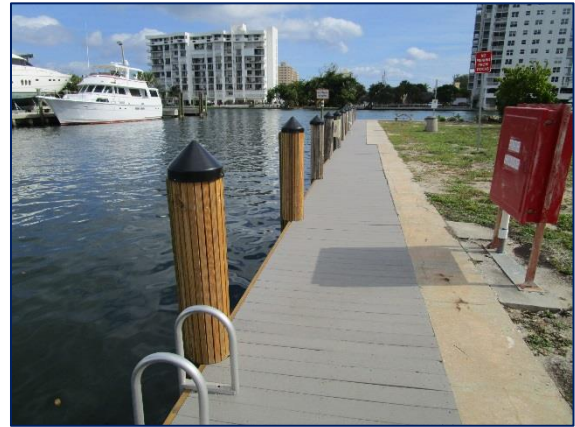
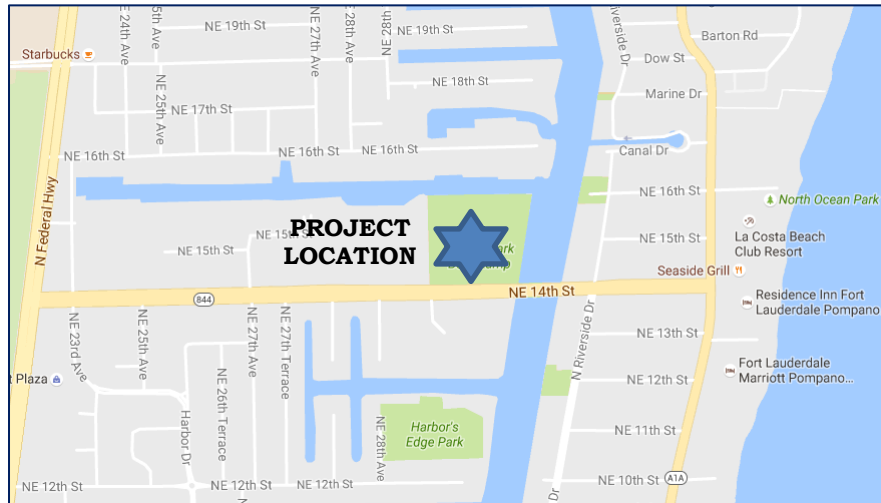


# BULKHEAD & DOCK CONDITION REPORT

## Alsdorf Park City of Pompano Beach

December 2018, Updated March 2019



Prepared for:  
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**INTRODUCTION:**

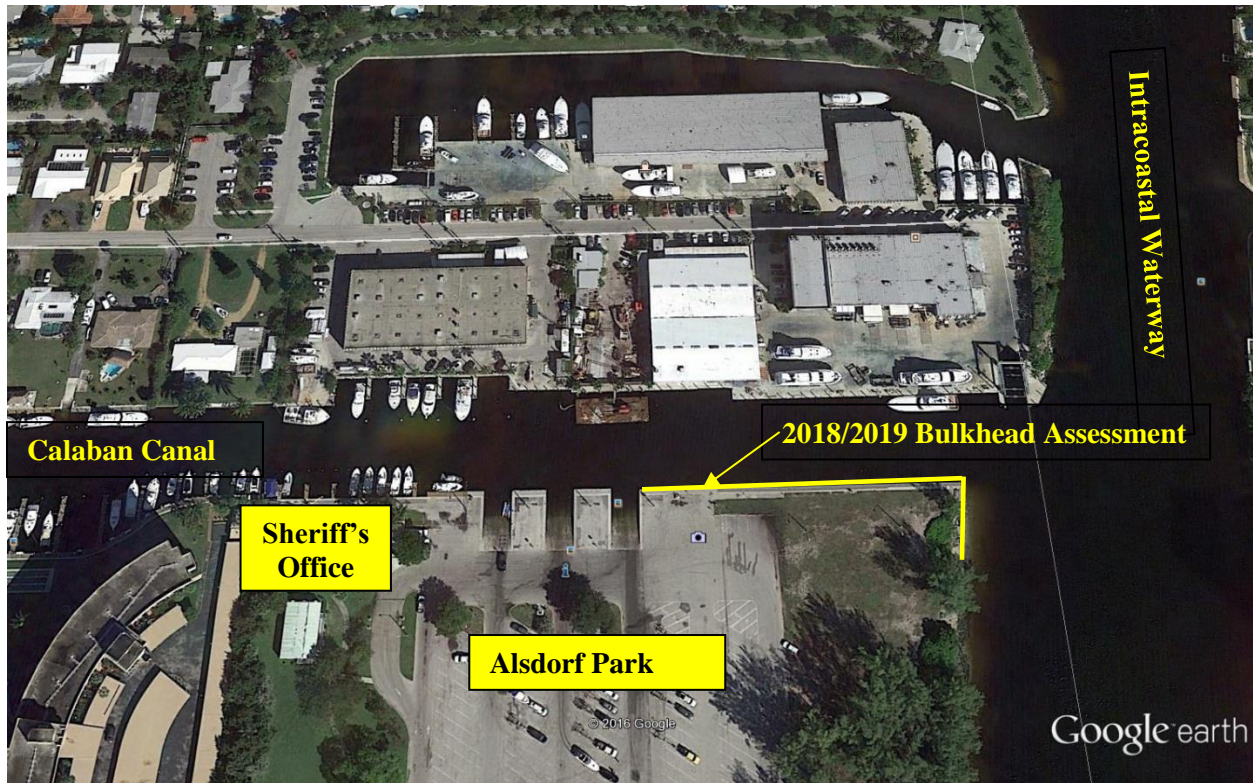
Pursuant to the request of the City of Pompano Beach, Sea Diversified, Inc. (SDI), conducted a bulkhead assessment at William J. Alsdorf Boat Launching Park (Alsdorf Park) located at 2901 Northeast 14<sup>th</sup> Street on the west side of the Intracoastal Waterway (ICWW). **Reference Figure A.** The bulkhead at Alsdorf Park extends along the south side of Caliban Canal, an artificial waterway bordering the north side of the Park property. The bulkhead measures approximately 780 feet in total length extending west from the ICWW along the Park to the west side of an adjacent sheriff facility where it abuts a private residential bulkhead. SDI conducted a previous inspection of this entire bulkhead in late July and early August of 2016. The current bulkhead assessment focused specifically on a 350-foot segment of the wall extending from the boat ramps to the ICWW including a small section extending along west side of the ICWW. **Reference Figure B.** This part of the bulkhead was noted to be in poor condition in 2016 so the updated inspection was conducted for purposes of checking on current conditions in preparation for initiating necessary repairs. Field work consisted of visual observations of existing conditions by engineering staff under the direction and supervision of a Professional Engineer. The current field work was conducted in December of 2018.



**Figure A**

**DESCRIPTION:**

The subject bulkhead structure is constructed of vertical concrete panels approximately 10-ft in width, vertical concrete T-piles and concrete cap. Excavation to determine the presence of a tie-back system was not conducted. A timber frame marginal dock runs the length of this section of bulkhead from the ICWW



**Figure B**

to the east boat ramp. The marginal dock is constructed with pressure treated timber framing and composite decking. The dock is attached to the bulkhead cap using timber ledgers and supported waterward by thirty-five (35) timber piles, spaced approximately 10-feet on center. Two (2) of the timber piles appear to have been replaced since the time of the previous inspection 2016 because of a reported vessel strike. Additionally, it appears several more timber piles have been jacketed with a vinyl wrap and back-filled with concrete since the previous inspection. The landside area of the bulkhead is comprised of natural ground and grass graded flat at approximately the same elevation of the concrete cap. Further west towards the boat ramp area, the bulkhead is bordered by asphalt.

**FIELD OBSERVATIONS:**

The field investigation was conducted in December of 2018 and consisted of both topside and in-water visual observations of the bulkhead to note evidence of damage, extreme deterioration or signs that the bulkhead may not be functioning as intended. The condition assessment was limited to structural components that were readily visible without extensive scraping of marine growth or excavation of sediments.

Commencing at the south end of the bulkhead section along the ICWW, the top surface of the concrete cap was observed to be in fair to poor condition with numerous surface cracks, damaged concrete, spalling and rust staining. The concrete T-piles showed signs of age with extensive deterioration but overall this section of bulkhead was observed to be in relatively stable condition. **(Plates A through D)**

Proceeding west into the Calaban Canal, the easterly 80 feet of bulkhead is laterally reinforced by concrete batter piles, which appeared to have been added to the original bulkhead structure as part of previous repair work. This easterly section of bulkhead also appeared to have a newer concrete cap, approximately 40 inches in width and 24 inches in depth, which apparently was constructed concurrent with the addition of batter piles. The upper side of the concrete cap was observed to be in fair condition with minor cracks and minimal signs of deterioration. (**Plates E and F**). This repaired section of bulkhead has rock rip rap stacked along the base of the vertical panels.

The batter piles along the first section of bulkhead were observed to be in good condition with no significant cracks or sign of deterioration. The outer face of the bulkhead cap, beneath the dock, was observed to have several cracks with several severe cracks at the east end near the entrance to the ICWW. (**Plates F and G**) One area of the concrete cap was observed to have exposed gravel or aggregate material along the lower corner of the outside face indicative of poor quality control during the repair / replacement of the cap. The condition of the T-piles, apparently part of the original construction, showed significant signs of deterioration. (**Plate H**) The concrete panels, also apparently part of the original construction, were observed to have some cracking, but extensive marine growth prohibited visual observations over much of the panel areas below water. Along this section of bulkhead, the marginal dock was observed to be in poor condition with sections of the dock framing that have failed and/or severely deteriorated. (**Plates G, H and I**)

Proceeding westerly, the concrete cap transitions to what appears to be an older cap measuring 24 inches in width and 12 inches in depth. This apparent older section of cap was observed to be poor condition with significant cracks along the top face of the cap. The ground behind the cap was observed to be stable with no significant signs of settlement indicative of possible material loss through the wall. Based on the 2016 investigation there were significant depression areas behind the wall and signs of material loss, so it is evident the City has been performing some degree of maintenance along the bulkhead. (**Plates J through N**)

At the bulkhead transition location, a section of the dock was repaired using new timber piles and timber framing with the original decking reattached to the underlying substructure. (**Plates O and P**) Along this section of the bulkhead continuing west to the boat ramp, the condition of the cap is extremely poor with extensive signs of deterioration, cracking and exposed rebar. As evidenced in the 2016 investigation, it appeared that the original cap was over-poured with a new cap at some point in the past. Large sections of the apparent over-pour were severely deteriorated with large cracks and missing concrete. (**Plates Q, R and S**) The cap condition is in such a poor state that the stability of the dock is a severe issue as the ledger board attached to the outer face of the cap could fail due to cracks and loss of concrete. (**Plates T and U**) The vertical piles and panels along this section of bulkhead were observed to have random cracks of varying degrees of severity.

#### **SUMMARY OF FINDINGS:**

The eastern 80 feet of the bulkhead observed in December 2018 appeared to have been repaired in the past with a new concrete batter pile lateral support system and new concrete cap. The small section of wall extending along the ICWW, also appeared to have been repaired in the past but included only the replacement of the concrete cap. These sections of the bulkhead are structurally stable with no evidence of loss of lateral support, however significant cracks in the concrete cap were observed predominately at the very east end adjacent to the ICWW. Along this section of bulkhead, the timber dock is in need of

repairs to many of the structural framing members. Several cross members were observed to have failed indicating the dock is not safe for pedestrian traffic.

West of the 80-foot repaired section, extending to the east boat ramp, the bulkhead appeared to be the original structure, however there was visual evidence that the bulkhead cap may have been repaired and/or over-poured in the past. The condition of this section of bulkhead is poor showing major signs of deterioration especially along the outer face and underside of the concrete cap. The upper surface of the concrete cap was also observed to have significant cracks. Along this section of bulkhead, the marginal dock is supported, in part, by a continuous ledger with a series of cross members that span from the ledger board to the outer timber pile system. Due to the extensive deterioration of the concrete cap, segments of the ledger board and many cross member supports are no longer properly secured to the face of the cap, so the overall capacity of the dock system has been compromised.

In summary, the subject bulkhead and adjacent marginal dock, as observed in December of 2018, are in a condition that warrant immediate attention, especially along the stretch of shoreline extending approximately 270 feet east of the boat ramps. Major repairs are needed to this segment of bulkhead or, if budgets allow, construction of a new bulkhead structure should be considered. Extensive repairs or full replacement of the marginal dock that adjoins to this section of bulkhead are also necessary as the existing structure was observed to be unsafe for public use. East of this section, minor maintenance to the bulkhead is necessary including repairs to the abutting timber dock. This section of timber dock along this stretch of shoreline was also determined to be unsafe for occupancy.

#### **RECOMMENDATIONS:**

Based on the results of the field observations, it is SDI's recommendation that immediate remedial measures be implemented to maintain and/or restore the stability of the bulkhead and marginal dock to ensure the long-term performance of the structures, as originally intended. More importantly, immediate remedial measures are required to ensure the safety of those that use the structures. Recommended repairs are outlined as follows:

##### Alternative One:

1. Secure the areas of immediate concern to prohibit access by the public.
2. Remove and dispose of the marginal dock decking and framing.
3. Along the bulkhead extending from the boat ramp easterly to repaired section (approximately 270 feet), carefully cut and remove a section of the concrete cap at each T-Pile location, only to the extent required for installation of 14" concrete batter piles. Cutting the cap and installation of batter piles should be conducted one at a time to minimize loss of lateral support. Temporary shoring of the bulkhead may be required until such time all batter piles are installed.
4. After installation of batter piles, carefully cut and remove the remaining cap sections to expose top of vertical panels. Install vertical steel dowels into the existing concrete panels and form and pour new concrete cap per details and specifications prepared by a qualified engineer. New concrete cap to match the previously repaired cap in size and elevation, unless otherwise directed by the engineer.
5. Along the entire bulkhead extending from the boat ramps to the ICWW including the small section of wall that extends south along the ICWW, repair existing T-Piles and vertical panels per direction of the engineer. Along the previously repaired section of bulkhead, repair the existing cap per direction of the engineer.
6. Reconstruct marginal dock with new timber piles where specified by the engineer. Reconstruction of the marginal dock shall be in accordance with plans and specifications prepared by the engineer.

Alternative Two - Interim Remedial Measures:

Based on SDI's observations on December 2018, of immediate concerns is the stability and safety of the marginal dock that borders the bulkhead east of the boat ramps to the ICWW. If budgets prohibit the extent of repairs outlined above, one alternative for the City to consider is to repair the marginal dock and perform maintenance and repairs to the only severely deteriorated bulkhead components with the objective to extend the life of the bulkhead until such time funds are available for major repairs or complete reconstruction of the bulkhead. This would encompass the following:

1. Secure the areas of immediate concern to prohibit access by the public.
2. Remove decking to expose the marginal dock substructure.
3. Along the entire bulkhead east of the boat ramp, remove the ledger attached to the bulkhead cap. Remove cross members and cross member supports at each timber pile location and all timber stringers.
4. Repair concrete cap, existing T-Piles and panels per direction of the engineer.
5. Install new timber piles adjacent to the concrete cap at each existing timber pile location. Replace existing severely deteriorated timber piles, as required. Contractor to be careful not to damage existing concrete cap or T-Piles. Install new timber cross members at each pile bent. Install new stringers and decking. Reconstruction of the marginal dock shall be in accordance with plans and specifications prepared by the engineer.

Alternative Three - Complete Reconstruction Alternative:

Based on the age and condition of the existing wall, the optimum action would be to construct a new concrete bulkhead (concrete panels, king piles, batter piles and cap) or alternatively construct the bulkhead using an interlocking sheetpile system (aluminum, composite or steel) with concrete batter piles and cap. A new bulkhead, if designed properly and maintained, would have a life expectancy of 50+ years.

**ESTIMATES OF PROBABLE CONSTRUCTION COSTS:**

Estimates of probable repair costs associated with the recommendations outlined above are incorporated, herein. Individual component costs are based on SDI's experience on similar types of construction along with consultation with various trades having experience in marine related construction activities. Estimated costs provided, herein are subject to change based upon further detailed site investigations, preparation of plans and specifications and further coordination with contractors in the marine construction field. In summary, the estimated repair costs are as follows:

Alternative One:

Contractor Mobilization and Demobilization:	\$ 10,000.00
Demolition of Timber Dock:	\$ 15,000.00
Concrete Batter Piles – (28) 14” piles @ 10’+/- O.C.:	\$ 70,000.00
Demolition of Concrete Cap:	\$ 25,000.00
New Concrete Cap (270 feet):	\$ 40,500.00
Concrete Cap, T-Pile and Panel Repairs: (Allowance):	\$ 20,000.00
Marginal Dock Reconstruction (5’x350’):	\$ 43,750.00
Timber Pile Replacement (Assume 25% Replacement, 9 piles):	\$ 18,900.00
Environmental Control Measures:	\$ 3,500.00
<u>City Permits, Bonds and Licenses:</u>	<u>\$ 5,000.00</u>
<b>Sub-total - Estimated Repair Cost:</b>	<b>\$ 251,650.00</b>
Contingency @ 10%	\$ 25,165.00
<b>Total - Estimated Repair Cost w/ Contingency:</b>	<b>\$ 276,815.00</b>

Alternative Two:

Contractor Mobilization and Demobilization:	\$ 10,000.00
Demolition of Timber Dock:	\$ 15,000.00
Concrete Cap, T-Pile and Panel Repairs: (Allowance):	\$ 20,000.00
Timber Pile Installation (35 total):	\$ 52,500.00
Marginal Dock Reconstruction (5'x350')	\$ 43,750.00
Timber Pile Replacement (Assume 25% Replacement, 9 piles):	\$ 18,900.00
Environmental Control Measures:	\$ 3,500.00
<u>City Permits, Bonds and Licenses:</u>	<u>\$ 5,000.00</u>
<b>Sub-total - Estimated Repair Cost:</b>	<b>\$ 168,650.00</b>
Contingency @ 10%	\$ 16,865.00
<b>Total - Estimated Repair Cost w/ Contingency:</b>	<b>\$ 185,515.00</b>

Alternative Three:

Contractor Mobilization and Demobilization:	\$ 25,000.00
Demolition of Timber Dock:	\$ 15,000.00
New Concrete Bulkhead (350 feet):	\$ 525,000.00
Marginal Dock Reconstruction (5'x350')	\$ 43,750.00
Timber Pile Replacement (35 piles):	\$ 73,500.00
Environmental Control Measures:	\$ 3,500.00
<u>City Permits, Bonds and Licenses:</u>	<u>\$ 5,000.00</u>
<b>Sub-total - Estimated Repair Cost:</b>	<b>\$ 690,750.00</b>
Contingency @ 10%	\$ 69,075.00
<b>Total - Estimated Repair Cost w/ Contingency:</b>	<b>\$ 759,825.00</b>

Notes:

1. Estimated costs for repairs and replacement are subject to further site investigations, geotechnical studies and final engineering analysis.
2. Costs provided, herein are provided for planning and budgeting purposes.
3. Costs estimates do not include engineering, permitting and construction administration.

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The site observations, report preparation and recommendations herein have been prepared under the direct supervision of a State of Florida Professional Engineer. Site observations were limited to areas and structure components readily visible. Underground, soil or other unknown conditions could alter the conclusions and recommendations of this report. Recommendations were developed based on experience and judgment of likely causes of conditions observed. If additional information regarding the marine facilities becomes known, including historical or existing site conditions, we reserve the right to amend the conclusions and recommendations of this report.

**Signed:**



William T. Sadler, Jr., P.E.  
President, Sea Diversified, Inc.  
Florida Registration Number 41184



**Plate A**  
**South View at East End along ICWW**  
**Note major crack at corner**



**Plate B**  
**Southerly View at East End along ICWW.**  
**Significant spalling, cracks and staining**





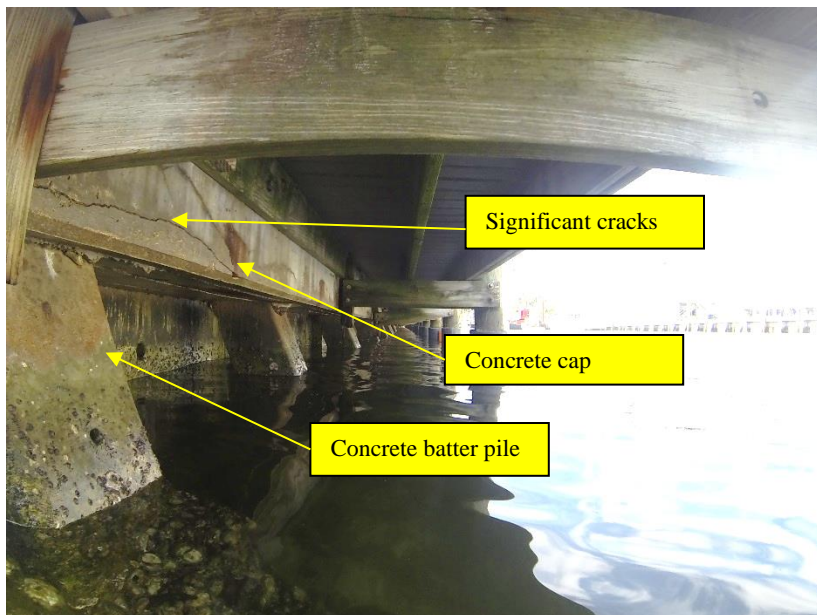
**Plate C**  
**West View at East End along ICWW.**  
**Significant spalling, cracks and staining**



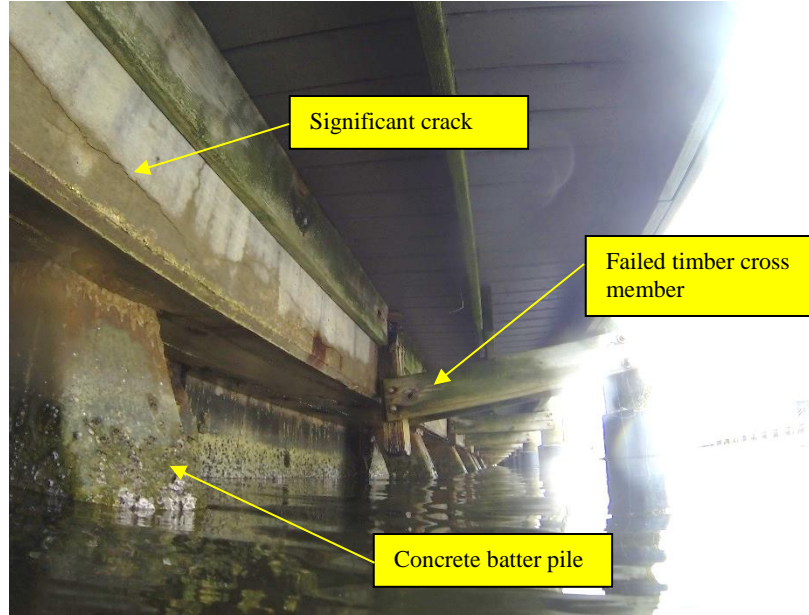
**Plate D**  
**North View at East End along ICWW.**  
**Major crack / loss of concrete and spalling corner.**



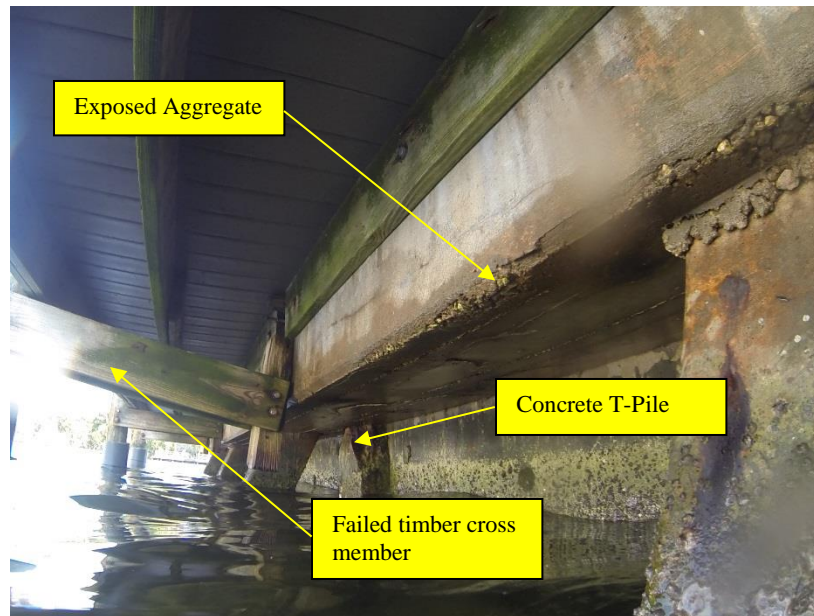
**Plate E**  
**West View from East end of bulkhead**



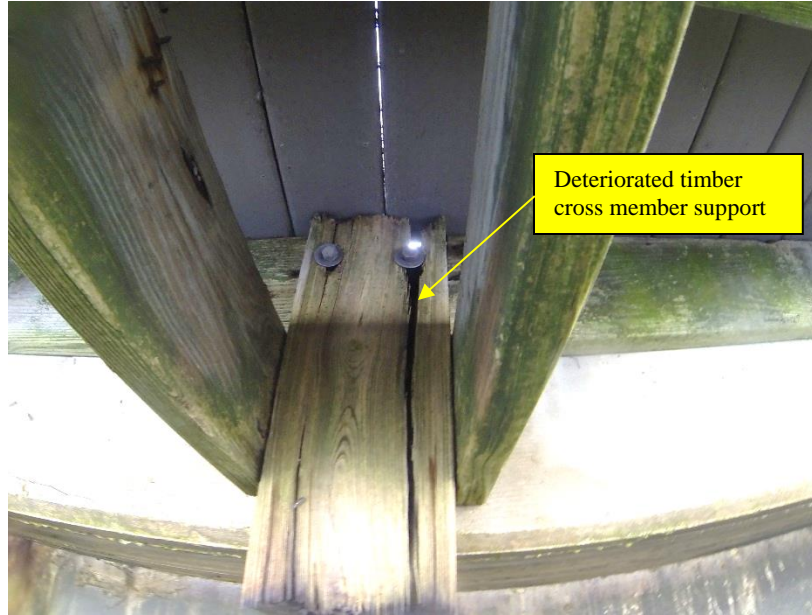
**Plate F**  
**West view from East end of bulkhead looking underneath dock.**  
**Bulkhead and dock components.**



**Plate G**  
**West view from East end of bulkhead looking underneath dock.**  
**Failed timber cross member**



**Plate H**  
**East view from East end of bulkhead looking underneath dock.**  
**Failed timber cross member**



**Plate I**  
**Cracked / deteriorated timber cross member support**



**Plate J**  
**East view at transition from repaired bulkhead section to original bulkhead structure**



**Plate K**  
**West view at transition from repaired bulkhead section to original bulkhead structure**



**Plate L**  
**Significant cracks in concrete cap**



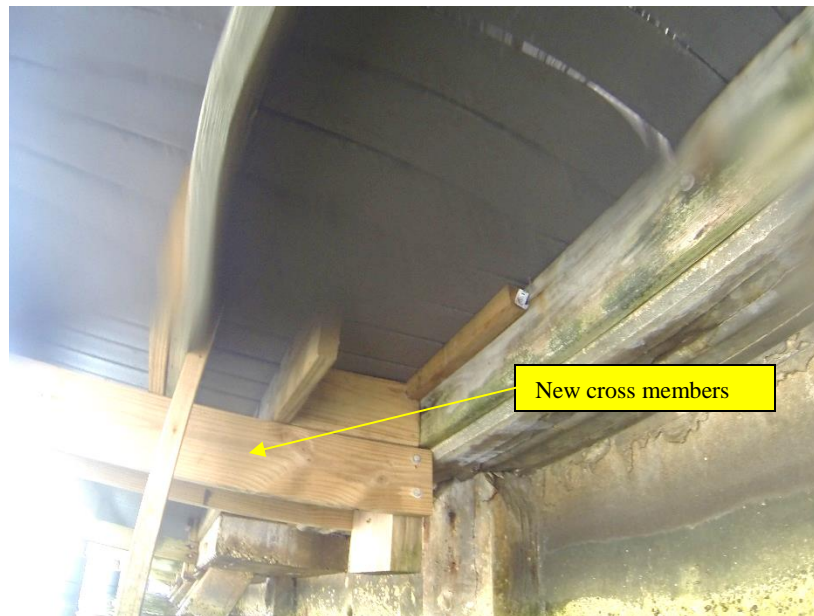
**Plate M**  
**Significant cracks in concrete cap**



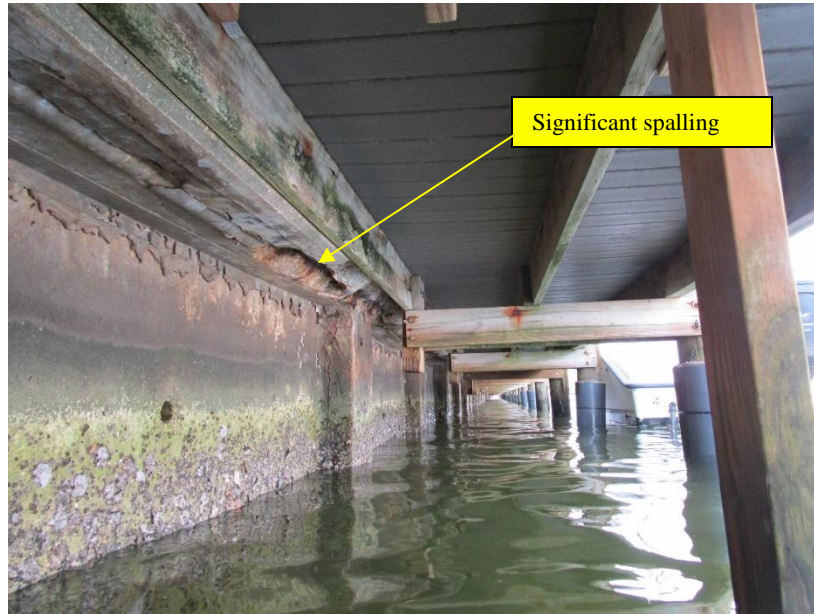
**Plate N**  
**West end of bulkhead under current assessment**



**Plate O**  
**View beneath dock at bulkhead transition point**  
**Note repaired section of timber dock**



**Plate P**  
**View beneath dock at bulkhead transition point**  
**Note repaired section of timber dock**



**Plate Q**  
**Typical condition of bulkhead cap and timber dock**



**Plate R**  
**Typical condition of bulkhead cap**





**Plate S**  
**Typical condition of bulkhead cap and dock**



**Plate T**  
**Typical condition of bulkhead cap and dock**



**Plate U**  
**Severely spalled concrete with evidence that cross member support connections are in poor condition**