

Introduction

This report summarizes conceptual descriptions, justifications, and technical evaluations of various waterfront boating infrastructure projects considered as part of this study.

We are aware that these projects received different public feedback (ranging from support to strong opposition). However, this document is intended to document the technical analysis performed on the ideas and concepts presented.

We further understand that some of these elements may not be part of the final recommendations of this study due to practical reasons, independently of their technical merits.

North Lake Improvements and City Marina Redevelopment

Project Summary

Description: The proposed project includes navigation improvements to North Lake, including dredging of shoals for safe sailing school operation, navigation access to private properties, modernization of City Marina, Sea Level Rise (SLR) adaptation, Run-Off control improvements, and potential environmental restoration.

Justification: strong demand for boating infrastructure, valuable City asset, economic benefits of marina modernization may support other improvements, resident's request for dredging, resident's request for trailer traffic reduction, flooding problems during high tide, uncontrolled run-off discharges, FEMA remapping and insurance cost increases, etc.

Works: multiple related improvements:

- marina redevelopment (larger vessels, similar footprint, modern standards, alternative slip count options)
- lake dredging (zoning for marina access / sailing school / residential docks access)
- stormwater discharge improvements (possibly seaward of seawall)
- shoreline improvements with habitat restoration (may be used to address seawall maintenance problems)
- alternative disposal of dredged material.

Related Works: Upland waterfront park / landscaping, signage to redirect trailer traffic through Hollywood Blvd., etc. Environmental mitigation and design elements may affect permitting and cost.

Management Issues: marina and trailer parking regulations and control through City Marina manager, diesel fuel tax issue (purchase marine diesel),

Cost / Funding: High cost. Florida Inland Navigation District (FIND), Broward Boating Improvement Program (BBIP), and BIG-P funding potentially available for public use boating infrastructure (marina docks and dredging).

City Decision-Making Control: High (permitting and construction on City-Owned properties)

Complexity: High (close coordination with residents and existing clubs, potential high cost and permitting challenges may require innovative approaches)

Importance: High

Priority: Intermediate

Detailed Project Description

The proposed improvements include a range of interrelated components, namely:

- Shoreline improvements including habitat creation and use of dredged material
- Stormwater wetland treatment and flood protection improvements
- Dredging of sailing area

- Dredging of navigation access to private properties
- Other on-site beneficial uses of dredged material to reduce costs
- City Marina redevelopment

We understand that these elements have a broad range of public response but this document is only intended to document the analysis performed and to provide the technical explanation and relationships among elements.

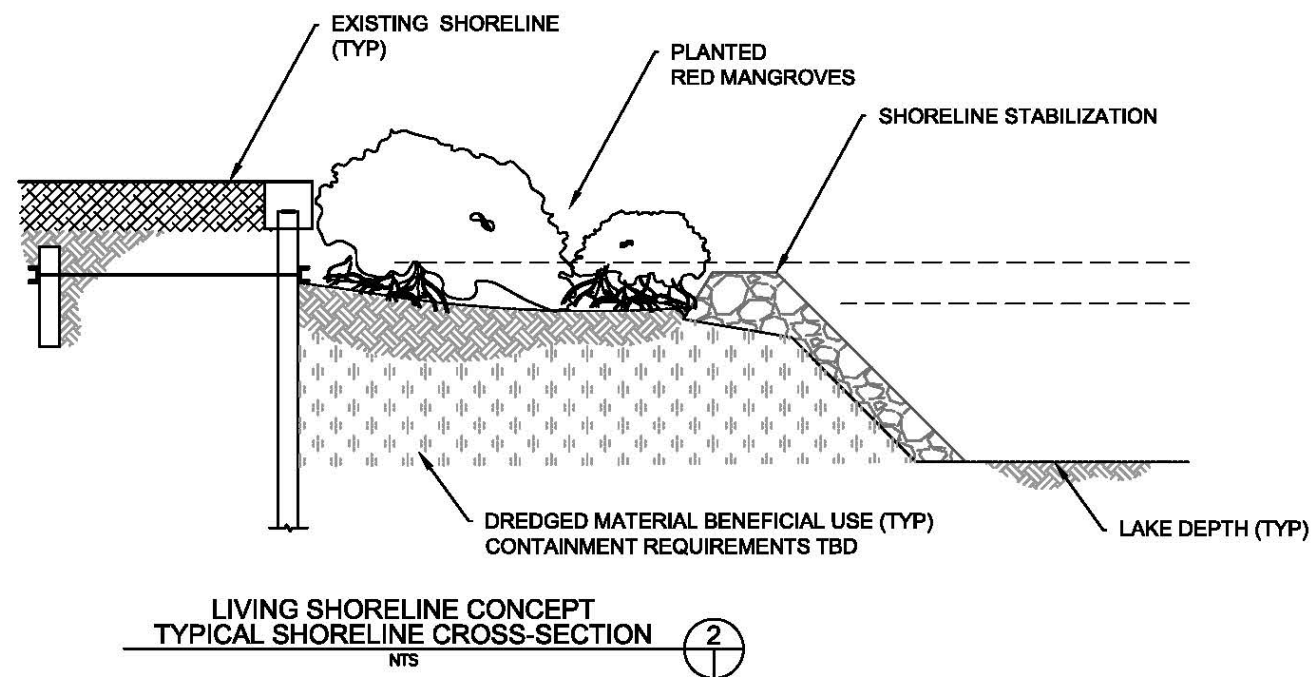
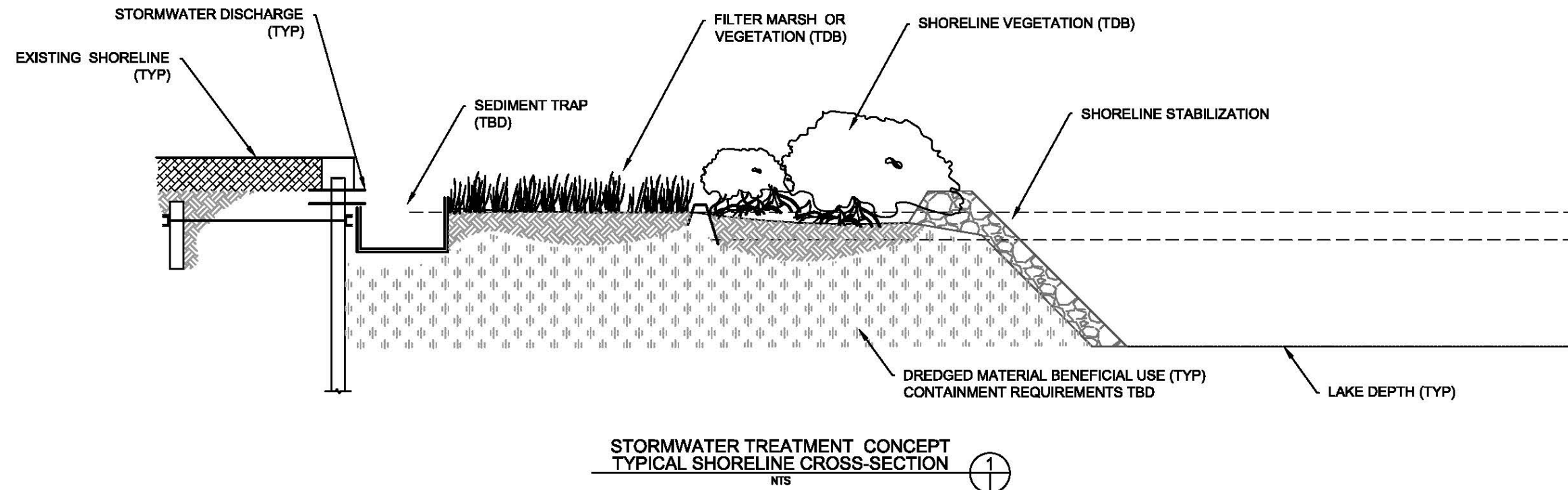
The concepts considered included extensive intertidal habitat creation and stormwater treatment areas using dredged material. These elements provide a conceptually strong approach to environmental design, which is supported by a number of national and international organizations, including the USACOE's "Engineering with Nature" initiative. The areas occupied by these features may be reduced by design.

This conceptual approach allows for user segregation: there would be a water area of North Lake dedicated exclusively to non-motorized uses (with physical barriers to prevent access of unauthorized motorized vessels), and a water area of the same size dedicated to the marina and boat ramp uses (approximately 13.8 acres).

According to a 2006 report regarding the feasibility of dredging North Lake, it was determined that the cost of dredging could be reduced by about half if the material could be used on site instead of being transported to a landfill. With consideration for this information several concepts were developed to try and use the material within the lake and surrounding area.

There are some environmental issues related to the dredging within the lake such as water quality, mitigation of impacts on seagrass beds, etc. ATM proposed innovative solutions to utilize the dredged material for on-site environmental improvements, such as stormwater discharge treatment, "living shoreline", and other features for habitat creation.

These concepts (Figure 1) show how creative utilization of the dredged material can create habitat, help reduce the sediment entering the lake, create suitable substrate for seagrasses, improve long-term water quality in the lake, and provide additional storm protection for waterfront properties.



IMPORTANT NOTES:
THIS IS CONCEPTUAL SKETCH FOR ILLUSTRATIVE PURPOSES ONLY.
RELATIVE DIMENSIONS ARE FOR ILLUSTRATIVE PURPOSES ONLY AND NOT TO SCALE.
DETAILED HYDROLOGIC AND ECOLOGICAL STUDIES SHOULD BE PERFORMED TO DESIGN A MANGROVE RESTORATION AND/OR BIOLOGICAL FILTER PROJECT.
ALL MANGROVE RESTORATION DESIGN IS SITE SPECIFIC.
TIDAL DATA RELATIVE TO EXISTING TOPOGRAPHY, SEA LEVEL RISE, STORM SURGE, AND STORMWATER DISCHARGE CONDITIONS SHOULD BE ANALYZED FOR DESIGN.

Figure 1
Shoreline Environmental Concepts
Waterways Master Plan
Hollywood, FL

North Lake Dredging

It is estimated that up to 215,000 cubic yards of material may need to be dredged to fulfil the North Lake improvements as envisioned in the more comprehensive and integrated plan considered.

It is envisioned that the existing marina basin would be extended northward and westward into the boat ramp area. The dredging depth would be least -8 to -10 feet MLW (deeper only by the ICW). The extent of dredging for navigation access to waterfront areas to the west of the lake may be refined based on cost. Maximum marina basin dredging (13.6 acres at -10 ft MLW) is estimated as 74,500 cy.

A 75 foot wide navigation channel may be dredged along the north perimeter of the lake into the "Key Hole" and on the south side from the marina basin westward for residential access. These channels would deepen the existing waterway by approximately 2 feet. The waters around the Sailing Club would be dredged to -5 +/- feet MLW to allow for safer recreational/non-power use by the Sailing Club and residents.

A minimum of 58,000 cubic yards of material would need if dredging is minimized.

It must be noted, however, that all the volume calculations are approximate and based on data collected in March 2006, and provided in URS's report, which does not include a bathymetric survey.

The analysis of the URS report results in a total unit dredging cost of up to \$50/cy to \$71/cy, considering dredging, mobilization and dewatering, hauling and landfilling, permitting, environmental mitigation, and contingency. This report indicates that approximately **50% of the cost calculated was due to upland disposal of dredged material**, which justifies making every possible effort to use the dredged material on-site.

Alternative disposal of dredged material aimed at reducing costs and improving permitting conditions should be researched.

Area	Dredging Volume (cy)
Concept 1 Marina Area (13.6 Ac):	
Scenario with all marina area dredged to -8 ft	35,400
Scenario with all marina area dredged to -10 ft	74,500
The residential access at north side of lake:	
all area dredged to -6 ft	19,400
The residential canals to the western end of the "keyhole":	
all area dredged to -6 ft	120,400

While the marina can pay for its dredging costs from the increased revenue and benefit from recreational navigation grants (FIND, BBIP, BIG-P, etc), all other dredging items will need to be funded by the City.

Dredging of Residential Channels

Along the “Keyhole” and along the north side of North Lake are many residences with access to the water. Many of these homes do not have boats because they lack the water depth to get to the ICW. A rough calculation of dredging needed to allow access to these residences was conducted using the 2006 data. It is determined that approximately 120,400cy will need to be removed to create a channel along both sides of the “keyhole” portion of the lake. An additional 19,400cy will need to be removed along the northern area of the lake to allow access to those homes.

Using unit cost estimates based on the dredging feasibility study by URS, the cost of dredging for residential and sailing navigation improvements is expected to be on the order of **\$7.8M to \$9.8M** if all dredged material is disposed off-site. Since the main use of these navigation improvements are for access to private properties, they are not eligible for FIND funding.

Marina Redevelopment

The marina is a major asset of the City, but operates well below its potential due to poor docking facilities. Municipal marinas in Florida have been redeveloped over the last 20 years to address outdated infrastructure and to adapt to new market demands, primarily larger boats.

The existing piers are in poor condition and the electrical and pump-out facilities are inadequate, but the most significant disadvantage is that the slip sizes are completely outdated. Over 50% of the slips are nominally for boats under 41-ft and actual occupancy of the marina has an average boat size below 40 ft. Annual Gross revenue from dockage is on the order of \$330,000 to \$370,000/yr, with occupancies between 63% and 72% and average rates of \$0.80/ft/day to \$0.86/ft/day. This is actually a very good performance, considering the conditions of the facility.

The proposed marina redevelopment is based on strong market evidence, but is conceptual.

Stormwater Treatment / Long Term Water Quality

In all concepts there is a plan for the storm water pump station on the property. A vegetated storm water run-off filter can be evaluated to improve water quality in the lake and allow for some beneficial on-site use of dredged material.

This feature may be designed to provide privacy for neighbors by isolating the boats in the marina from residents. The height of the vegetated buffer may be managed by proper trimming strategy, to achieve the best balance between views and privacy, at the request of the adjacent residents.

It is understood that the fine sediment material in the Lake is the result of storm water run-off which is deposited directly into the Lake through storm drains that discharge on multiple sites throughout the North Lake. The installation of sediment traps at storm water discharge locations will help remove/reduce the amount of sediment entering the Lake. These traps would be designed to allow for mechanical removal of sediments by land-based equipment, likely reducing future needs for dredging of fine sediments from the Lake.

Due to the unique circumstance that water area is available adjacent to the stormwater discharges, an innovative concept based on structures located seaward of the shoreline is proposed. Sediment traps may be considered in conjunction with a natural filtration system. It is also possible that some biological treatment and salinity change attenuation effect might be achieved (depending on design flows and area for treatment).

The concept also assumes that any use of water space for this stormwater sediment trap / filter area be lined with mangroves for habitat creation within the North Lake.

Storm water run-off sediments typically bring with it chemicals and metals which are harmful to marine life and humans. Two sediment samples were tested for metals, both taken in areas where the silt was thickest. The samples tested above the Threshold Effects Level (TEL) for Arsenic, Lead and Mercury but did not exceed the Probable Effects Level (PEL). Dredging will increase flushing of this material and the filtering of storm water going forward in the future will help increase water quality.

Detailed sea grass surveys, conducted during the optimum growing period for sea grasses, should be completed to fully define areas of resources. This data can also help realize the negative effects of the silt as it relates to the reduced sea grass beds. In addition to pollutant loading attached to the storm water run-off sediments, the silt is not a suitable substrate for sea grass. URS's report implies that the reduced presence of sea grasses in the Lake could be due to the increased amount of silt covering the bottom.

The design of these sediment traps / stormwater filters may also be done in conjunction with tide flaps and/or additional pumping stations, which may be required to prevent regular flooding due to sea level rise.

North Lake Improvements Summary Conclusions

Improvements to the Lake can technically be done in a way where the environment and the residents can benefit.

- Dredging (strongly supported by residents) will improve navigation, aesthetics, and will increase flushing.
- Stormwater filtration/sediment trap systems will reduce the need to dredge in the future and reduce the amount of unsafe chemicals and metals attributed to the storm water run-off.
- Use of dredged material on site for habitat creation, such as “living shorelines”, will help create suitable habitat and significantly reduce the cost of any dredging. Their creation may also help offset the mitigation for expected negative impacts of dredging on seagrass beds.
- Marina improvements will shift the marina dock supply to a much more demanded slip mix, serving boaters compatible with the residential nature of the neighborhood. The marina project is economically sustainable, as it is expected to generate enough revenue to pay for its improvements.

This analysis is based on the very basic surveying efforts made in 2006 and limited additional technical information available. It is recommended that a much more detailed study be conducted prior to any further analysis/assessment of existing conditions.

The technical and permitting feasibility of the concepts proposed should be evaluated further. The proposed concepts are in line with presently well-established trends such as “engineering with nature”, beneficial uses of dredged materials, resilient coastal protection solutions, and sea level rise adaptation strategies, but will require additional design efforts and regulatory agency agreement. Issues of concern include: the quantification of the negative impact of dredging on seagrass; the quantification of positive impact on water quality; the detailed engineering solution for use of the dredged material and containment strategy for on-site use; environmental impact of on-site use of potentially contaminated sediment, compared to a do-nothing option; the effectiveness of the proposed stormwater sediment trap / filters for pollution loading and sedimentation control (and its integration to a sea level rise adaptation strategy).

In particular, a survey of the Lake should be conducted along with sediment depth measurements. A detailed survey for sea grasses should be conducted during the peak growing season for *Halophila johnsonii* to fully map the protected species. Further analysis of the sediment being removed should be conducted and analyzed per recommendations in the attached memo.

Day-Use Dockage along ICW

Description: Day-use Docks to access the beach by boaters are proposed at City-Owned property along the ICW. Where pump stations are located, these properties are situated at the ends of cross streets which provide an opportunity for a connection between the ICW and the Ocean/Hollywood Broadwalk. Additional locations for day use docks may be negotiated with Broward County, FDOT and private developers to enhance this connectivity.

The length of shoreline along each City property should be assessed for the construction of a day-use dock with respect to the construction setback associated with the ICW. This has been looked at on a broad scale with the information available and it appears favorable at many of the properties. Future analysis will have to accurately survey the seawalls along the City properties and verify its proximity to the ICW.

Fixed timber docks are proposed along the seawalls of the City properties (see figure). It is proposed that these docks will be supervised by City Marina staff. Appropriate signage will be place to make public aware of the Day-Use nature of these sites. Ordinances should be created to enforce the hours of use and to enforce the towing of vessels left overnight. Call boxes connecting directly to the marina may assist in the utilization of these docks.

As an upland component to these docks, a safe, well-lit, landscaped corridor through the property to the sidewalk should be designed. If it is feasible, a clearly marked crosswalk should be located directly adjacent to these corridors to direct the users to the Broadwalk and beach. Signs can be utilized to direct users to local attractions, restaurants, etc.

Justification: connectivity and revitalization

Works: build side-tie dockage without utilities (day use dockage) along these properties

Related Works: Upland public access, pedestrian crosswalks, landscaping, etc.

Management Issues: operation regulations and control through City Marina manager

Cost / Funding: relatively low cost. FIND and Broward County Improvement funding available for boating infrastructure

City Decision-Making Control: High (permitting and construction on City-Owned properties)

Complexity: Low

Importance: High

Priority: High

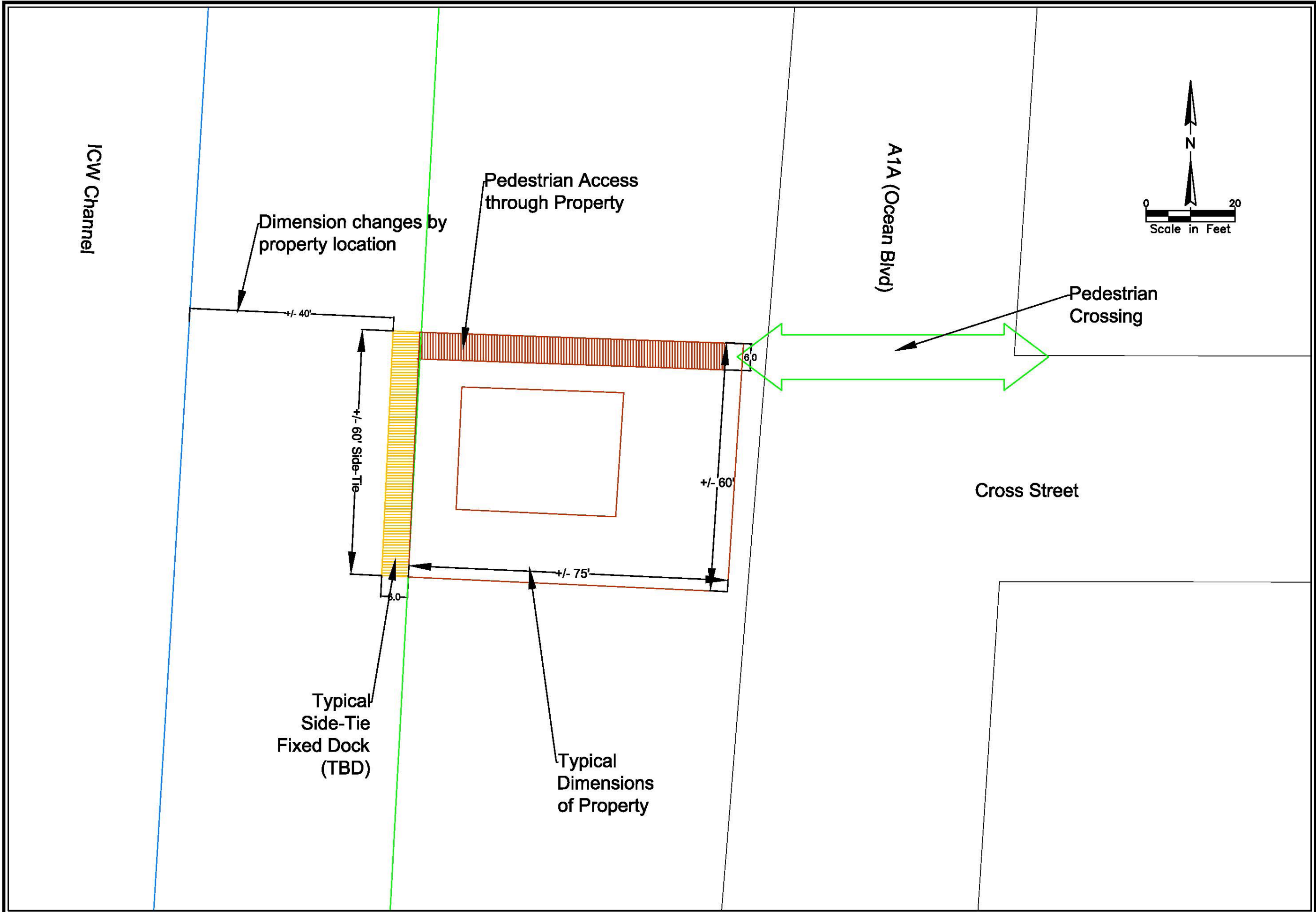


Figure 6
 Day-Use Dockage at City Properties
 Hollywood Waterways Master Plan
 Hollywood, Florida

Hollywood Options.dwg Day Use Docks at Pump Stations 3/28/14

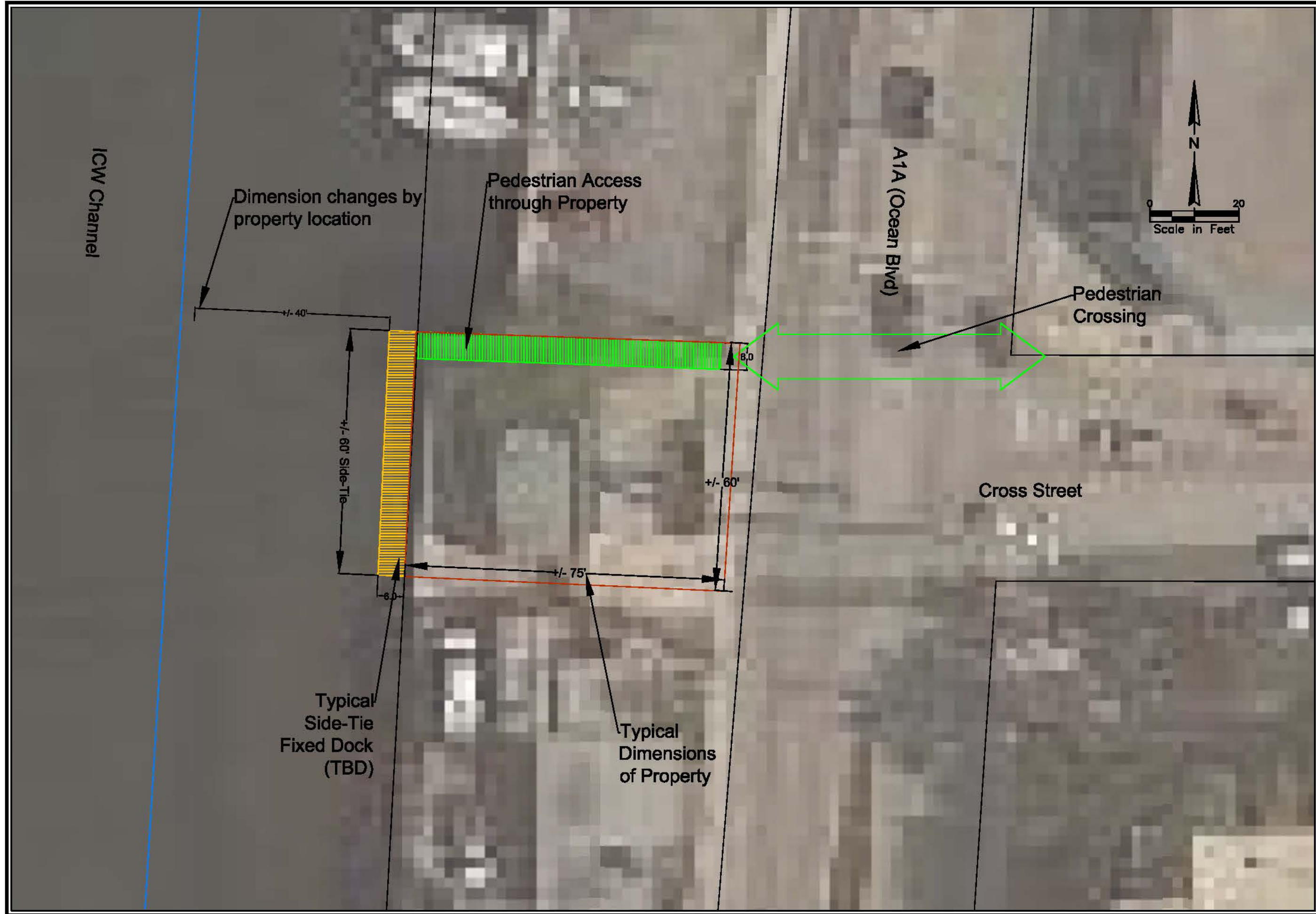


Figure 7
Day-Use Dockage at City Properties
Hollywood Waterways Master Plan
Hollywood, Florida

Hollywood Options.dwg Docks with Aerial at Pump Stations 3/28/14

The Coves Boating Facility Improvements

Description: Where Sheridan Street meets A1A there are two spoil areas on each side of Sheridan St. The north side is currently used as a County Park and limited access to the south side of Sheridan St. has kept it from being developed. There is tremendous potential for this area if partnership with the County is attainable.

At present the densely vegetated areas which extend north and south from the Sheridan St are used by the homeless where tarps and tents are set up. The cove on the north side is used for moorings of mostly derelict vessels. Recently, two vessels have broken their mooring become hazards to navigation. At the time of this report, one is currently tied to the day-use dock at Anne Kolb Nature Center and the other is lying on its side near the fishing piers at the north end of Anne Kolb Nature Center.

This site is a great location to establish a satellite marina with limited facilities and/or day-use destination dockage for access to the Park and the Ocean. There are two concepts for the construction of docks in the cove. The first concept (Figures 8 and 9) utilizes the entire shoreline of the cove with a mix of slips ranging from double loaded 40 ft. slips to longer flexible side-tie options for multiple smaller boats or for larger boats. The second concept (Figure 10) consists of two separate docks, one with access to the park and one with the landing closer to A1A and the pedestrian crosswalk. Both designs may be constructed using fixed timber docks or floating timber docks anchored to fixed access points. These floating docks are set off the shoreline to allow for shoreline mangrove restoration.

As part of upland improvements, a connection to the south side via a wooden dock under Sheridan St. may be investigated. General landscaping with the removal of invasive vegetation, planting of native species, nature trails, and over-water viewing platforms would increase public traffic in these areas and reduce the vagrant population.

The coves offer excellent opportunities for wetland/mangrove shoreline restoration which can be built as part of the docking improvements and provide an amenity for non-boaters.

Justification: strong demand for boating infrastructure, connectivity ICW-Beach

Works: dockage / managed mooring field; day use docks; fishing piers

Related Works: coordinate access, etc.

Management Issues: coordination with Broward County, Management through the City Marina recommended

Cost / Funding: intermediate cost. FIND and Broward County Improvement funding available for boating infrastructure

City Decision-Making Control: Intermediate (requires coordination with county)

Complexity: Intermediate (requires coordination with County)

Importance: Intermediate

Priority: Intermediate

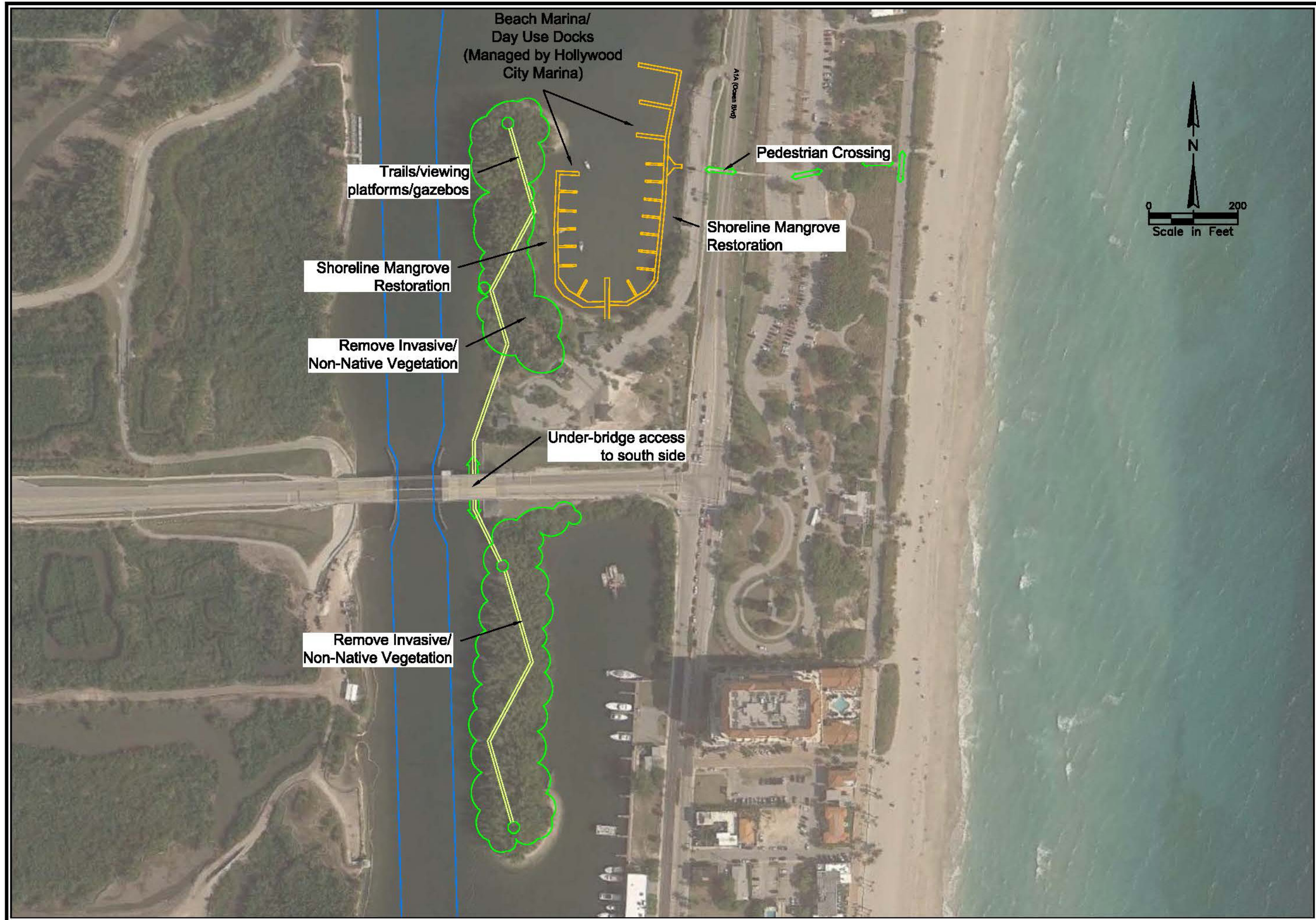


Figure 8
The Coves
Hollywood Waterways Master Plan
Hollywood, Florida

North Cove 20May14.dwg Coves 3/28/14

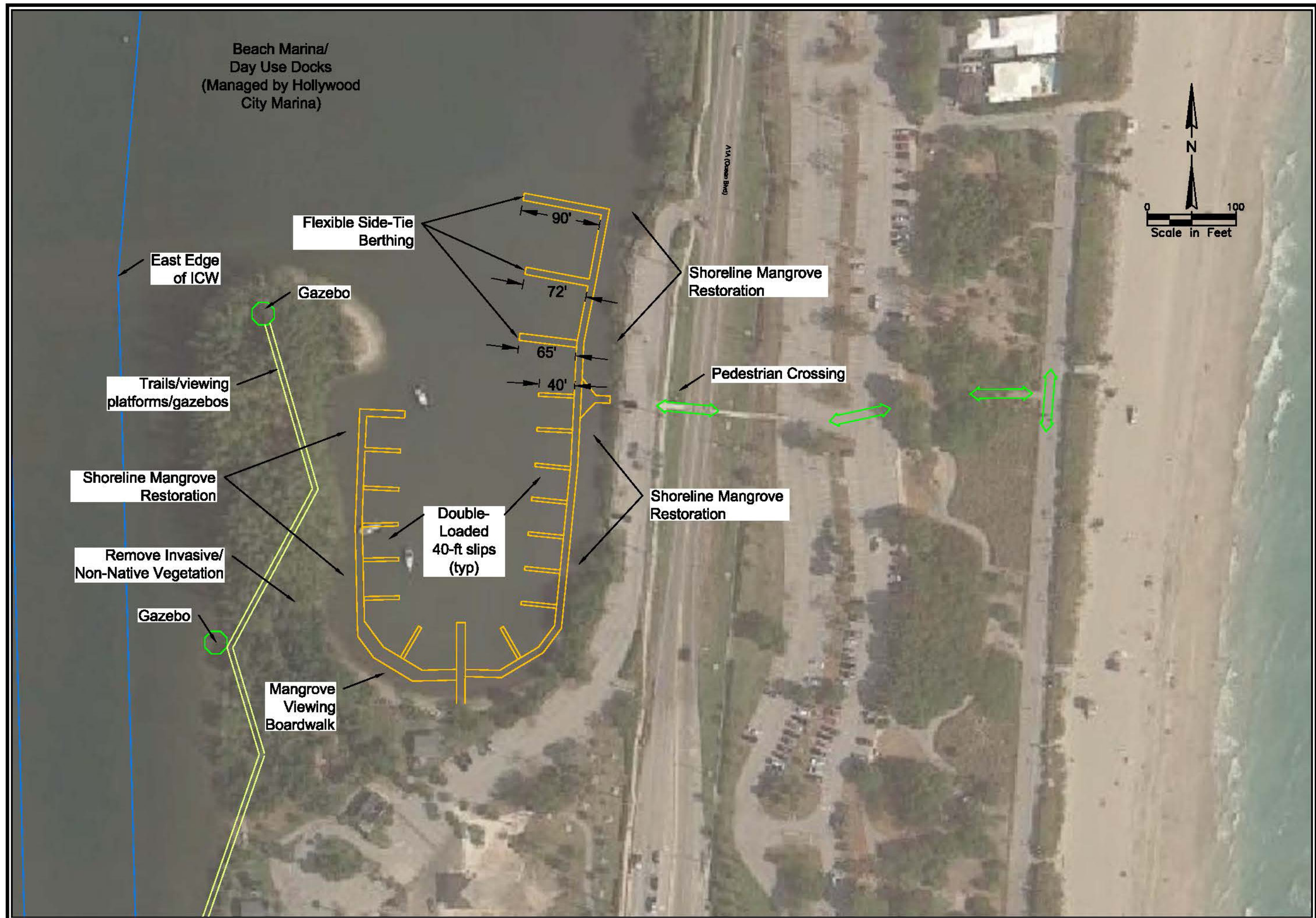


Figure 9
North Cove - Concept 1
Hollywood Waterways Master Plan
Hollywood, Florida

North Cove 20May14.dwg North Cove 3/28/14

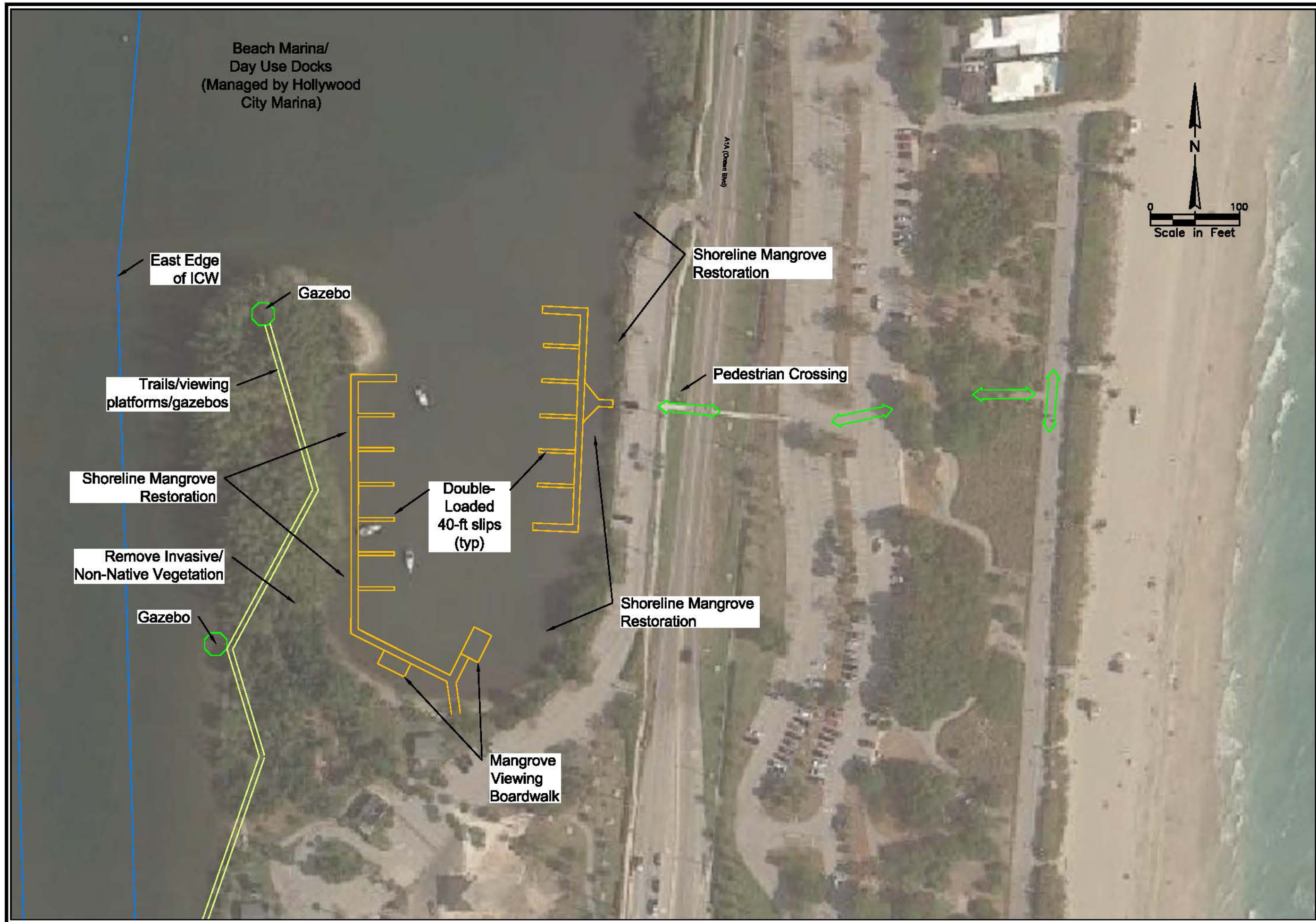


Figure 10
North Cove - Concept 2
Hollywood Waterways Master Plan
Hollywood, Florida