



# Appledore Marine Engineering Inc.

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December 8, 2011

Mr. Brad Lown  
Prescott Park Trustees  
PO Box 1103  
Portsmouth, NH 03802

Re: Prescott Park Waterfront Inspection – Letter Report  
Location: Portsmouth, New Hampshire  
Appledore Project No. 5122

Dear Mr. Lown:

This letter summarizes the findings of the inspection of the Prescott Park waterfront facilities in Portsmouth, New Hampshire completed in July, 2011. The scope of the work included an above and underwater inspection of the waterfront to provide an overall assessment of the structures and provide recommendations for repairs.

The investigation consisted of a visual and tactile inspection of the various waterfront structures encompassed within the park. The following table and attached drawing provide an overview of the facilities inspected with condition assessments, estimates of remaining service life, recommendations, and repair cost estimates. Details of the findings with accompanying photographs are included in the following pages.

In order to assist in the planning and phasing of repairs, recommendations are prioritized as Immediate, Near Term, or Deferrable with definitions provided in Table 1. The assessed condition of the various structures within the park are presented as Engineering Assessment Ratings which are based on engineering judgment and defined on page 11.

### *Waterfront Description*

The waterfront facilities at Prescott Park encompass an area approximately 1,000 ft long from the North Pier at the northern boundary of the park to southern boundary near the Pierce Island Bridge. The structures inspected include:

- North Pier
- North Dock
- South Docks
- T-Head Pier

- Southern Pier
- Approximately 1,215 ft of quaywall (excluding fencing along top)
- Approximately 170 ft of sheet pile bulkhead
- Approximately 2,050 ft of rip rap protected shoreline (1,500± of which is located on Four tree island)

**Observations and Assessments**

With the exception of the South Docks which are recommended for immediate replacement, the waterfront facilities at Prescott Park were found to be in Fair to Satisfactory condition with no significant immediate repairs required.

**Table 1: Summary of Inspection Findings & Recommendations**

Structure	Engineering Assessment Rating <sup>1</sup>	Estimated Remaining Service Life (years) <sup>2</sup>	Repair Priority <sup>5</sup>	Repair Recommendations <sup>3</sup>	Estimated Budget Amount <sup>4</sup>
North Pier	Satisfactory	30	Near Term	• Replace deteriorated timber bracing	\$1,700
North Dock	Fair	5-10	Near Term	• Replace deteriorated timber guide piles (4 total)	\$9,600
			Immediate	• Replace two broken chain pile guides	\$350
			Immediate	• Replace 1 deteriorated guide pile	\$2,400
South Dock	Serious	0-1	Immediate	• Replace dock and gangway	\$385,000
T-Head Pier	Fair	20	Deferrable	• Replace decking and railing	\$54,000
South Pier	Fair	20	Near Term	• Replace failed bracing	\$24,000
			Near Term	• Replace fender piles if berthing capability is to be restored	\$12,000
Quaywall	Satisfactory	50	Near Term	• Chink and re-point 6 ft portion of joint as indicated on drawing	\$6,000
Sheet Pile Bulkhead	Satisfactory	20	Deferrable	• Re-coat exposed steel	\$30,000
Riprap Shoreline	Satisfactory	30	Near Term	• Repair void in riprap near T-Head Pier abutment	\$4,500
<b>Overall Engineering Assessment Rating<sup>1</sup></b>	<b>FAIR</b>	<b>Estimated Studies, Permitting, and Design Cost</b>			<b>\$75,000</b>
		<b>Total Estimated Budget Amount<sup>4</sup></b>			<b>\$605,000</b>

<sup>1</sup> See pg. 11 for definition of Engineering Assessment Ratings

<sup>2</sup> Estimates for remaining service life assume the structure is repaired and maintained. Extended service life may be possible, but typically increased repairs are required and functionality / capacity may be reduced.

<sup>3</sup> Repair recommendations are preliminary and are intended for general cost estimating purposes. A detailed inspection should be completed to assess the general conditions found in the Routine Inspection and develop specific repair plans.

<sup>4</sup> These estimates are based on estimated 2011 costs and should be adjusted for the actual year construction is proposed to commence. Costs include mobilization/demobilization, contingencies, overhead and profit.

<sup>5</sup> **Immediate:** System or element is in failure, or is expected to fail in the next year. Such failure will likely result in the significant loss of facility operations, and/or will adversely affect the facilities mission; or will likely cause significant property damage.

**Near Term:** System or element is currently functional, but has a high probability of failing before the next scheduled inspection. Such failure will likely result in the significant loss of facility operations, and/or will adversely effect the facilities mission; or will likely cause significant property damage.

**Deferrable:** System or element is expected to remain functional until the next scheduled inspection; however it is our recommendation to program these repairs to prevent more complex and expensive structural repairs.

### ***North Pier***

The 1999 vintage North Pier is in Satisfactory condition with deterioration primarily limited to marine borer damage to the lower pile bracing connections located below Mean Low Water (MLW). It is estimated that the North Pier has 30 years of service life remaining, assuming it is repaired and maintained. The majority of the bracing members exhibited marine borer damage with deterioration ranging from 10% up to 90% at the lower connection. The piles, pile caps, stringers, decking, and railing were all found to be in satisfactory condition with only minor signs of deterioration. It is recommended to replace the timber bracing within 5 years.

### ***North Dock***

The North Dock is of unknown vintage and is found to be in Fair condition. It is estimated that the timber docks have 5-10 years of service life remaining. Of the 27 timber guide piles, 4 were found to have abrasion loss within the tidal zone ranging from 15% to 30% and one pile was found to have 75% section loss at the mudline due to marine borer activity. The chain pile guides have failed in two locations and the gangway, floats, and mooring hardware were found to be in Satisfactory condition. It is recommended to replace one pile and monitor the deterioration in the remaining guide piles and plan to replace them within 3 years. The two failed chain pile guides and the severely deteriorated guide pile should be replaced prior to the next boating season.



Photo 1: North Pier and North Dock

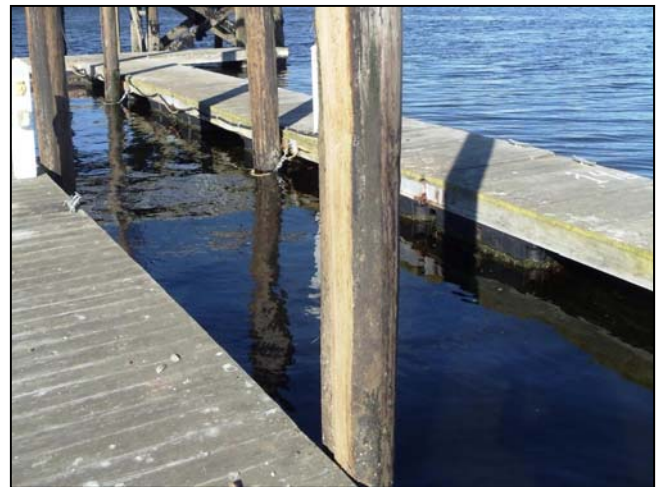


Photo 2: Typical Abrasion Damage to Guide Pile at North Dock

### ***Southern Dock***

The South Dock has a long history of repeated failure, primarily relating to the connections between the concrete float modules. Overall the dock is in Serious condition with several of the float modules maintained in operation through the use of temporary repairs. The dock is at the end of its service life and should be replaced as soon as possible. The gangway is in Satisfactory condition but should be considered for replacement when the new floats are installed. The mooring blocks used to anchor the dock were found to be in Satisfactory condition and should be considered for re-use (mooring chain to be replaced).



Photo 3: South Dock



Photo 4: Temporary repair to float module connection at T-head

### ***T-Head Pier***

The T-Head was overall found to be in Fair condition. The piles, bracing, pile caps and stringers were found to be in Satisfactory condition with only minor signs of deterioration. The timber decking and railing exhibited moderate fungal decay and should be replaced within 5 years. It is estimated that the T-Head Pier has 20 years of service life remaining, assuming it is repaired and maintained.



Photo 5: T-Head Pier



Photo 6: Typical Fungal Decay on Railing

## ***South Pier***

The South Pier was found to be in Fair condition. The piles, bracing, pile caps and stringers were found to be in Satisfactory condition with only minor signs of deterioration. One failed bracing member was found on the eastern face of the South Pier and the fender piles along the north face were all found to have severe fungal decay and to be in Poor condition. The fender piles provide a berthing face for vessels and should be replaced only if the intent is to restore future berthing capabilities to the pier. It is recommended to replace the failed bracing member within the next 5 years and it is estimated that the structure has 20 years of service life remaining, assuming it is repaired and maintained.



Photo 7: South Pier



Photo 8: Typical deteriorated fender pile on South Pier

## ***Quaywall***

The quaywalls are generally found to be in Satisfactory condition. The 2005 repairs in the vicinity of the floating docks are intact and in satisfactory condition. It is estimated that the quaywalls have 50 years of service life remaining, assuming they are repaired and maintained. Evidence was found of past sinkhole repairs behind the quaywall, however no significant additional subsidence was found during inspection. One 6 ft. by 4 in. area of missing chinking and mortar was found in the quaywall near the T-Head Pier (see attached plan for location) and should be re-pointed within the next 5 years. No missing or displaced stones or significant subsidence behind the walls were observed. The fencing along the top of the quaywalls was not included in this inspection.



Photo 9: Quaywall at Basin Looking North



Photo 10: Quaywall at Southern End of Park

### ***Sheet Pile Bulkhead***

Two sections of the shoreline are protected by steel sheet pile bulkheads of unknown vintage.

At the north end of the park, an approximately 90 ft long section of sheet pile bulkhead is found in the vicinity of the North Pier. Approximately 6 ft of the sheeting is exposed at low water with riprap toe protection extending to the mudline below.

Between the T-Head Pier and the South Pier, there is an approximately 80 ft long section of sheet pile bulkhead with a riprap slope outboard of the wall. Approximately 2ft of the sheeting is exposed above the riprap, which extends above Mean High Water.

The exposed portions of steel sheeting on both bulkheads exhibit moderate surface corrosion and no coating was found. No holes or significant corrosion scale were observed and ultrasonic measurements of the steel thickness indicates that the sheet piles have a nearly full section. The riprap toe protection in front of the sheet pile is intact with no observed missing or displaced stones. It is estimated that the steel sheet pile bulkhead has 20 years of service life remaining and it is recommended to recoat the exposed portions of both sections of sheet pile within the next 5 years.



Photo 11: Steel sheet pile bulkhead at North Pier



Photo 12: Steel sheet pile bulkhead south of T-Head Pier



### ***Riprap Shoreline***

Approximately 535 ft of riprap protected shoreline is located the vicinity of the T-Head and South Piers where it serves to support and protect the pier approaches, abutments and adjacent beach areas. On Four Tree Island, approximately 1,500 ft of riprap shoreline protects the walkway to the island and the exposed northern shoreline.

In 2005, repairs were made to replace missing or displaced stones and repair undermining of the South Pier approach. The repairs were generally found to be intact, however one area of undermining was found at the eastern end of the T-Head Pier where an approximately 3 ft x 3 ft x 1 ft void exists beneath the corner capstones. It is recommended to use a cementitious grout to fill and seal the void in order to prevent further erosion and possible displacement of the capstones.

In 2005, riprap shoreline protection was added to areas of Four Tree Island, inspection found those areas and the remaining shoreline on the island to be in Satisfactory condition.



Photo 13: Riprap slope at South Pier



Photo 14: Void in riprap at South Pier abutment

**Conclusions and Recommendations**

The waterfront facilities at Prescott Park were generally found to be in Fair to Satisfactory condition with the South Dock and one guide pile on the North Dock representing the only components where immediate replacement is recommended.

It is recommended to plan for a rehabilitation of several of the structures within 3 to 5 years. Recommended repairs within this time horizon include those with a 'Near Term' repair priority as outlined in Table 1. The cost estimates provided are preliminary and should be adjusted for the actual year construction is proposed to commence.

Given the age and deterioration levels found during inspection, it is recommended to re-inspect the waterfront facilities at the Park in 2014.

We appreciate the opportunity to work with the Prescott Park Trustees in the preservation of a Portsmouth landmark and look forward to providing continued service in the years to come.

Sincerely,



Dan O'Connor, PE  
Engineer



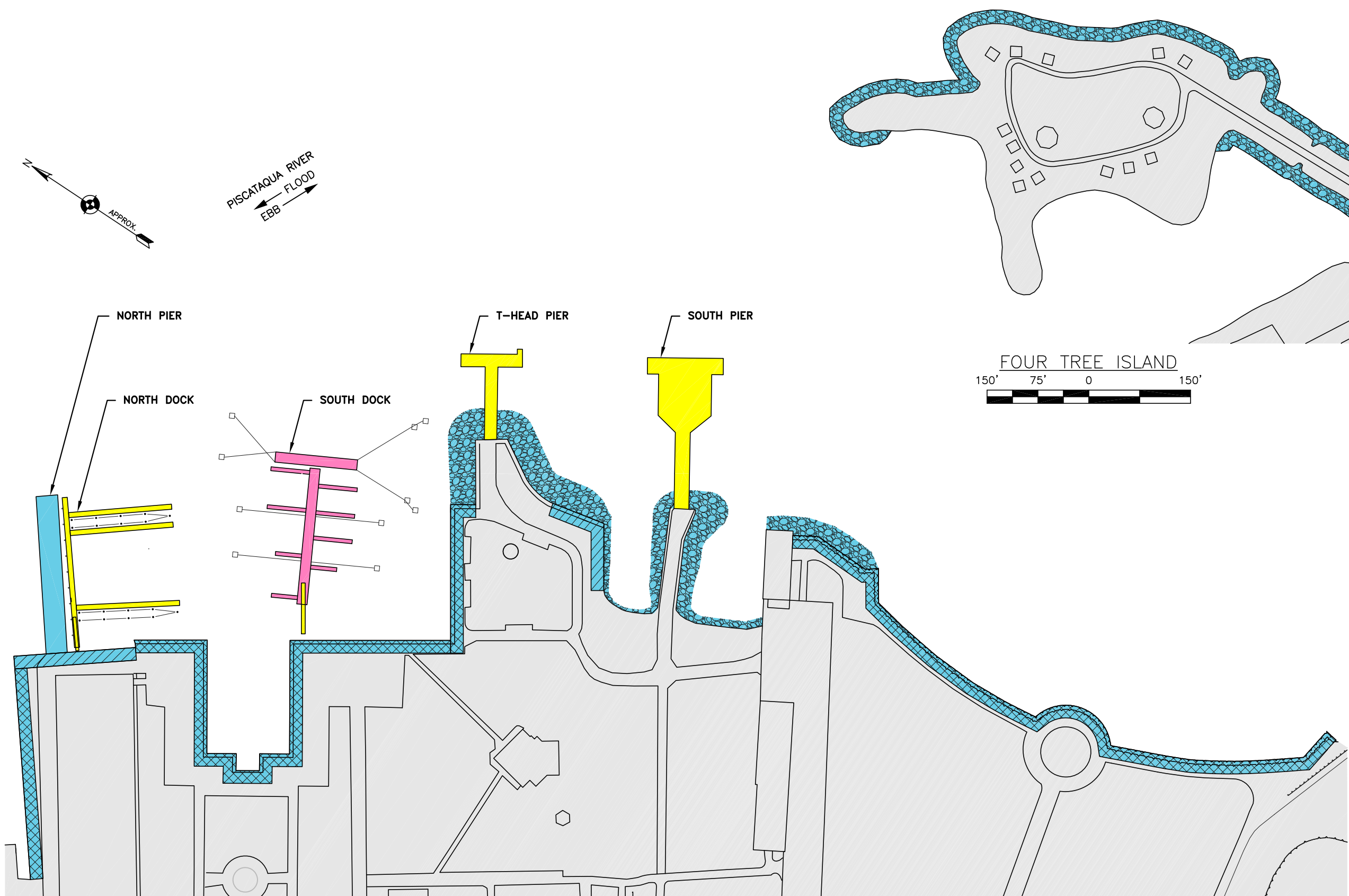
Robert Snover, PE  
President

## Engineering Assessment Ratings

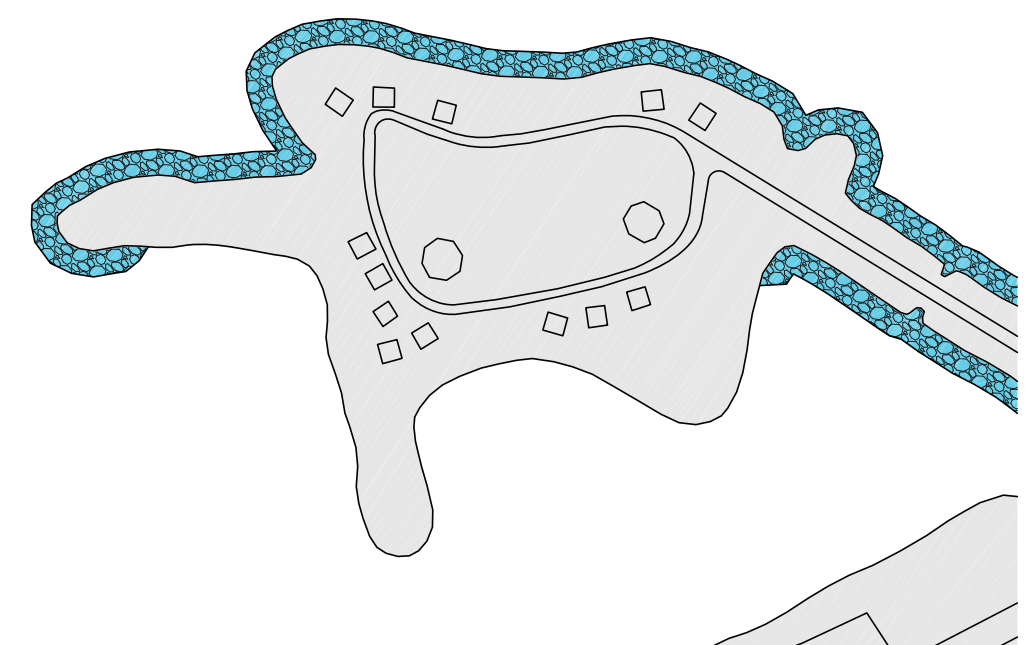
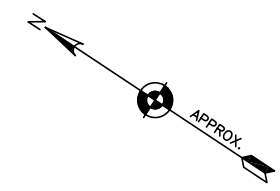
The Engineering Assessment Ratings for the structures are based on engineering judgment and assessment descriptions. Ratings are based on the existing in-place structure relative to its condition when newly built.

Rating	Description
Good	No visible damage, or only minor damage is noted. Structural elements may show very minor deterioration, but no overstressing is observed.
Satisfactory	Limited minor to moderate defects or deterioration are observed, but no overstressing is observed.
Fair	All primary structural elements are sound, but minor to moderate defects or deterioration is observed. Localized areas of moderate to advanced deterioration may be present but do not significantly reduce the load-bearing capacity of the structure.
Poor	Advanced deterioration or overstressing is observed on widespread portions of the structure, but does not significantly reduce the load-bearing capacity of the structure.
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.
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.

From: *Underwater Investigations, Standard Practice Manual, ASCE, 2001.*



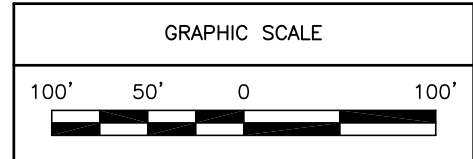
PISCATAQUA RIVER  
 ← FLOOD  
 ← EBB →



- LEGEND:**
- STRUCTURE IN GOOD CONDITION
  - STRUCTURE IN SATISFACTORY CONDITION
  - STRUCTURE IN FAIR CONDITION
  - STRUCTURE IN POOR CONDITION
  - STRUCTURE IN SERIOUS CONDITION
  - STRUCTURE IN CRITICAL CONDITION
  - STEEL SHEET PILE BULKHEAD
  - QUAY WALL
  - RIPRAP

PRESCOTT PARK PLAN

80' 40' 0 80'



DATE  
 DECEMBER  
 2011

APPLEDORE MARINE  
 ENGINEERING, INC.  
 PORTSMOUTH, N.H.

CITY OF PORTSMOUTH  
 JOSIE F. PRESCOTT TRUST  
 PORTSMOUTH, NEW HAMPSHIRE

PRESCOTT PARK PORTSMOUTH, NH FIG. NO.  
 WATERFRONT CONDITION PLAN 1