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Pelican Isle Master Association
435 Dockside Drive
Unit #203
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RE: Seawall Assessment Report

Turrell, Hall, & Associates, Inc. conducted a site visit to the above referenced property on May 4, 2022 to conduct a visual, non-invasive assessment of certain portions of the existing seawall and fixed docks. Findings and photos were compared to those from a previous report that was conducted by our company in 2017.

Background

Below is a typical concrete seawall and its components. Most seawalls are composed of steel reinforced concrete tongue and groove panels, 4-6 foot wide. The panels are installed into the berm to a specified embedment depth which is important to prevent the bottom of the wall from kicking out (where it rotates out at the bottom). A steel reinforced concrete cap is then poured on top of the panels. A tieback rod connects the cap to a large concrete anchor in the uplands called a deadman. The exposed face refers to the height of the cap above the berm and is used to determine the necessary panel embedment and tieback length when the wall is designed.

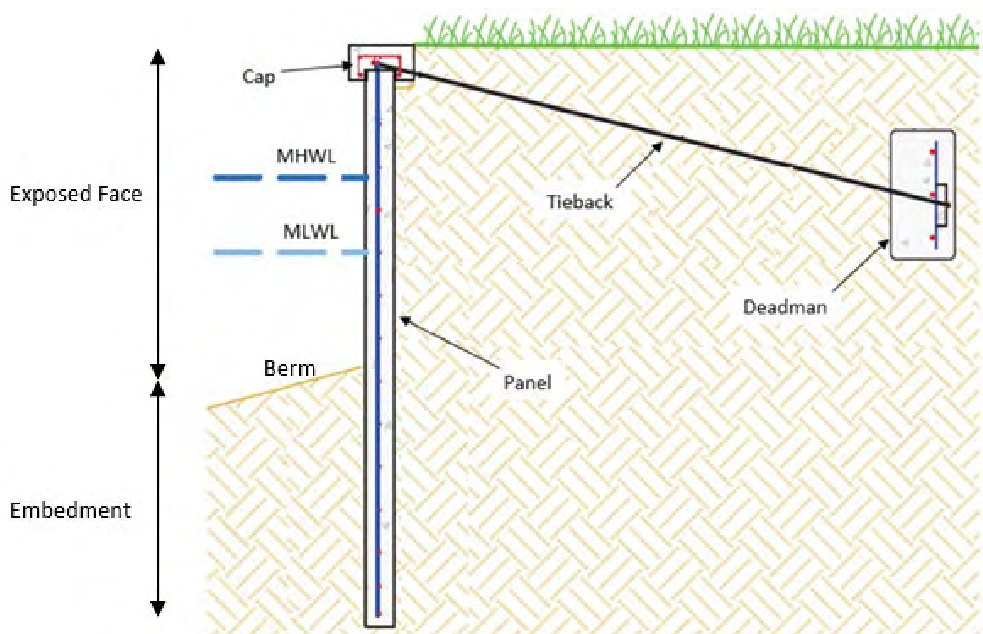

Figure 1: Typical Concrete Seawall Cross-section

Existing Conditions

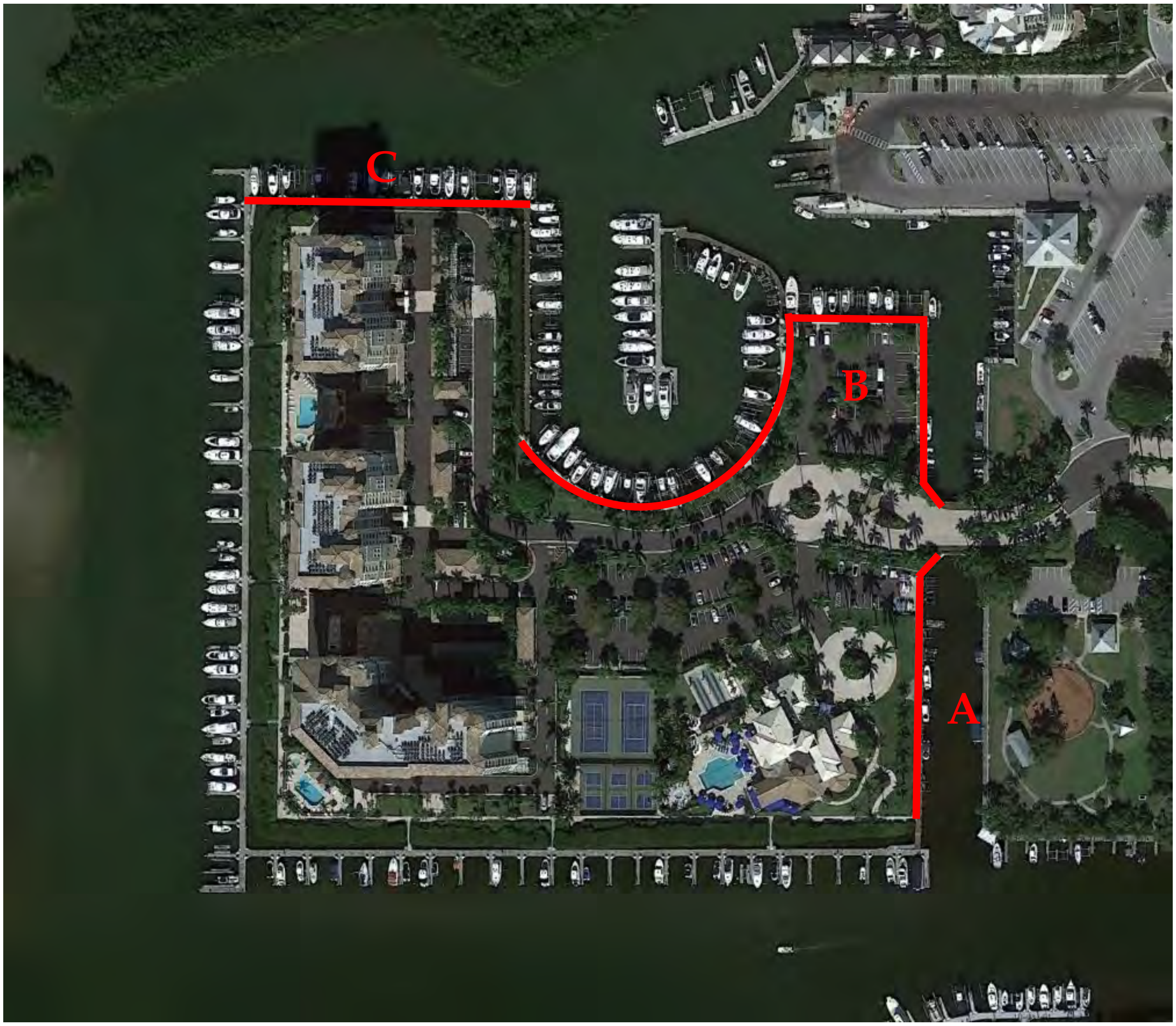

Figure 2: Site Aerial

For clarity in this report, the seawall is divided into three sections. They are depicted in figure 2 and will be referred to as sections A, B, and C. On the South and West sides of the island, the seawall functions as an upland retaining wall. These areas were not assessed.

<u>Section A</u>

The North end of section A has had some weephole modifications done to reduce hydrostatic pressure behind the seawall by allowing water to flow through the panels. The remainder of this section has mostly original weepholes with a few extras having been drilled. While the weepholes do not have any visible obstructions, they only way to verify they are working is to observe them during a rain event to see whether they are releasing water. In 2021 the seawall seams in this area were treated with foam injection to mitigate the loss of upland soils.

There are numerous cracks running horizontally and diagonally on some of the seawall panels, and while concerning, these defects were also identified in the 2017 report and do not appear to have worsened since then. In addition, there are multiple cracks in the seawall cap. The smaller, hairline cracks that can be seen running perpendicular to the shoreline in multiple locations along the cap are caused by expansion/ contraction and are typical in concrete seawalls. These are not of concern unless they expand to larger then 1/8". However, at the two directional changes in this section, more significant cracking can be seen (see figure 5). These were not mentioned in the previous report so it is unclear as to whether they are new. They should be monitored for changes.

The tiebacks were not dug up during this noninvasive assessment and were therefore not checked. However, the cap appears to wander (not straight) at a location just south of the kayak racks, indicating that the wall has moved out, possibly due to a tieback failure. As discussed in the previous report, there has been a waler beam installed on the face of the seawall panels to add supplemental support. It is unclear as to whether to movement in the cap occurred before or after the waler was added.

Figure 3: Extra Weephole Drilled

Figure 4: Horizontal Seawall Panel Crack

Figure 5: Seawall Cap Crack at Directional Change

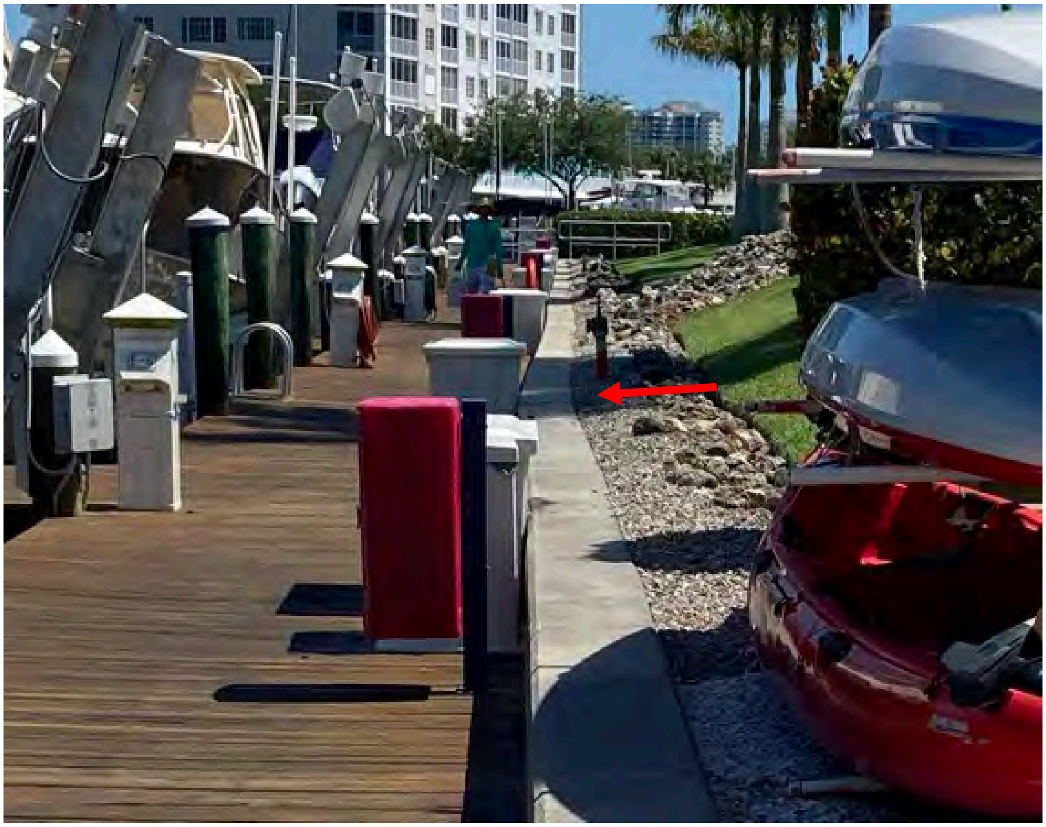

Figure 6: Seawall Cap Bowing Outward

Figure 7: Minor Loss of Backfill Behind Cap

Section B

This section includes the seawall inside the basin and up around the northeast peninsula. Findings are consistent with those of the last report; the seawalls inside the basin and on the north side of the peninsula are in fair condition with no defects noted (they are only ranked fair due to the age). The wall is straight and true with no signs of rust bleeding or significant cracking. However, there is one stormwater pipe in the basin that does not appear to have been cleaned out recently as it has accumulated a lot of growth. This can cause upland failure of the stormwater system and can lead to seawall damage.

Along the east run of this seawall, there is a composite waler with supplemental tieback rods installed. Above the waler there are numerous horizontal cracks in the panels that have been patched with grout. Both the waler and the patches appear the same as in the 2017 photos.

Figure 8: Stormwater Pipe Inside Basin

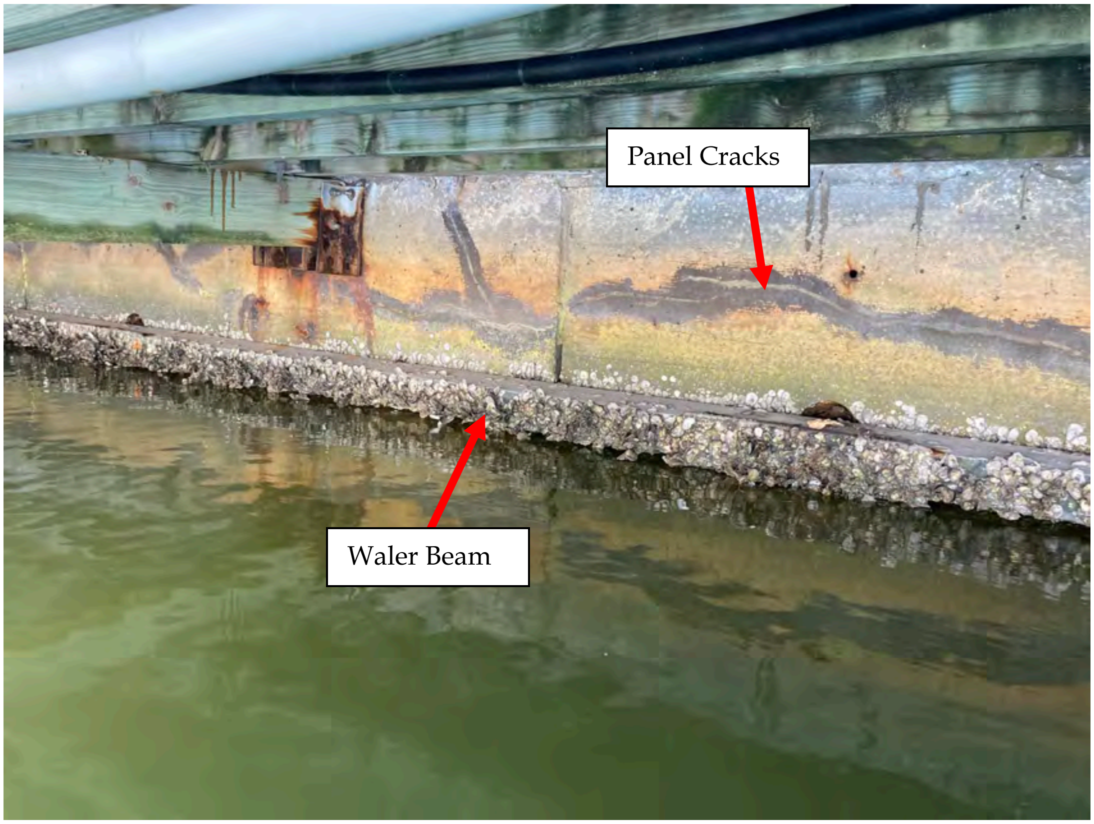

Figure 9: Grouted Panel Cracks

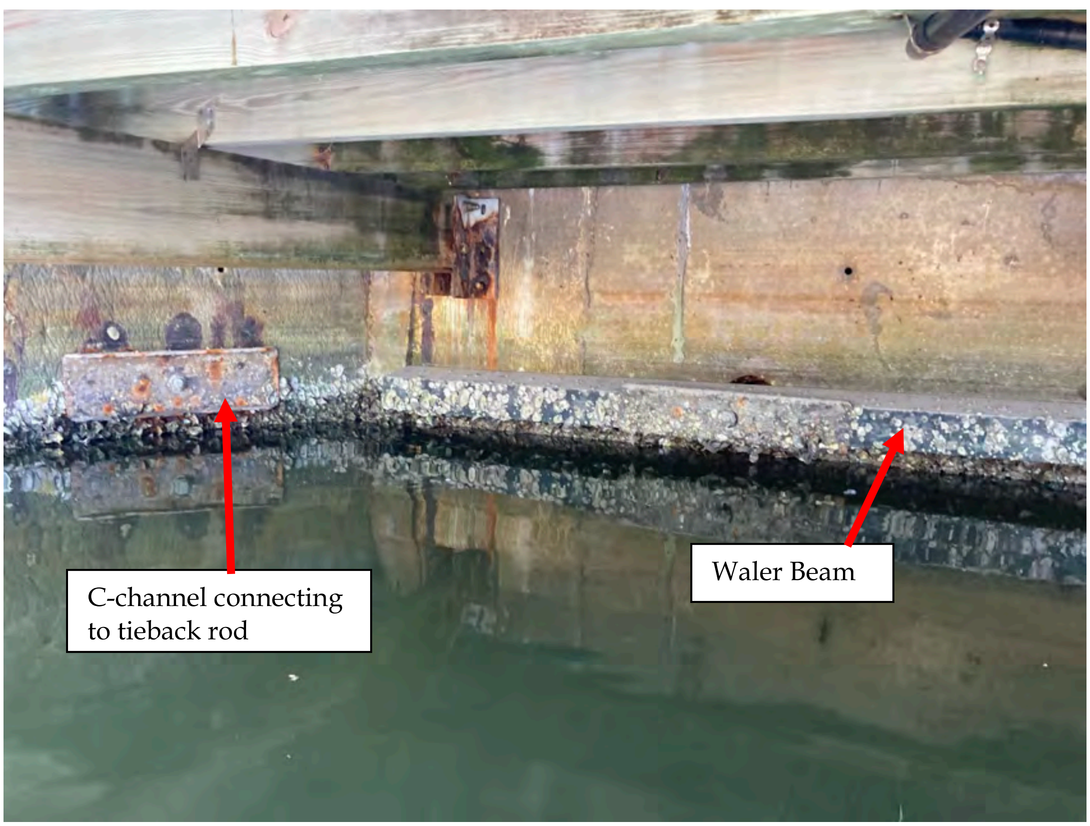

Figure 10: End of Composite Waler and C-channel for a Helical Tieback

<u>Section C</u>

A few defects were noted in this section such as rust bleeding and panel cracking. These were also present in 2017 and haven't noticeably worsened. Comparing photos, it is apparent that the stormwater pipes here have since been cleaned out and had most of the barnacle growth removed.

The previous report noted panels toward the east end of this area had rotated out at the bottom. In 2021, there has been riprap installed to help stabilize the base and prevent further movement (see figure 15). The figure also shows the galvanized steel channels that connect the supplemental tieback rods to the face of the seawall. Unlike the riprap, these were present in 2017 and have remained intact, although difficult to see due to barnacle growth. This area was also treated with foam injection in 2021.

Figure 11: Minor Rust Bleeding (seen in 2017 report as well)

Figure 12: Stormwater Pipe

Figure 13: Stormwater Pipe, Panel Crack, Rust Bleeding (seen in 2017 report)

Figure 14: Seawall C East Termination, Helical Tieback Channel and Weephole

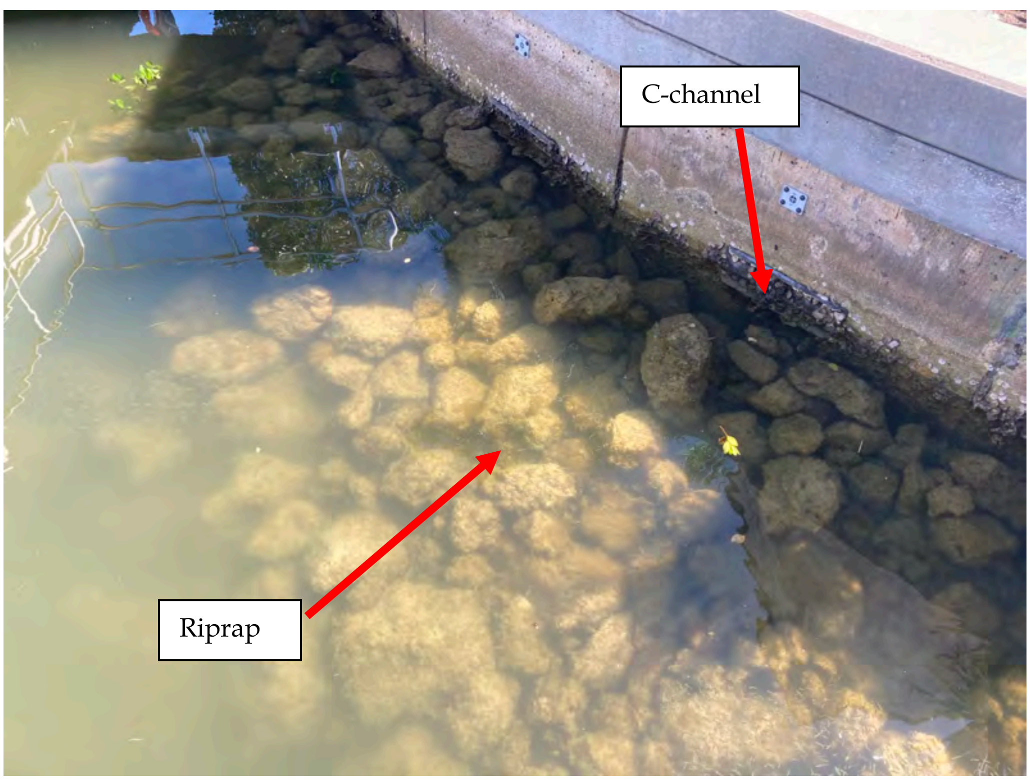

Figure 15: Riprap Installed in Response to Seawall Base Kickout Identified in 2017

<u>Fixed Docks</u>

The existing fixed docks were not addressed in the 2017 report. They are constructed on round wood pilings, 8-10" in diameter. The pressure treated decking rests on top of boards called stringers, that run length wise along the dock. These are supported by the cap timbers, which run perpendicular to them and are bolted to the piles. The piles are wrapped with vinyl to protect them from marine boring organisms that will otherwise eat away at the wood. A diagram is shown in figure 16 for clarity.

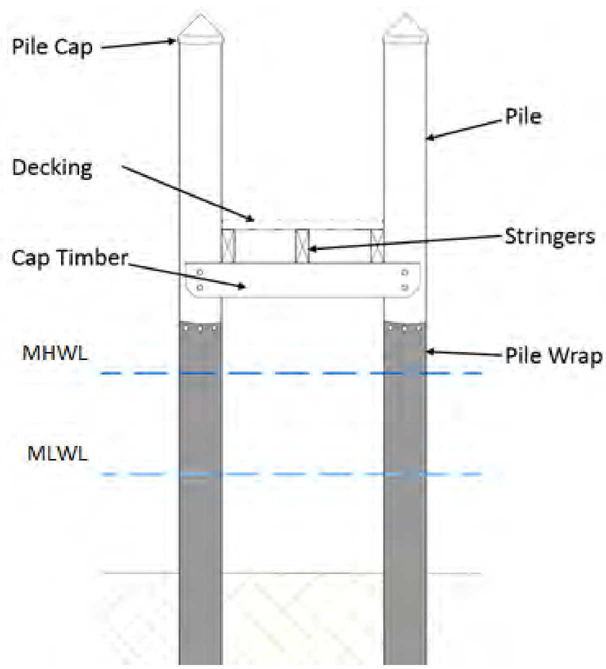

Figure 16: Typical Fixed Dock Components

In the case of the fixed docks that run adjacent to the seawall, there is only one row of pilings and the backside of the dock is supported by steel hardware that fastens the cap timbers to the concrete seawall panels. The downside to this design is that the dock's structural integrity relies on the condition of the seawall. Additionally, most of this hardware is severely corroded (see figure 17). The bolts and nuts holding the cap timbers to the piles are stainless steel and most of them are in good condition, showing signs of rust staining but no structural corrosion was found.

The dock framing (stringers and cap timbers) was in fair condition. A few boards were splitting down the center, one of which is shown in figure 19 along with a missing cap timber bolt. The decking was replaced in recent years and has been maintained well but is warping significantly in certain areas, presenting a tripping hazard. Several boards appear to have been replaced. The broken board photographed in figure 22 appears to have happened recently and should be replaced as well.

The condition of the wood pilings range from fair to poor. Almost all of the pilings show some level of deterioration, indicated by the orange, fuzzy areas directly above the vinyl wrapping. This is typically either caused by dry rot or saltwater wicking into the wood and creates a soft spot in the wood. Figure 25 shows one of the worst pilings, and a close up of another deteriorated pile can be seen in figure 18. A few of the piles have had a concrete collar formed around them as a temporary repair.


Figure 17: Hardware Connecting Fixed Dock to Seawall Panel

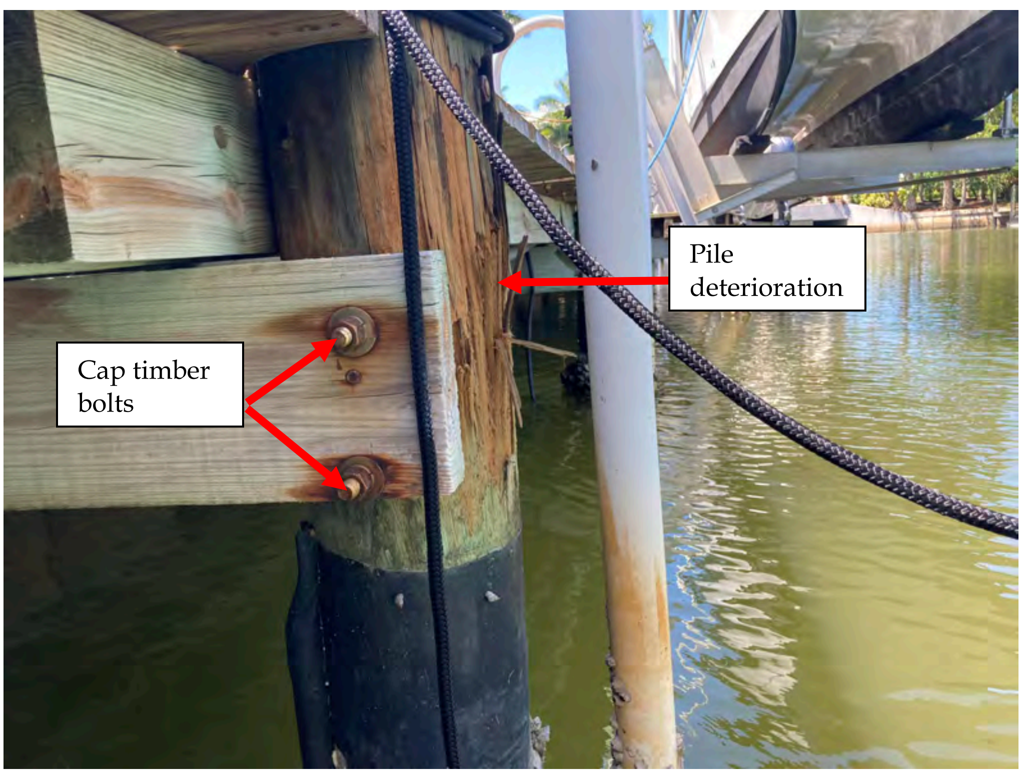

Figure 18: Close Up Pile Deterioration, Dock Framing

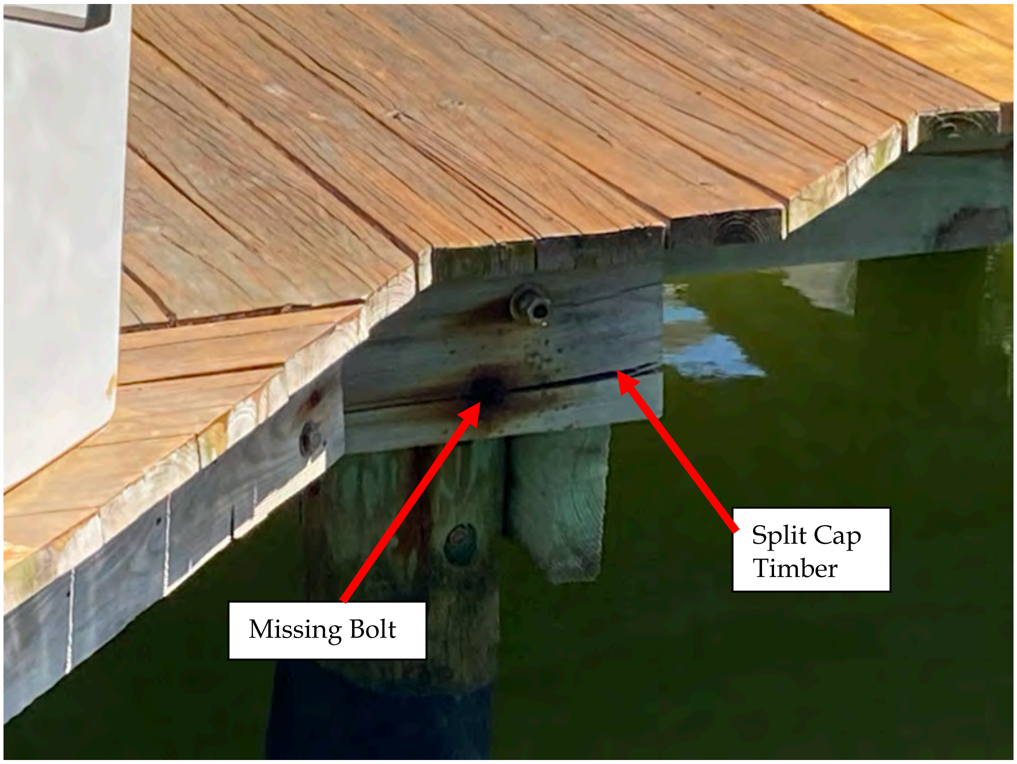

Figure 19: Dock Framing – Split Lumber and Missing Bolt


Figure 20: Warped Deck Boards

Figure 21: Recently Replaced Deck Boards

Figure 22: Broken Deck Board

Figure 23: Pile Repair (concrete poured inside sleeve around the pile)

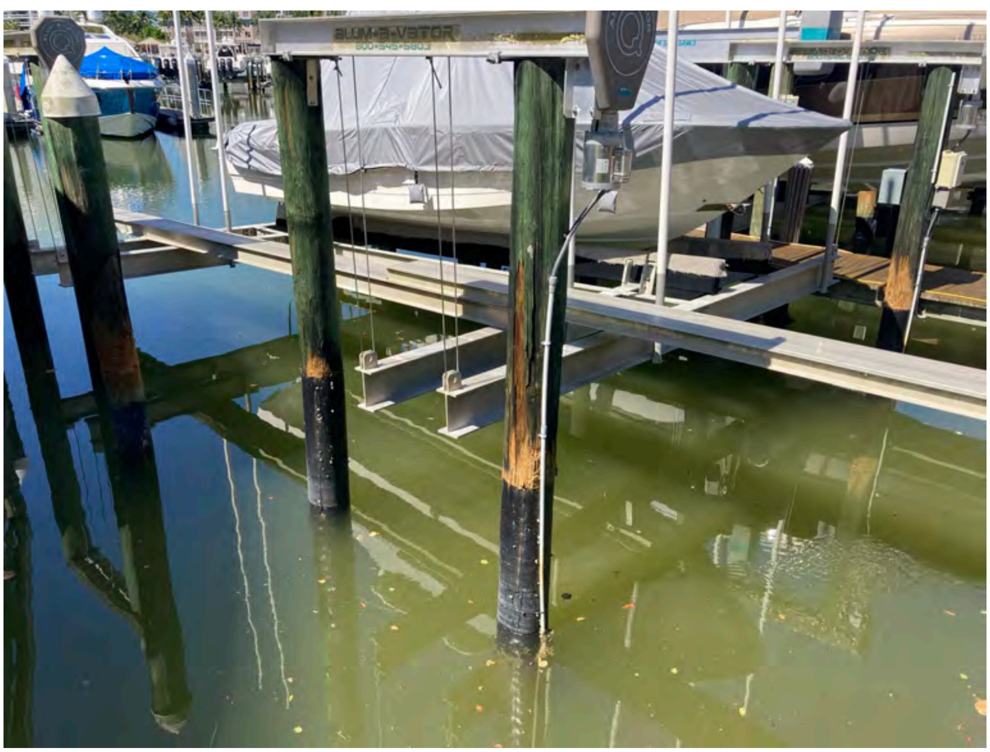

Figure 24: Detriorated Boatlift Piles

Figure 25: Severely Deteriorated Dock Pile