U.S. Census, Google, Moffatt & Nichol

Figure B-7: NOVA/ DC Population Growth

Summary

The NOVA/DC market is currently underserved, with a need for 15 to 20 wet slips throughout the region. The NOVA/DC area population is expected to increase by approximately 486,000 people by 2030. This population increase may result in need for a minimum of additional 500 wet slips in the region. These slips are expected to be absorbed throughout the population growth

period at prevailing market rates. The City Marina may capture a percentage of the existing and future underserved market.

B.3.3 UPLAND DEVELOPMENT

The type of upland development associated with a marina can attract different types of boaters to the project. Residential components of upland developments typically draw long-term boaters and absorption of slips is in line with the upland absorption. Conversely a commercial development or waterfront attraction will generally attract more transient boaters seeking a temporary stop.

Two proposed developments are planned along the waterfront at Robinson Terminals North and South; a new mixed use community at Robinson Terminal North (RTN) and Robinson Landing development at Robinson Terminal South (RTS). Both developments include residential (townhomes and condominium) and commercial (retail and restaurants) components, with RTN also included a boutique hotel. RTN proposes 66 residential units while RTS has planned 96 townhomes and condominiums. Marina slip demand for these sites is expected to be residential and tourism driven (see following section). Demand for slips associated with waterfront development typical varies from 10% to 20% of the total residential units, resulting in 16 to 32 additional slips. Commercial and public spaces that will be incorporated into these developments may also attract transient boaters, necessitating additional day slips to accommodate these boaters. The transient component is discussed in next section, Tourism.

B.3.4 TOURISM

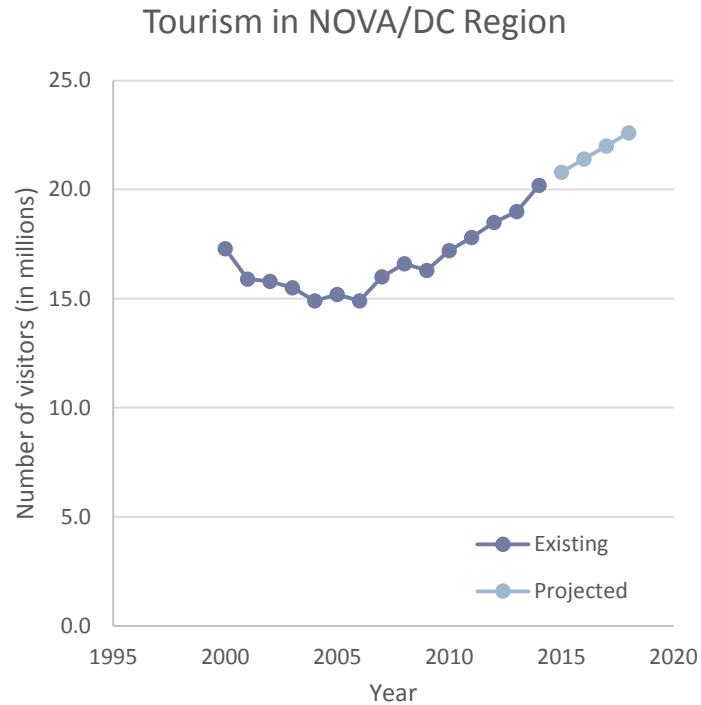
Transient boating for this analysis is defined as boaters passing through or visiting the region temporarily. The transient boating market is comprised of local residents and seasonal boaters from out of state traveling to historic, cultural, and entertainment destinations sites in the DC and NOVA markets such as those shown in Figure A-2.

Trends in boating tourism are expected to follow overall tourism trends in the NOVA/DC regional area. Recent tourism trends, as shown in Figure B-8, indicate a recent increase in tourism to the greater region. Tourist visits have increased 2 to 3% since 2008, with similar trend projected through 2020.

New cultural and entertainments venues in the region will be coming online within the next 5 years including The Wharf at the DC Southwest Waterfront, the expansion of The Yards Development, and rejuvenation of boathouse row on the Anacostia River. In addition, the MGM casino at National Harbor is slated to open in December 2016. These new destinations will draw potentially more visitors, including local and out-of-state boaters, to the area.

In addition, retail, restaurant, and cultural activities planned at the RTN/RTS development and the public spaces along the City's waterfront will be enhanced as part of City's Waterfront Master Plan; providing upland amenities and destinations that transient boaters typically desire. The

presence of foot traffic at these destinations also appeal to those boaters wishing to display their vessels.



Source: GPTMC, Moffatt & Nichol

Figure B-8: NOVA/DC Tourism Growth

Marina managers’ report a varying estimate on the number of transient slips offered at each marina. On average, marinas in DC, Alexandria, and National Harbor generally offer 10 to 15% of their slips for transient boaters with additional demand accommodated when possible in other vacant slips.

Marinas in the Occoquan region generally reserve 1 to 2% of their slips. This suggests that the NOVA/DC market has approximately 150 to 225 transient slips. Increasing this supply 2 to 3% over the next 10 years suggests a demand for 30 to 65 additional slips.

There are potential barriers to attracting transient barriers from out of state. The distance from the mouth of the Potomac River to Alexandria or DC is approximately 85 to 95 nautical miles. NOVA/DC is a half to day-long cruise from the mouth of the Potomac River. The distance is a deterrent for the transient boater that is passing through the Chesapeake Bay as there are many marinas or other destinations along the route that are more convenient. Based on feedback received from most dockmasters in the region, there is generally sufficient transient facilities for out-of-state boaters.

Megayachts, generally defined as boats greater than 80 feet long piloted by professional crews, occasionally visit NOVA/DC region on an Owner or charter basis. These vessels may visit the market on a transient basis similar to other boats passing through the area or attend a special event (Fourth of July, sporting events, etc.). As new tourism destinations open, additional megayachts may visit the area during the summer season though it is not anticipated to be a constant demand. A few marinas in the region have berths to accommodate 1 to 5 megayachts, primarily side tie berths. Marinas that have room to accommodate these vessels may experience more frequent visits and should incorporate flexibility into their marina slip layout as required.

Summary

Slip demand generated by boating tourism, both from local residents and transient boaters, is site dependent and is projected to grow consistent with overall tourism rates. An additional 30 to 65 slips to accommodate transient boaters may be anticipated. These slips are expected to be fully occupied during period of peak demand and potentially unoccupied during the offseason.

B.4 Projected Slip Size Demand

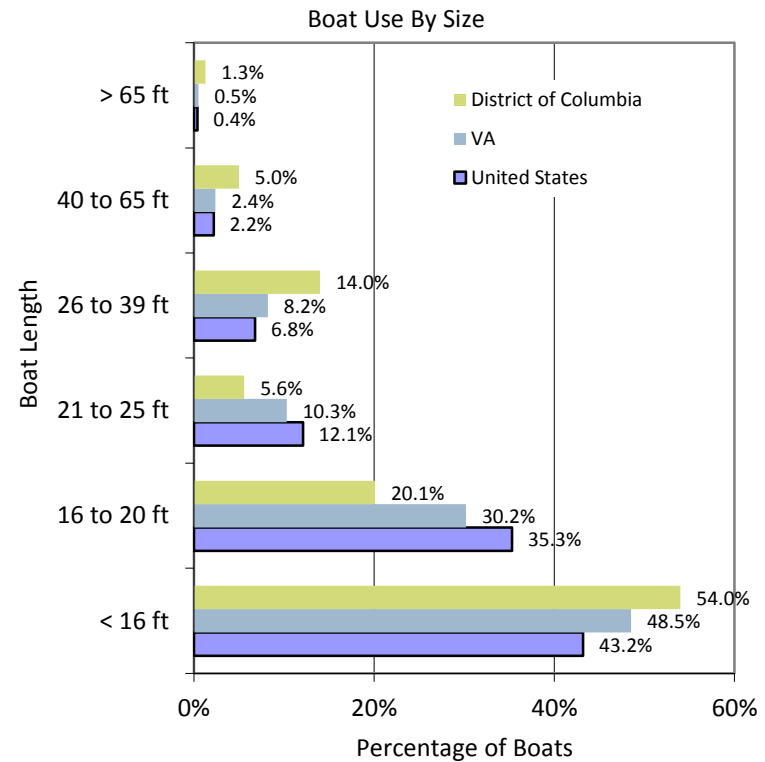
Surveys of boaters by the U.S. Coast Guard suggest that the percentage of boats less than 25 feet in length is generally smaller in the NOVA/DC region than that percentage observed throughout the U.S. on average. The percentages of boats greater than 25 feet in the region are consistent or slightly greater than the national average as shown in Figure B-9.

Figure B-9 suggests that demand for marina slips in the NOVA/DC will be highest for slips in the 26 to 40-foot range. The percentage of regional slips in the 40 to 60-foot vessel length is consistent with national averages. Less than 3% of the slips in the nation can accommodate vessels greater than 50 feet. This trend is below the slip size distribution at most marinas in the region as shown in Table B-3.

Based on existing market survey information, slips that accommodate vessels in the 35 to 45 foot class are highly desirable for urban marinas outside of downtown DC. Key to providing flexibility in marina slips is providing sufficient fairways, slip widths, and power for vessels as they get larger and

more amenity-laden. Slip size analysis suggests the following slip mix for new marinas:

- 26 ft to 34 ft 15% -25%
- 35 ft to 44 ft 45% - 6%
- 45 ft to 59 ft 10% - 20%
- > 60 ft 5% -10%



Source: USCG, Moffatt & Nichol

Figure B-9: Length of Boat Used Most Often

Table B-3: Marina Slip Size by Sub-Area

Submarket	Total Slips	Percentage of Slips by Length (feet)						
		< 20	20-29	30-39	40-49	50-59	60+	Other
DC	1040	0%	31%	27%	26%	5%	5%	6%
VA	910	0%	50%	29%	11%	3%	4%	3%
Total*	1950	0%	40%	28%	19%	4%	4%	5%

*Total reflects marinas where slips cataloged by size. Not all marinas included.

New marinas in the urban environment, especially associated with active waterfronts that attract transient boats should accommodate vessels up to 50 ft with berthing for some larger vessels available on T-heads or bulkheads.

B.5 Summary

The number of registered boats in the NOVA/DC market is generally stable, with a slight upward trend in the past few years. The market is underserved for boat slips based on population growth. Combining the underserved

population with projected population growth suggest potential demand for approximately 500 additional wet slip in the next 15 years.

Transient boat traffic from local boaters is anticipated to expand with improved access to waterfront such as the City of Alexandria and new tourist destinations in the region. Marinas in these area should focus on providing access to these destinations, with the ability to accommodate another 30 to 65 slips. These additional slips may be added at existing or new facilities. In addition to increasing transient slip counts, marinas should continue to manage short term vacancy of annual lease holder slips for transient vessel use.

Upland developments in the City of Alexandria that are planned within the next 5 years may also require 16 to 32 slips additional slips to accommodate homeowners and tenants in these developments.

Slips that accommodate vessels in the 35 to 45 foot class are highly desirable and should be the focus of urban marinas outside of downtown DC core.