

## FINAL REPORT

Prepared for the City of Clearwater  
January 2025



# HARBOR MARINA UNDERWATER INSPECTION REPORT

Clearwater, Florida



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Table of Contents

Document Verification..... 1

List of Figures ..... 2

List of Tables..... 3

List of Photos ..... 4

Executive Summary..... 5

South Marina Summary ..... 5

North Marina Summary..... 5

1. Introduction..... 6

1.1. Condition Assessment Ratings..... 6

2. Underwater Inspection Findings – South Marina ..... 8

2.1. South Marina A-Dock ..... 9

2.2. South Marina B-Dock ..... 12

2.3. South Marina C-Dock ..... 15

2.4. South Marina D-Dock ..... 17

2.5. South Marina Marginal Walkway ..... 18

3. Underwater Inspection Findings – North Marina..... 20

3.1. North Marina A-Dock..... 20

3.2. North Marina B-Dock..... 22

3.3. North Marina Marginal Walkway..... 24

3.4. North Marina Shore Side Walkway..... 26

4. Condition Summary ..... 29



# List of Figures

Figure 1: Plan Layout of the South Marina Basin ..... 8

Figure 2: Enlarged Planview A-Dock ..... 9

Figure 3: 12' Wide Wave Attenuator Cross-Section ..... 10

Figure 4: New Wave Attenuator Plan View..... 10

Figure 5: Planview of B-Dock..... 12

Figure 6: Cross-section of B-Dock..... 13

Figure 7: C-Dock Planview ..... 15

Figure 8: D-Dock Planview ..... 17

Figure 9: Plan Layout of the North Marina Basin ..... 20

Figure 10: North Basin A-Dock Planview..... 20

Figure 11: North Basin B-Dock Planview..... 22

Figure 12: North Basin Marginal Walkway Planview ..... 24

Figure 13: North Basin Shore Side Walkway Planview ..... 26





List of Tables

Table 1: Tide Chart for October 21 – 25, Clearwater, Florida..... 6

Table 2: Condition Rating System for Waterfront Structures (ASCE Manual No. 130) ..... 7

Table 3: South Marina Condition Summary ..... 29

Table 4: North Marina Condition Summary..... 29



# List of Photos

Photo 1: Polyurethane Liner Tear and Exposed Foam..... 11

Photo 2: Cable Corrosion Around Cable End ..... 11

Photo 3: Typical Pile Guide Corrosion ..... 12

Photo 4: Large Concrete spall ..... 14

Photo 5: More than Average Cable Corrosion ..... 14

Photo 6: Concrete Crack Typical ..... 16

Photo 7: Concrete Spalling around Cable Sleeve..... 16

Photo 8: Cracking at the west face ..... 18

Photo 9: Cable Corrosion..... 19

Photo 10: Concrete Spall Caused by Gangway..... 19

Photo 11: NW Corner Concrete Spalling ..... 21

Photo 12: NE Corner Exposed Steel Conduit for Cable ..... 22

Photo 13: NW Corner Spall..... 23

Photo 14: NW Corner Concrete Spalling ..... 24

Photo 15: Walkway Listing..... 25

Photo 16: Corroded Cable End..... 26

Photo 17: Walkway Listing..... 27

Photo 18: Corroded Cable End..... 28

Photo 19: Sunken Sailboat ..... 28



## Executive Summary

As part of Moffatt & Nichol's (M&N) Engineer of Record Master Services Agreement with The City of Clearwater, an underwater investigation of the floating docks at the Harbor Marina was conducted during the week of October 21, 2024. Under the direction of M&N, DiveTech International, LLC (DiveTech) provided the underwater divers and conducted the non-invasive inspection of the water borne areas of the floating docks. As part of a separate report but complementary, M&N waterfront structural, mechanical and electrical engineers conducted an above water inspection to document damage resulting from recent hurricanes Helene and Milton that hit the Tampa Bay area within 2 weeks of each other.

The purpose of this assessment was as follows:

- Assess overall condition of the floatation and underwater structure of the floating docks,
- Provide a basis of existing condition of the floating docks,
- Plan needed repairs floating docks.

The condition rating system used below and throughout this report is based on ASCE Manual 130, which has established a standard condition rating system for all waterfront facilities.

### South Marina Summary

Overall, the south marina is in fair condition. There is considerably loss of floatation throughout the marina. Chipping and spalling of the concrete was observed at the float connections of the main docks and at the finger pier connections. During low tides D-Dock is resting on the mudline in some areas.

### North Marina Summary

Overall, the north marina is in fair condition. There is substantial loss of floatation throughout the marina. Chipping and spalling of the concrete was noticed at the float connections. Several of the post-tensioned cables are showing signs of corrosion and spalling around the cable conduits. Various utility conduits for pipe and cable protection have been broken between the floats or have moved into one float or the other, exposing tension cables and utilities to the marine environment.



# 1. Introduction

Moffatt & Nichol (M&N) were contacted by the City of Clearwater to provide inspection of the Harbor Marina following both Hurricane Helene and Hurricane Milton that effected the project area. As part of that inspection, an underwater inspection of the floating docks was requested to be performed by DiveTech International, LLC (DiveTech). M&N engineers provided direction and supervision during the entire inspection.

The underwater inspection was conducted on October 21 through 25, 2024 by a 3-man crew from DiveTech with engineer supervision from M&N. During the week of the inspection, temperatures ranged from between 64 – 68 degrees for lows and 82-86 degrees for highs. For tidal information see Tide chart below.

**Table 1: Tide Chart for October 21 – 25, Clearwater, Florida**

Date		HIGH				LOW			
		AM	Ft	PM	Ft	AM	Ft	PM	Ft
21	Monday	1:25	3.4	4:37	1.9	9:22	-0.2	7:47	1.8
22	Tuesday	2:07	3.3			10:25	0.1		
23	Wednesday	2:58	3.0			11:41	0.4		
24	Thursday	4:16	2.7					1:03	0.5
25	Friday	6:15	2.5	9:42	2.1			2:13	0.6

The existing marina has 126 boat slips, as well as over 1,000 feet of overnight side-tie mooring for visitors, and over 600 feet of side-tie mooring for daytime visits and special events that happen in the downtown area. M&N was provided drawings from Tetra Tech, Inc and ShoreMaster of the existing floating docks and the *Failure Assessment & Recommendations* report completed by Erickson Consulting Engineers, dated June 2018.

This underwater inspection, along with the above water inspection that was perform around the same time, will serve as a baseline to provide guidance to the City of Clearwater for maintenance planning for the marina. During the inspection, the M&N engineers documented the damage that happened due to Hurricane Helene and Hurricane Milton.

Based on the reports and existing drawings provided by the City of Clearwater, we understand that the original design of the floating docks consists of concrete floating dock with expanded polystyrene foam and polyurethane coating at the underside to protect from water inundation and waterborne organisms. Two longitudinal tension cables run through each float joining all floating dock.

## 1.1. Condition Assessment Ratings

The condition assessment ratings provided in this report are based on the ASCE Manual 130, which has established a standard condition rating system for inspection of waterfront facilities. The use of a standard condition rating system results in the ability to compare the results with future assessments and track the condition over time.



Condition Ratings are used to indicate the condition of the entire structure or system and indicate its ability to perform its intended function. Not every element making up the structure is required to meet the requirements of the overall rating. For example, localized load restrictions may be recommended for specific areas where isolated deterioration has reduced the load carrying capacity of that portion of the structure.

**Table 2: Condition Rating System for Waterfront Structures (ASCE Manual No. 130)**

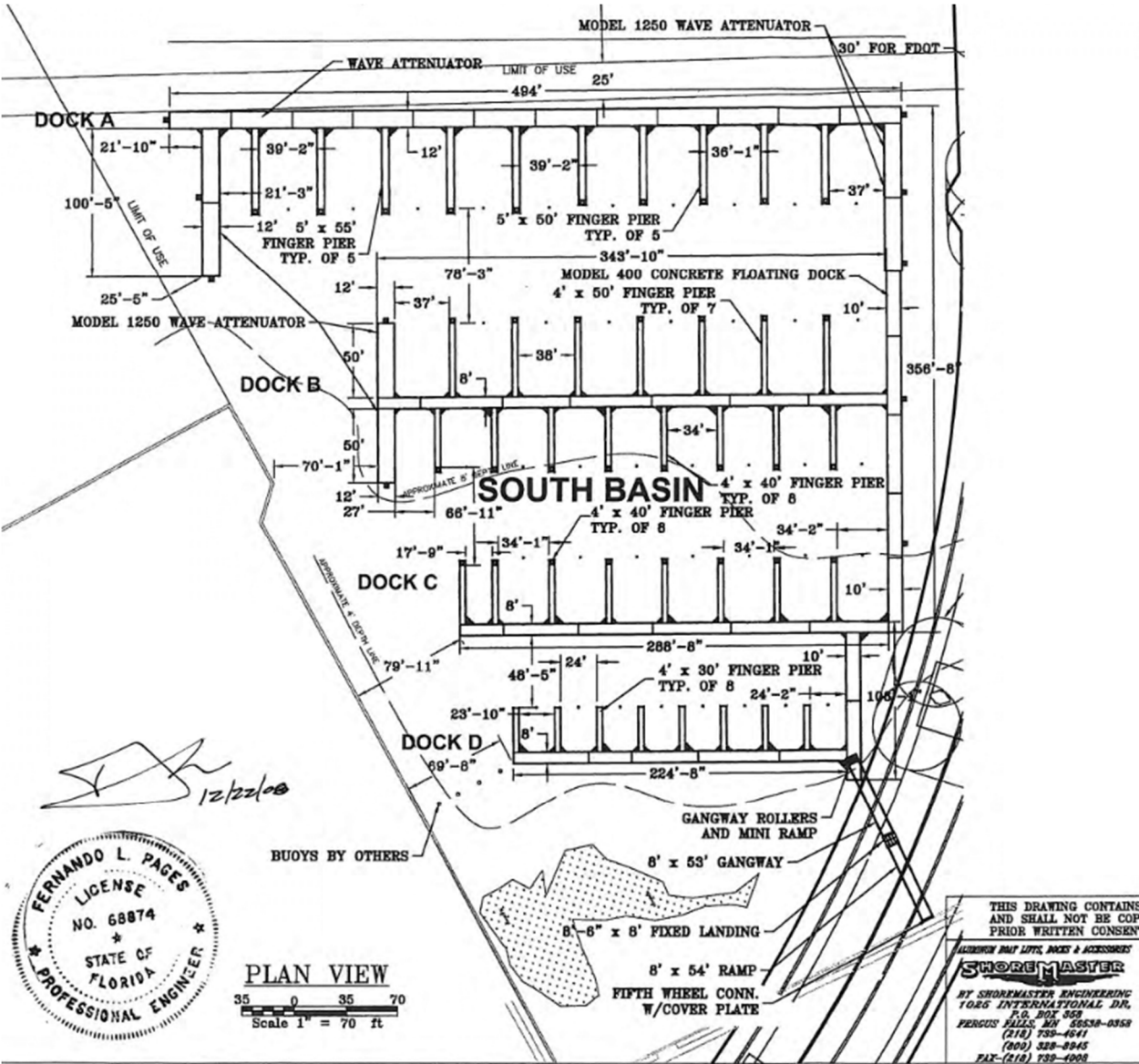
Rating		Description
6	Good	No problems or only minor problems noted. Structural elements may show some very minor deterioration, but no overstressing observed. No repairs are required.
5	Satisfactory	Minor to moderate defects and deterioration observed, but no overstressing observed. No repairs are required.
4	Fair	All primary structural elements are sound, but minor to moderate defects and deterioration observed. Localized areas of moderate to advanced deterioration may be present but do not significantly reduce the load bearing capacity of the structure. Repairs are recommended, but the priority of the recommended repairs is low.
3	Poor	Advanced deterioration or overstressing observed on widespread portions of the structure but does not significantly reduce the load-bearing capacity of the structure. Repairs may need to be carried out with moderate urgency.
2	Serious	Advanced deterioration, overstressing, or breakage may have significantly affected the load bearing capacity of primary structural components. Local failures are possible, and loading restrictions may be necessary. Repairs may need to be carried out on a high-priority basis with urgency.
1	Critical	Very advanced deterioration, overstressing, or breakage has resulted in localized failure(s) of primary structural components. More widespread failures are possible or likely to occur, and load restrictions should be implemented as necessary. Repairs may need to be carried out on a very high-priority basis with strong urgency.



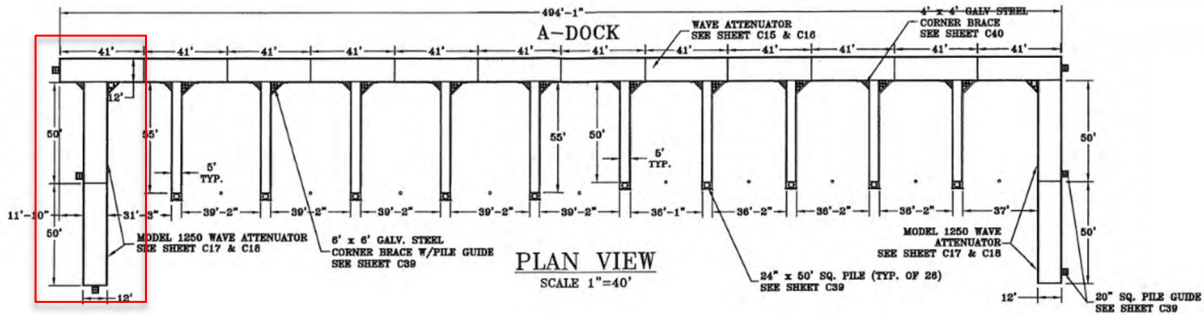


## 2. Underwater Inspection Findings – South Marina

The following section is a detailed summary documenting the condition of each component of the Clearwater Harbor Marina – South Basin.



## 2.1. South Marina A-Dock



**Figure 2: Enlarged Planview A-Dock**

The most outer wave attenuator (northwest side) of the marina, referred to as A-Dock, consists of twelve (12) 41 feet long by 12 feet wide wave attenuator sections, as showing in Figure 2, with a total depth of 10', see Figure 3 below. A-Dock was inspected on Monday, October 21<sup>st</sup>, during the low tide there was approximately only 2 feet of water between the bottom of the float and the mudline at the northern corner of the dock. The floatation is designed to be throughout the entire length of the dock and sealed on the bottom with a polyurethane coating. During the underwater assessment, it was discovered that the polyurethane coating has failed in most areas with more than 20% of the floatation exposed to the elements. Typical exposed floatation can be seen in Photo 1.

These large wave attenuators have two (2) tension cables that run along each side of the attenuator and connect the attenuators together. Also, there are cables on each side of the finger piers that attach them to the main dock sections. During the inspection, several of the cables were found to have more corrosion around the ends than was typically seen throughout the rest of the marina. This is especially concerning for A-Dock, since the cables in the main dock were replaced with the latest construction to replace the south wave attenuators in 2023 (see red box in Figure 2). Accelerated corrosion can be seen in Photo 2.

Several pile guides show serious corrosion as shown in Photo 3.

The new wave attenuators at the south corner are 50-feet long by 13.5-feet wide with a 20-inch freeboard and internal steel pipe piles, as shown in Figure 4. Although just being installed, the new concrete wave attenuators show some signs of defects, whether from production or just wear and tear. The edges show signs of aggregate loss, surface cracking, and even a few cracks with corrosion bleed out at the waterline. These items should be watched carefully. In addition, it should be noted that both transition plates have sheared off at the connection points. One was swept away during Hurricane Helene, and the other was removed from the dock after coming loose and put into storage.

The overall condition of A-Dock is considered **Poor to Serious**. There are some areas that need significant repair/replacement and are overstressed, while others can be repaired or maintained to remain in working order.

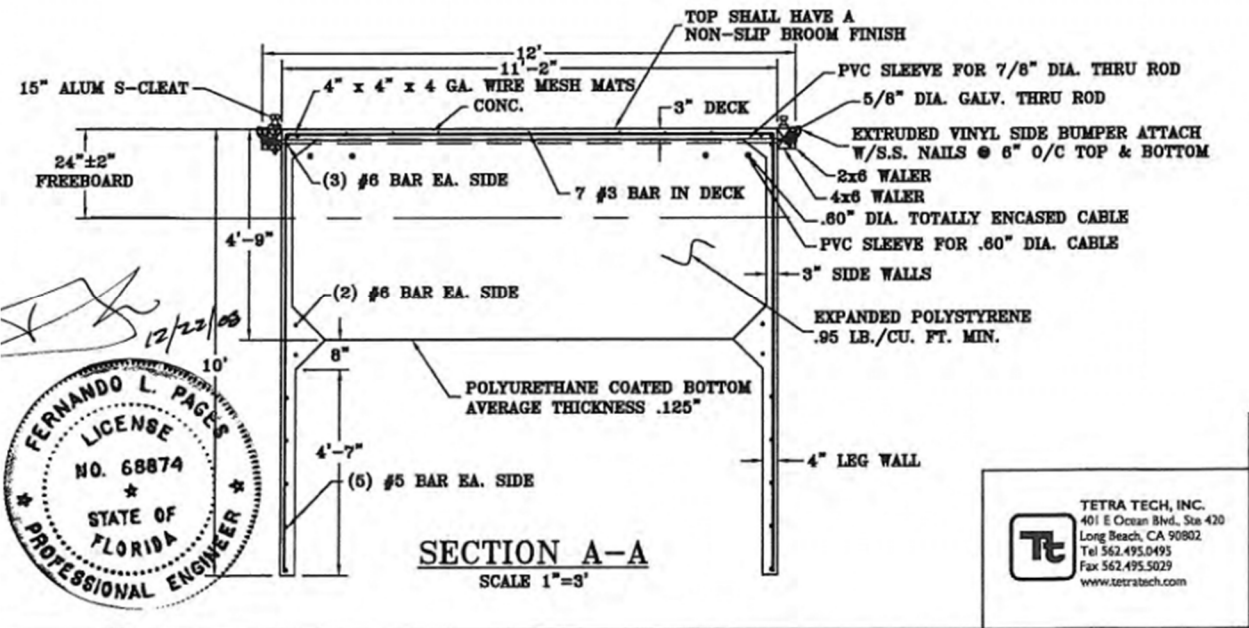


Figure 3: 12' Wide Wave Attenuator Cross-Section

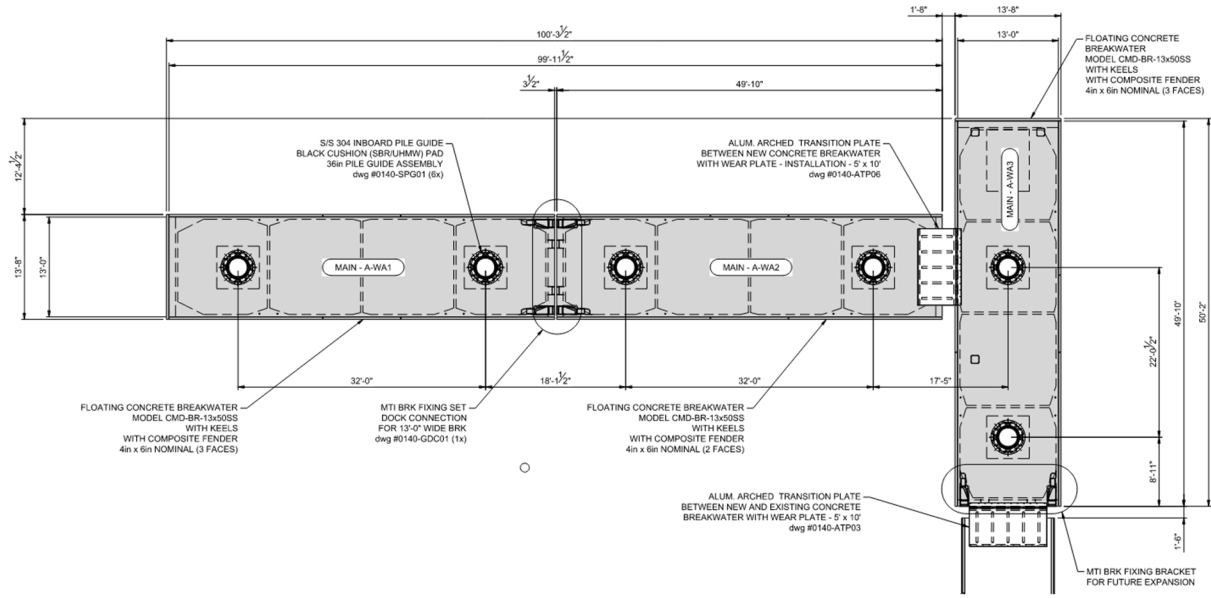


Figure 4: New Wave Attenuator Plan View





***Photo 1: Polyurethane Liner Tear and Exposed Foam***



***Photo 2: Cable Corrosion Around Cable End***



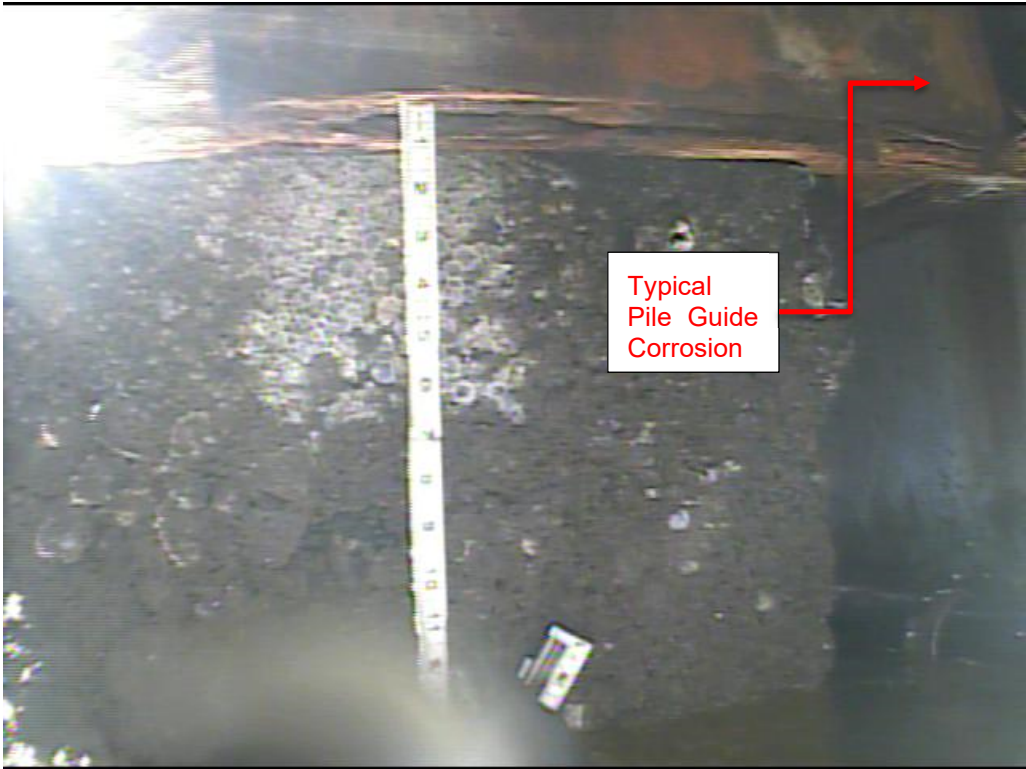


Photo 3: Typical Pile Guide Corrosion

2.2. South Marina B-Dock

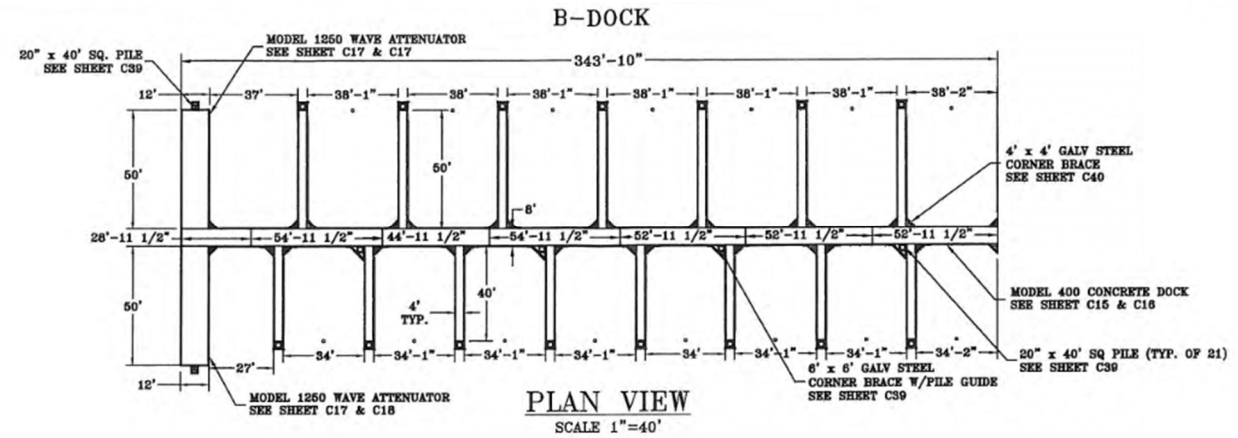


Figure 5: Planview of B-Dock

B-Dock consists of an 8 feet wide walkway with 4 feet wide finger piers. The main B-dock walkway is constructed similar to A-Dock, with only one cable on each side of dock sections connecting the floats together. The plan view of the dock can be seen in Figure 5 and the cross-section of the walkway in Figure 6. The floatation is designed to be throughout the entire length of the dock and sealed on the bottom with a polyurethane coating.





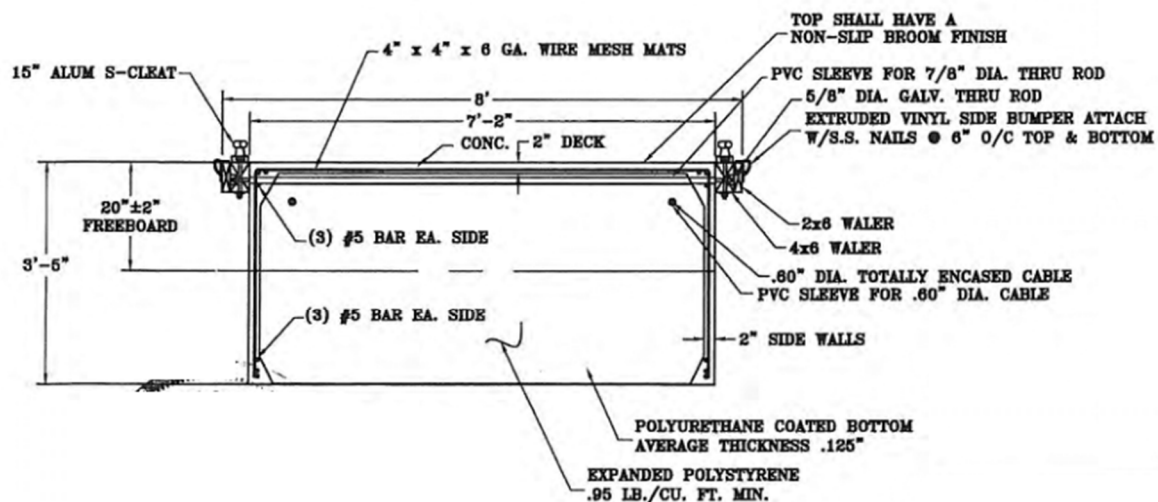
During the underwater assessment, it was discovered that the polyurethane coating has failed in most areas with more than 20% of the floatation exposed to the elements or large holes have been created. In some areas, such as the 50 feet long wave attenuator sections at the south end, have whole sections of floatation missing.

The concrete on the floats is in relatively good condition with limited spalling in some areas. Some of the spalling is minor, others are larger sections with corrosion bleed that could cause issue in the near future. An example of the largest of the large spalls can be seen in Photo 4 below.

Severe corrosion was observed on many of the cables that run through the finger piers and the main dock. Photo 5 below shows one of the cables with a larger than average amount of corrosion. Although this cable does not show signs of spalling around the cable sleeve, this was observed on several cables within B-Dock.

The wave attenuators at the end of B-Dock are in **Serious** condition due to nearly 50% flotation loss, the walkway and rest of the finger piers are in poor condition due to more than 20% flotation loss.

The overall condition of B-Dock is considered **Poor to Serious**. There are areas that need the floatation replaced and others that need significant repair/replacement and are overstressed, while others can be repaired or maintained to remain in working order.



**SECTION A-A**  
SCALE 1"=2'

**Figure 6: Cross-section of B-Dock**





***Photo 4: Large Concrete spall***



***Photo 5: More than Average Cable Corrosion***

## 2.3. South Marina C-Dock

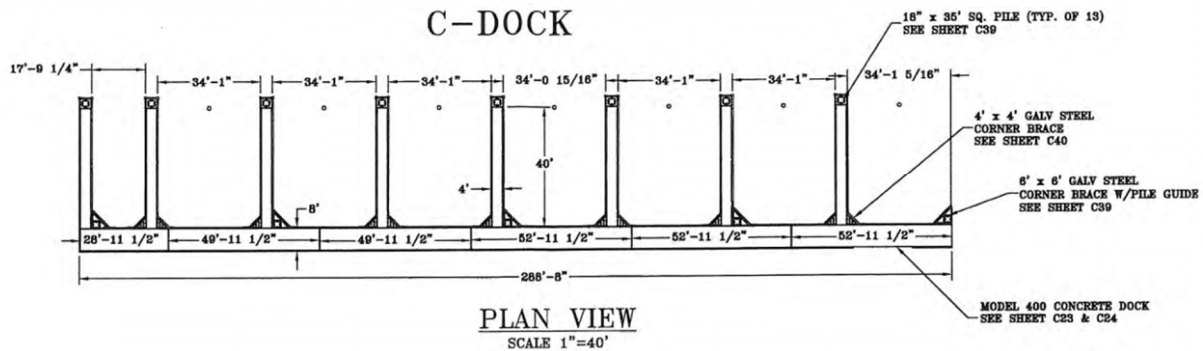


Figure 7: C-Dock Planview

C-Dock consists of an 8 feet wide walkway with 4 feet wide finger piers. The main C-Dock walkway is constructed similar to B-Dock, with one cable on each side of dock sections connecting the floats together. The plan view of the dock can be seen in Figure 7 and the cross-section of the walkway in Figure 6 under section 2.2. The floatation is designed to be throughout the entire length of the dock and sealed on the bottom with a polyurethane coating. It should be noted that at low tide, there is approximately 5 feet of water between the bottom edge of the float and the mudline. During the underwater assessment, it was discovered that the polyurethane coating has failed in most areas with more than 20% of the floatation exposed to the elements or large holes have been created.

The concrete on the floats shows signs of surface cracks throughout the main dock and finger piers. These cracks appear to have corrosion pushing the crack out causing a bubble in the concrete. Photo 6 shows a typical crack that was observed during the inspection.

During the inspection, severe corrosion was observed on many of the cables that run through the finger piers and the main dock, several have concrete spalling around the cable sleeve. Photo 7 below shows one of the cables with a larger than average amount of corrosion and spalling than typically seen throughout the rest of the dock.

The overall condition of C-Dock is considered **Poor**. There are some areas that need significant repair/replacement and are overstressed, while others can be repaired or maintained to remain in working order.



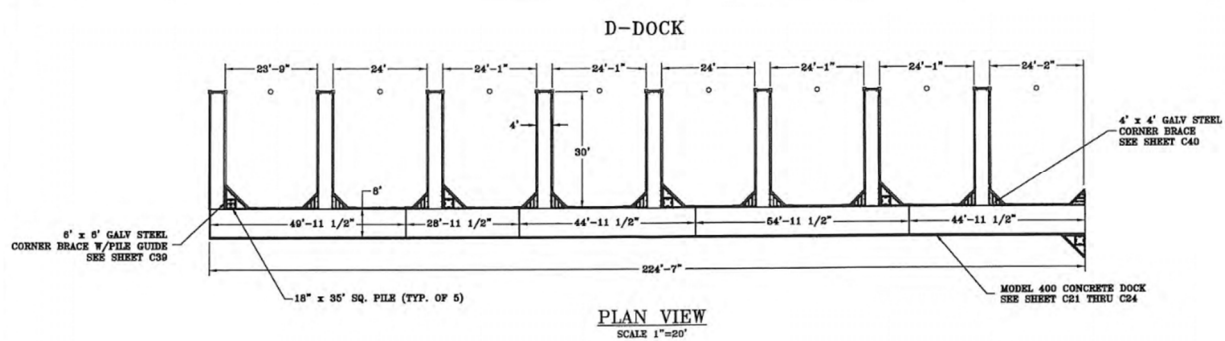


***Photo 6: Concrete Crack Typical***



***Photo 7: Concrete Spalling around Cable Sleeve***

## 2.4. South Marina D-Dock



**Figure 8: D-Dock Planview**

D-Dock consists of an 8 feet wide walkway with 4 feet wide finger piers. The main D-dock walkway is constructed similar to C-dock, with one cable on each side of dock sections connecting the floats together. The plan view of the dock can be seen in Figure 8 and the cross-section of the walkway in Figure 6 under section 2.2. The floatation is designed to be throughout the entire length of the dock and sealed on the bottom with a polyurethane coating, but there was not enough water for the divers to safely get under the floating dock to check the condition of the coating and floatation. At low tide, there is approximately 6 inches of water between the bottom edge of the float and the mudline, with several areas of the dock resting on the mudline. This could cause undue stress on the internal cables.

The concrete on the floats shows signs of surface cracks throughout the main dock and finger piers. These cracks appear to have corrosion pushing the crack out causing a bubble in the concrete. Photo 8 shows a typical crack that was observed during the inspection.

As with the rest of the docks, the finger piers are tied together with post-tensioned cables and appear to be in good condition, with very little corrosion bleed and no spalling around the caps. It was noticed, during the inspection, that the sleeves that protect the cables between the floats were scraped up, indicating differential movement of the floats and the sleeves.

The overall condition of D-Dock is considered **Fair**.





*Photo 8: Cracking at the west face*

## 2.5. South Marina Marginal Walkway

The main walkway from east to west at the north side of the south marina, called Marginal Walkway, consists of 10 feet wide concrete floats and two 12 feet wide wave attenuators at the west end, which are similar to the wave attenuators at A-Dock. The 10 feet wide floats have 1 cable on either side, where the wave attenuator has 2 cables on each side that connects the floats together. During the inspection, several of the cables were found to have more corrosion around the ends than was typically seen throughout the rest of the marina. This is especially concerning on the marginal walkway, since the entire marina is connected to the marginal walkway. Accelerated corrosion can be seen in Photo 9.

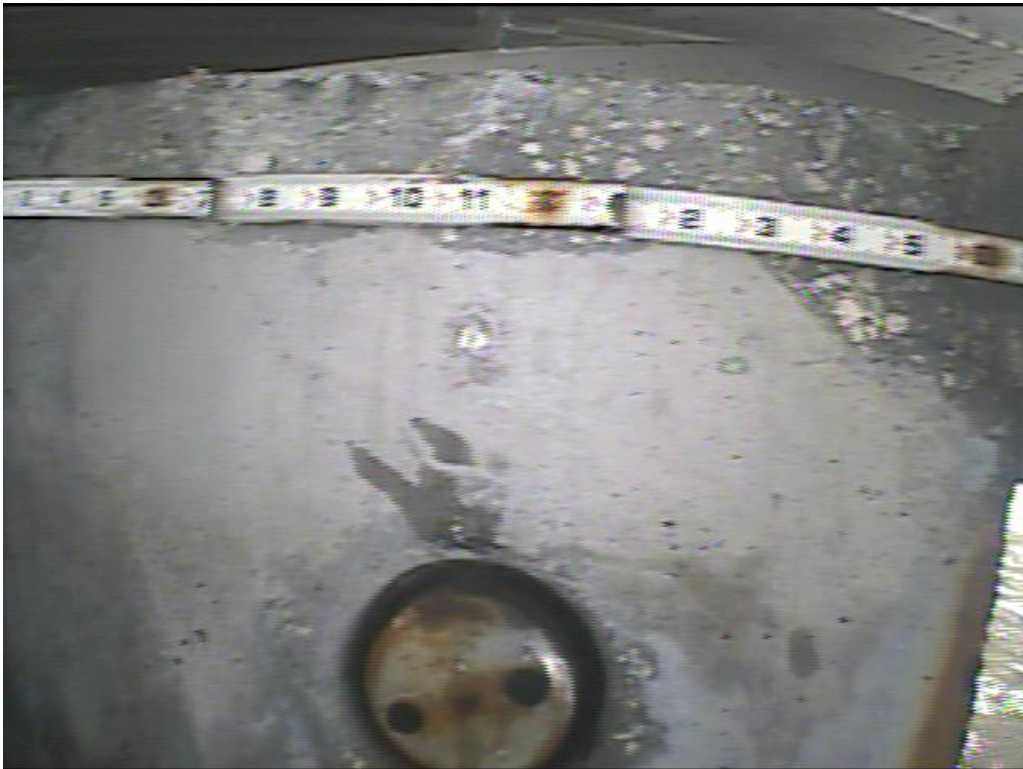
The floatation is designed to be throughout the entire length of the dock and sealed on the bottom with a polyurethane coating. During the underwater assessment, it was discovered that the polyurethane coating has failed in most areas with more than 50% of the floatation exposed to the elements or large holes have been observed. There are large sheets of the polyurethane coating just floating beneath the walkway, partially still attached to the floats.

The 8 feet wide gangway to the marina caused concrete spalling damage to the first float of the marginal walkway due to the extreme high water during Hurricane Helene and caused the aluminium gangway to reverse its normal slope, causing impact to the end of the concrete float. Part of the extent of this spall can be seen in Photo 10.

The overall condition of the Marginal Walkway is considered **Poor to Serious**. There are some areas that need significant repair/replacement and are overstressed, while others can be repaired or maintained to remain in working order.



***Photo 9: Cable Corrosion***



***Photo 10: Concrete Spall Caused by Gangway***

### 3. Underwater Inspection Findings – North Marina

The following section is a detailed summary documenting the condition of the floating components of the Clearwater Harbor Marina – North Basin.

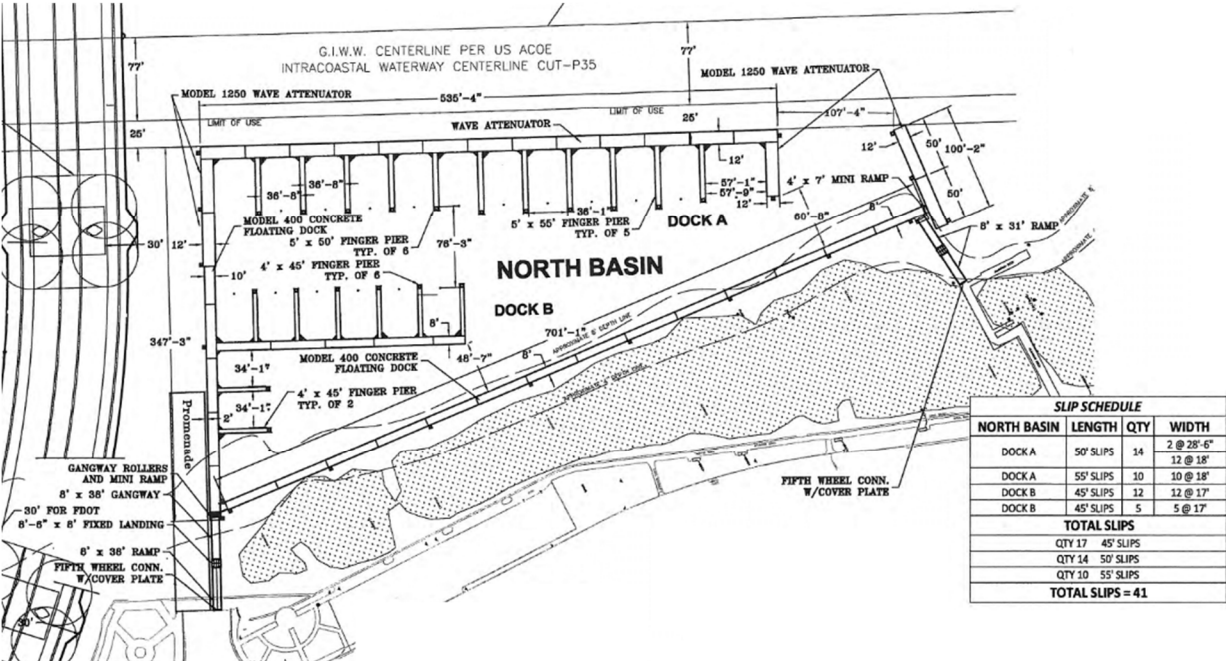


Figure 9: Plan Layout of the North Marina Basin

#### 3.1. North Marina A-Dock

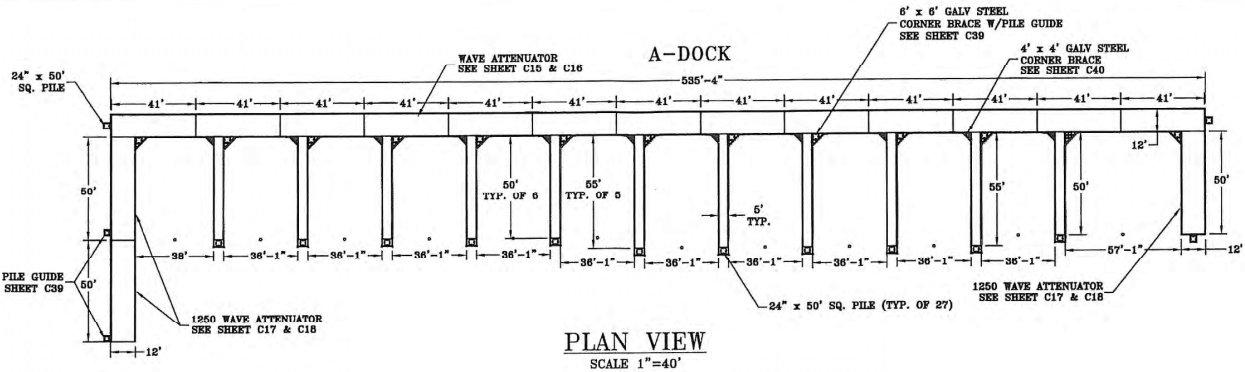


Figure 10: North Basin A-Dock Planview

A-Dock of the North Basin is constructed the same as A-Dock of the South Basin with 41 feet long by 12 feet wide wave attenuator sections and 5 feet wide finger piers, as described in section 2.1 above. The north basin is in deeper water, therefore can dock larger vessels with deeper draft. A-Dock was inspected on Thursday, October 24<sup>th</sup>. The floatation is designed to be throughout the entire length of the dock with the bottom sealed with a polyurethane coating. During the underwater assessment, it was discovered that





the polyurethane coating has failed in most areas with more than 40% of the floatation exposed to the elements.

These large wave attenuators have two (2) tension cables that run through each side of the attenuator and connect the attenuators together. There are also cables on each side of the finger piers that attach them to the main dock sections. During the inspection, several of the cables were found to have corrosion around the ends. Particularly concerning is the northern most cable that shows larger sign of corrosion and cracking around the steel cable cap. Accelerated corrosion can be seen in Photo 11. In addition, several spalls with exposed steel were observed, see Photo 12.

The overall condition of A-Dock is considered **Poor to Serious**. There are some areas that need significant repair/replacement and are overstressed, while others can be repaired or maintained to remain in working order.

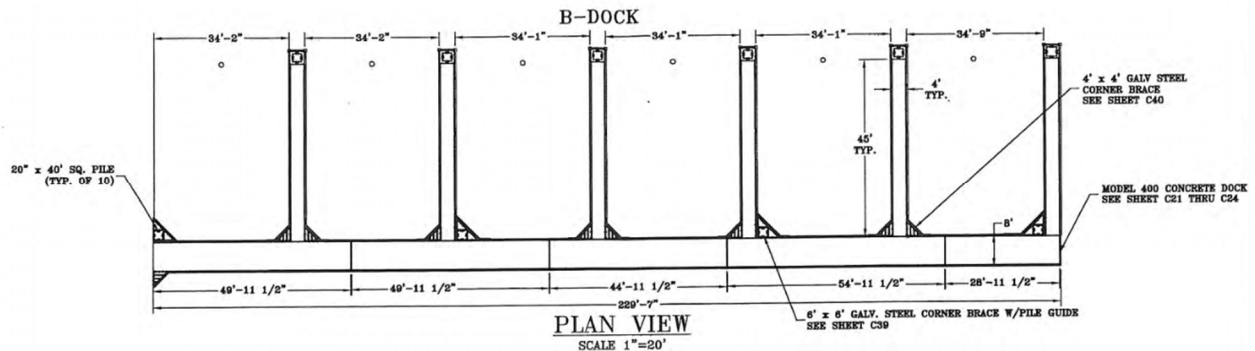


*Photo 11: NW Corner Concrete Spalling*



**Photo 12: NE Corner Exposed Steel Conduit for Cable**

### 3.2. North Marina B-Dock



**Figure 11: North Basin B-Dock Planview**

The other main dock in the north marina basin is B-Dock, which is an 8 feet wide concrete floating dock similar to B-Dock in the South Marina with 4 feet wide finger piers. The main B-Dock walkway is constructed similar to A-Dock, but with only one cable on each side of the 8 feet wide dock section connecting the floats, as well as on each side on the finger piers connecting them to the main dock. As stated in the description for A-Dock, the floatation is designed to be throughout the entire length of the dock and sealed on the bottom with a polyurethane coating. During the underwater assessment, it was discovered that the polyurethane coating has failed in most areas with more than 30% of the floatation exposed to the elements or large holes have been created.





This dock is generally used to house the Freedom Boat Club and their fleet of smaller vessels. The concrete on the floats are in relatively good condition with limited spalling and cracking in some areas. Some of the spalling is minor, others are larger sections with corrosion bleed that could cause issues in the near future. An example of one of the larger spalls can be seen in Photo 13 below.

During the inspection, severe corrosion was observed on many of the cables that run through the main dock and finger piers. Photo 14 below shows one of the cables with a larger than average amount of corrosion.

The overall condition of B-Dock is considered **Fair**.

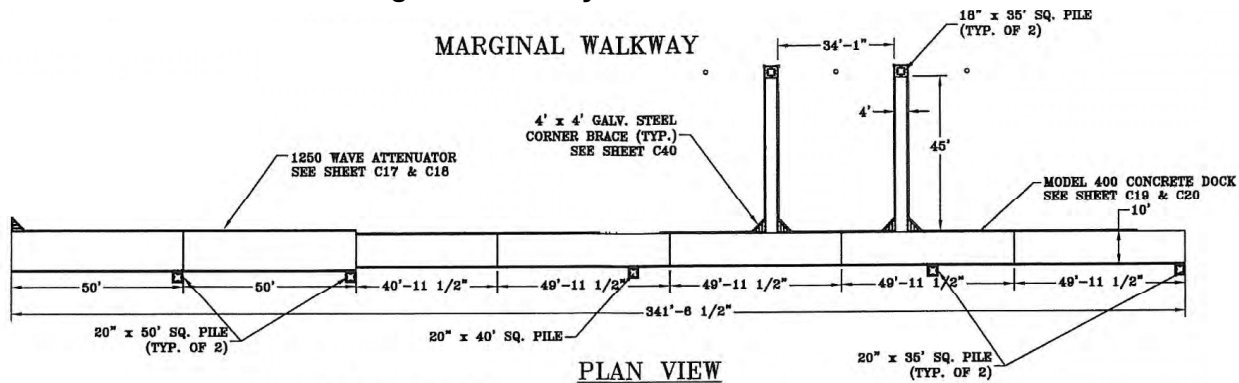


*Photo 13: NW Corner Spall*



**Photo 14: NW Corner Concrete Spalling**

**3.3. North Marina Marginal Walkway**



**Figure 12: North Basin Marginal Walkway Planview**

The Marginal Walkway consists of a 10 feet wide walkway with 12 feet wide wave attenuators and 4 feet wide finger piers. The marginal walkway floats are constructed similar to the other floating docks. The plan view of the dock can be seen in Figure 12. The floatation is designed to be throughout the entire length of the dock and sealed on the bottom with a polyurethane coating.

During the underwater assessment, it was discovered that the polyurethane coating has failed in most areas with more than 50% of the floatation exposed to the elements or large holes have been created. In some areas have whole sections of floatation missing, this could be the reason that there has been noticeable listing (high spots and low spots) along the walkway, see Photo 15.



Several of the cables were found to have corrosion around the ends as typically seen throughout the rest of the marina, see Photo 16.

The overall condition of the Marginal Walkway is considered **Poor to Serious**. There are some areas that need significant repair/replacement and are overstressed, while others can be repaired or maintained to remain in working order



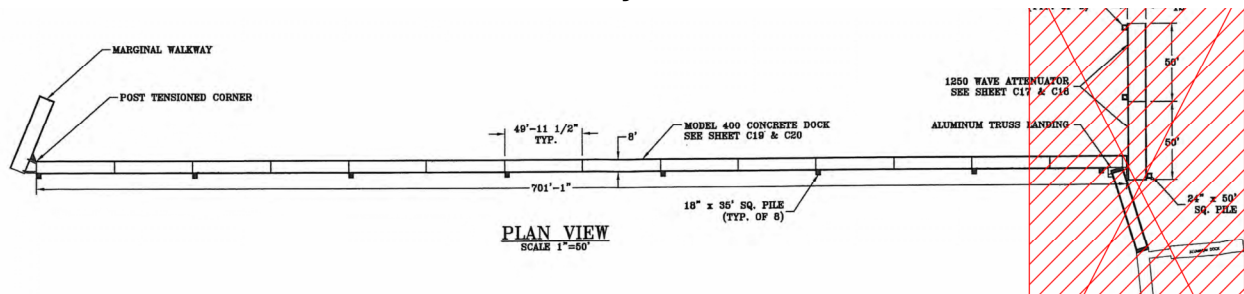
*Photo 15: Walkway Listing*





**Photo 16: Corroded Cable End**

### 3.4. North Marina Shore Side Walkway



**Figure 13: North Basin Shore Side Walkway Planview**

The Shore Side Walkway consists of 8 feet wide concrete floats. The shore side walkway floats are constructed similar to rest of the structures. The plan view of the dock can be seen in Figure 13. The floatation is designed to be throughout the entire length of the dock and sealed on the bottom with a polyurethane coating.

During the underwater assessment, it was discovered that the polyurethane coating has failed in most areas with more than 30% of the floatation exposed to the elements or large holes have been created. In some areas have whole sections of floatation missing, this could be the reason that there has been noticeable listing (high spots and low spots) along the walkway, see Photo 17.

Several of the cables were found to have corrosion around the ends as typically seen throughout the rest of the marina, see Photo 18.



The most northern part of the shore side walkway including a fishing pier was not accessible due to a sunken sailboat, see Photo 19.

The overall condition of the South Marginal Walkway is considered **Poor to Serious**. There are some areas that need significant repair/replacement and are overstressed.



***Photo 17: Walkway Listing***





***Photo 18: Corroded Cable End***



***Photo 19: Sunken Sailboat***

## 4. Condition Summary

Below are tables documenting the condition summary of each dock section of the marina. These items should be taken into consideration when planning maintenance of the marina for future years. Several items are critical to the functionality of the marina.

**Table 3: South Marina Condition Summary**

Dock	Condition Rating	Comments
A-Dock	Poor to Serious	Cable corrosion, pile guide corrosion
B-Dock	Poor to Serious	Missing floatation, cable corrosion, pile guide corrosion
C-Dock	Poor	Missing floatation, cable corrosion, pile guide corrosion
D-Dock	Fair	Concrete surface cracking, utility conduit movement
Marginal Walkway	Poor to Serious	Missing floatation, cable corrosion, listing, pile guide corrosion

**Table 4: North Marina Condition Summary**

Dock	Condition Rating	Comments
A-Dock	Poor to Serious	Missing floatation, cable corrosion, listing, pile guide corrosion
B-Dock	Fair	Concrete surface cracking
Marginal Walkway	Poor to Serious	Missing floatation, cable corrosion, listing, pile guide corrosion
South Shoreside Walkway	Poor to Serious	Missing floatation, cable corrosion, listing, pile guide corrosion

