

# BMA, INC.



## JUPITER PLANTATION SHORELINE CONDITIONS ASSESSMENT REPORT

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Jupiter Plantation Homeowners Association  
825 Center Street · Jupiter, FL  
September 29, 2023



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## **Jupiter Plantation Homeowners Association**

### **Shoreline Conditions Assessment Report**

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**EXECUTIVE SUMMARY**

Visual inspections of the shoreline conditions at Jupiter Plantation were conducted on multiple dates in August and September 2023, along the lakes and eastern drainage canal. A structural conditions assessment was performed on the existing hardened lake shorelines (bulkheads) and unarmored embankments. Following is a brief summary of findings for the main inspected components:

The hardened shoreline segments consist of a variety of bulkhead designs including a navy-style timber wall as well as corrugated sheetpile walls of aluminum, vinyl, and cementitious sheeting. The unarmored shorelines consist of graded, vegetated slopes, some underlain with geofabric and other stabilizing materials.

In general, the bulkheads were found to be in fair to good condition, but the structures are aging – most dating to the 1980’s – and are nearing the end of their originally intended service lives. The timber walls are deteriorating and in the worst condition of the bulkheads. The cementitious walls are in good condition overall, but one segment of this wall has encountered a prior failure and was replaced with corrugated vinyl sheeting and a concrete cap. The miscellaneous aluminum wall sections are in good condition. There are isolated areas that require immediate attention, while complete replacement of the remainder of the original bulkheads should be planned and implemented over the next five to ten years.

In general, the unarmored shorelines along the lakes are in fair to good condition. Over time, the embankments have experienced settlement due to basic long-term soil compaction, stormwater runoff, irrigation, and rainfall. Some areas of settlement are more notable than others; in these areas, the slopes and tops of banks have settled, thereby migrating towards structures. Isolated areas of badly settling shoreline should be repaired through regrading and reshaping the embankments, including the use of geotextile products for additional support as necessary. The remaining shorelines in good condition should be closely monitored over time, with maintenance and repairs being initiated regularly as necessary.

The east drainage canal banks are in fair condition. On the west side of the canal (Jupiter Plantation side) the slopes are experiencing some settlement due to stormwater runoff and heavy rainfall events. Several drainage flumes are being undermined and require repair. But the banks are generally in good condition. The east side of the canal is on a steeper slope and is experiencing more severe erosion. Of particular concern are the large trees along the bank that are in danger of falling (some already have fallen across the canal). These trees present a potential hazard to Jupiter Plantation property as well as to the effectiveness of water flow through the canal during storm events. The canal banks should be addressed by tree removal, reshaping, and revegetating as necessary.

Following are detailed descriptions of the bulkhead and shoreline conditions followed by a list of prioritized recommendations and preliminary cost estimates. Typical, representative photographs and a site plan are attached at the end of the report, providing further detail and explanation of the findings and recommendations.

### **SHORELINE CONDITIONS ASSESSMENT**

Visual inspections of the shoreline conditions at Jupiter Plantation were conducted on August 22 and August 24, 2023. A structural conditions assessment was performed on the hardened lake shorelines (bulkheads) and unarmored embankments. Underground and underwater inspections were deemed unnecessary and not included as part of this investigation.

The hardened shoreline segments consist of a variety of bulkhead designs including the following:

- *Navy-style timber bulkheads:* approximately 635 linear feet
- *Corrugated cementitious sheeting:* approximately 400 linear feet
- *Corrugated vinyl sheeting:* approximately 80 linear feet
- *Corrugated aluminum sheeting:* approximately 30 linear feet

The unarmored shorelines include approximately 1,595 linear feet along lakes and 1,850 linear feet at the eastern drainage canal (both sides total).

The property was originally developed in the early 1980's, and most of the bulkheads date to this original construction period (timber and cementitious walls). Some subsequent work has been accomplished over the years to repair and/or replace the original wall structures (with aluminum and vinyl sheeting bulkheads).

Following are descriptions of the various shoreline treatments, followed by a list of prioritized recommendations for repair/replacement and associated cost estimates. At the end of the report are typical, representative photographs and a shoreline site plan exhibit, to further describe the conditions.

#### **Timber Bulkheads**

The timber bulkheads run for approximately 635 linear feet and are a navy-style wall design with vertical timber face pilings, horizontal timber walers, and vertical timber sheetpiles. A tieback system runs landward of the bulkhead, with a steel rod extending from each face pile, back to a buried deadman anchor. (The underground tieback system was not exposed or inspected at this time).

The timber bulkheads are in fair condition. The face piles appear to be in good condition, most likely due to their original conservative design. The tieback system could not be inspected but the nuts and washers at the face piles are galvanized and in good condition. Additionally, there did not appear to be many leaning piles, which would indicate that the tieback system is still largely intact.

The walers, sheetpiles, and top cap are in poor to fair condition, in an advanced stage of deterioration. These structural components are rotting from constant wetting and drying cycles, resulting in splitting and failing members.

Lastly, the hardware (connecting sheetpiles to walers and walers to face piles) could not be inspected since it is installed from the backside of the wall.

#### **Corrugated Cementitious Sheeting Bulkheads**

Approximately 400 linear feet of hardened shoreline is comprised of corrugated, cementitious sheetpiles with a concrete cap. This section of bulkhead also has a tieback system as described above, although no part of this tieback system is visible without excavation behind the wall.

Overall, this section of wall is in fair to good condition. There were some isolated cracks detected in the sheeting but overall the sheeting is fully intact and the concrete cap is straight with no obvious movement or rotation. These conditions would imply that this wall style is still structurally viable.

#### **Corrugated Aluminum Sheeting Bulkheads**

There are three segments of bulkhead comprised of corrugated aluminum sheeting with a concrete cap. These wall sections are located at water control structures with higher grades than the surrounding banks, which may explain why this design was used in lieu of the timber wall.

The aluminum bulkheads are in good condition, with no evident movement or leaning. There are isolated spots of early aluminum corrosion, but they have not reached the point of being structurally deficient. Again, the tieback system was not visible but these walls were primarily straight and plumb.

#### **Corrugated Vinyl Sheeting Bulkhead**

Approximately 80 linear feet of the hardened shoreline is comprised of corrugated, vinyl sheetpile with a concrete cap. This section of bulkhead also has a tieback system as described above, although no part of this tieback system is visible without excavation behind the wall.

Overall, this section of wall is in good condition. This vinyl segment of wall was installed within the past few years to repair a previous wall failure. While the vinyl sheets appear to be slightly bowing, there are no other indications that the wall is overstressed. The cap remains intact and straight with no obvious movement.

#### **Unarmored Shorelines**

There are approximately 1,595 linear feet of lake shoreline that have not been hardened and consist of fairly gentle, grassy slopes down into the lakes. The eastern drainage canal consists of 1,850 linear feet of unarmored shoreline (both sides total).

In general, the grassed shorelines along the lakes are in fair to good condition. Over time, the embankments have experienced settlement due to basic long-term soil compaction, stormwater runoff, irrigation, and rainfall. Some areas of settlement are more notable than others; in these areas, the slopes and tops of banks have settled, thereby migrating towards adjacent structures.

There are several locations along the lake shorelines where concrete bags have been stacked in order to form headwalls around drainage outfall pipes. These areas are experiencing settlement and erosion around the bagged headwalls and should be repaired.

The east drainage canal embankments are in fair condition. On the west side of the canal (Jupiter Plantation side) the slopes are experiencing some settlement due to stormwater runoff and heavy rainfall events. There are several concrete drainage flumes along the eastern canal that carry stormwater from the small parking areas down into the drainage canal. In three locations, these flumes have been undermined to the point where the parking lot asphalt has failed and the flumes have been undermined.

The east side of the canal is at a steeper slope and is experiencing more severe erosion. Of particular concern are the large trees along the bank that are in danger of falling (some already have fallen across the canal). These trees present a potential hazard to Jupiter Planation property as well as to the effectiveness of water flow through the canal during storm events.

**PRIORITIZED RECOMMENDATIONS**

In general, the hardened shorelines (bulkheads) and unarmored shorelines are in fair to good condition. However, there are isolated areas that require immediate/short-term attention. Due to their age and the fact that isolated areas have previously failed, the bulkheads should be planned for replacement over the coming years. Following is a prioritized schedule for repairs and/or replacements:

- **Years 0 to 1:** miscellaneous isolated repairs:
  - o Bagged headwall areas – replace with permanent headwalls of concrete or vinyl sheeting
  - o Concrete drainage flumes – regrade and backfill shorelines and reinstall drainage flumes
  - o Shoreline grading – at Building 46, regrade and reshape adjacent lake bank and resod
  - o Shoreline grading – at north end of east canal, regrade and compact shoreline, redirect drainage to flumes, resod impacted areas
  - o Shoreline grading – at isolated areas of badly settling shoreline, regrade and reshape shorelines, resod
  
- **Years 3 to 5:** replace timber bulkheads with vinyl sheetpile and concrete cap system
  
- **Years 6 to 8:** replace cementitious bulkheads with vinyl sheetpile and concrete cap system

In the interim, all shorelines and bulkheads should be inspected regularly (every 12 to 18 months), and any elements found to be of immediate concern should be repaired as necessary.

**ESTIMATE OF CONSTRUCTION UNIT COSTS**

Following are estimated construction costs for the various recommendations outlined above. These line items are preliminary and based on limited information available at this time; the numbers can be used to plan and budget long-term repairs and improvements.

- **Years 0 to 1** **\$50,000**  
-miscellaneous isolated repair work
  
- **Years 3 to 5** **\$560,000**  
-replacement of timber bulkheads, ongoing targeted repairs
  
- **Years 6 to 8** **\$370,000**  
-replacement of cementitious bulkheads, ongoing targeted repairs

These numbers are based on a preliminary typical vinyl wall section and are based on 2023 construction costs. Appropriate inflation factors should be used when planning long-term capital improvements.

***THE FOLLOWING PAGES CONTAIN:***

**TYPICAL, REPRESENTATIVE PHOTOS WITH DESCRIPTIONS**

**SHORELINE SITE PLAN EXHIBIT**

Any questions on the above report should be directed to Bolchoz Marine Advisors, Inc.

Jupiter Plantation – Shoreline Conditions Assessment Report  
Typical, Representative Photos



*Timber bulkhead, dry-rotted walers and sheetpiles*



*Timber bulkhead, dry-rotted walers and sheetpiles*



*Timber bulkhead, vegetation protruding through timber sheeting*



*Timber bulkhead, deteriorating walers and sheetpiles*

Jupiter Plantation – Shoreline Conditions Assessment Report  
Typical, Representative Photos



*Corrugated cementitious sheeting bulkhead  
in fair to good condition*



*Corrugated cementitious sheeting bulkhead  
in fair to good condition*



*Newer vinyl bulkhead, in good condition*



*Corrugated vinyl sheeting, in good condition*

Jupiter Plantation – Shoreline Conditions Assessment Report  
Typical, Representative Photos



*Aluminum headwall in good condition*



*Aluminum headwall in good condition  
some backfill loss through pipe penetrations*



*Natural shoreline, grassed embankment  
settling slightly, slopes flattening*



*Natural shoreline, in good condition*

Jupiter Plantation – Shoreline Conditions Assessment Report  
Typical, Representative Photos



*Timber bulkhead transition to concrete bag headwall; poor condition, bank eroding*



*Natural shoreline with drainage box, some erosion along sides*



*Concrete headwall in good condition*



*Concrete bag headwall, bags sagging and settling*

Jupiter Plantation – Shoreline Conditions Assessment Report  
Typical, Representative Photos



*Drainage canal, eroding bank from stormwater runoff*



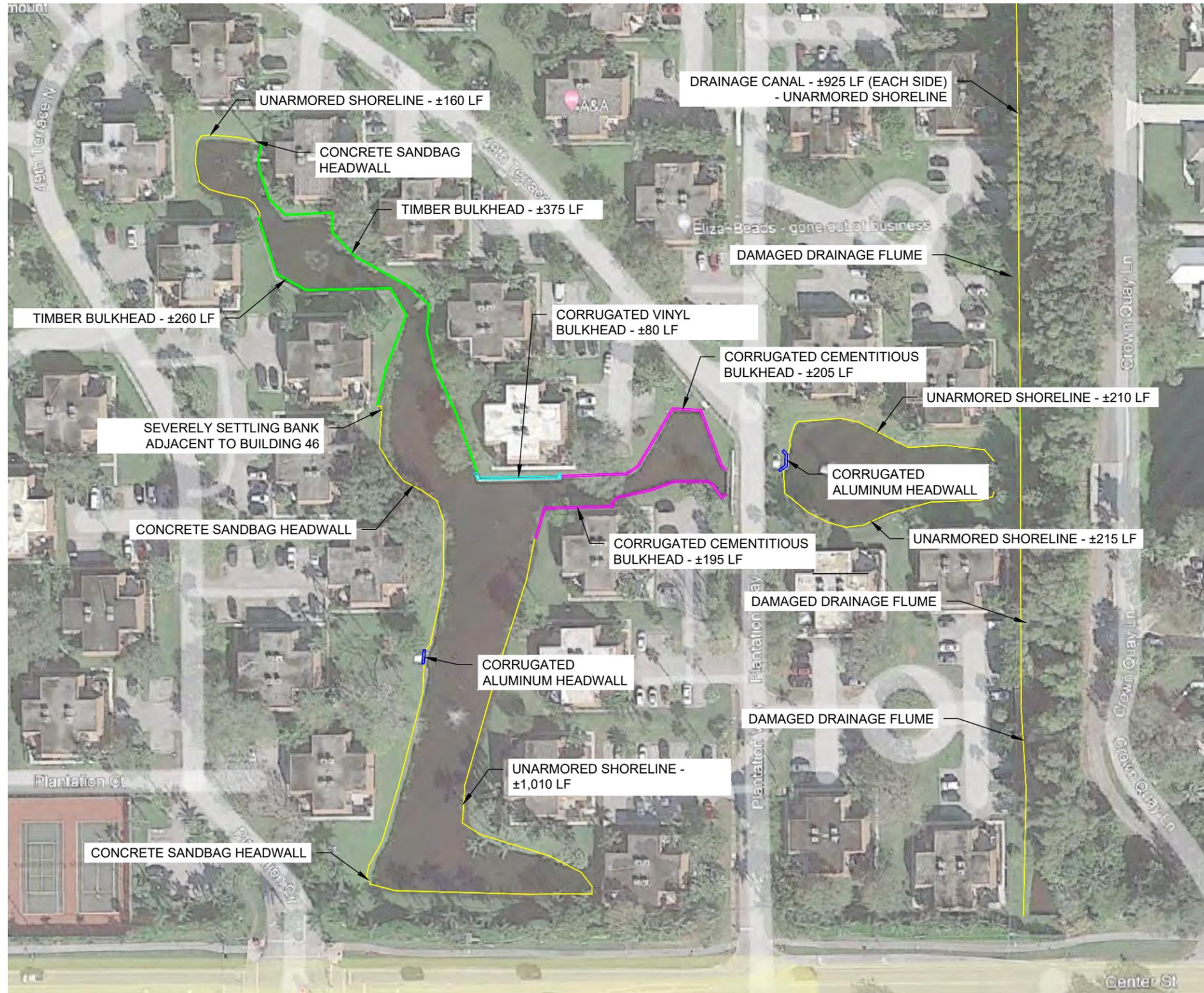
*Drainage canal, fallen pine from east side; eroding bank and multiple leaning trees*



*Undermined concrete flume at east canal, failed asphalt*



*Undermined concrete drainage flume at east canal (one of three)*

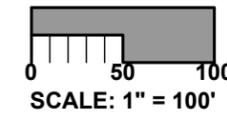


**EXISTING CONDITIONS**  
SCALE: 1" = 100'

LEGEND		LF
<span style="color: green;">■</span>	= TIMBER BULKHEAD	±635
<span style="color: magenta;">■</span>	= CORRUGATED CEMENTITIOUS BULKHEAD	±400
<span style="color: cyan;">■</span>	= CORRUGATED VINYL BULKHEAD	±80
<span style="color: blue;">■</span>	= CORRUGATED ALUMINUM BULKHEAD	±30
<span style="color: yellow;">■</span>	= UNARMORED SHORELINE - LAKES	±1,595
<span style="color: yellow;">■</span>	= UNARMORED SHORELINE - CANAL	±1,850



NORTH



Revisions	Drawn by: BSM	Checked by: MDB	Date: 9/29/2023	Sheet No. 1
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**EXISTING CONDITIONS AND NOTES**  
**JUPITER PLANTATION WALLS**

For: 825 CENTER STREET  
JUPITER, FLORIDA 33458

23095



618 US HIGHWAY 1  
SUITE 106  
N PALM BEACH, FL 33408  
561-315-3318  
www.bmainc.co