EXECUTIVE SUMMARY

The Town of Chatham has retained Pare Corporation (Pare) to complete an “Overall Site Assessment of Facility Conditions” at the Chatham Fish Pier site. The purpose of this assessment is to guide the Town in its evaluation of uses and options for the Fish Pier and its amenities, and identify areas to improve resiliency for the coastal structures.

The Chatham Fish Pier serves as a thriving coastal commercial establishment as well as a popular tourist attraction. As described herein, this presents its own challenges for operation, maintenance, and improvement. By undertaking the recommended improvements, and completing regular maintenance, the Town can enable both industries to continue to succeed.

In the process of conducting the Overall Site Assessment of Facility Conditions at the Chatham Fish Pier site, Pare incorporated the resiliency of structures to survive current weather and tidal patterns. By considering effects from dynamic weather and sea level conditions, the Town can better ensure post-storm continuity of the Chatham Fish Pier’s major infrastructure components and utilities, and reduce the amount of maintenance and repair that may be required from storm damage.

The Chatham Fish Pier site is comprised of the following components:

- Fish Packing Building
- Observation Deck at the Fish packing Building
- Wharfinger Building and access stars from the upper parking lot.
- Waterfront structures and infrastructure

There are several important points of fact that may impact how the Town views the future of this facility:

- Although the Town of Chatham is the largest tourist destination on the Cape, and the Fish Pier Observation Deck is the largest tourist destination in Chatham, the primary use of this facility is to support the Commercial Fishing Industry.
- Presently, the peak commercial fishing season overlaps with the peak tourism season, such that both uses are operating at their peak capacity at the same time.
- The current FEMA Flood Elevation is approximately nine (9) feet above the finished floor elevation of the Fish Packing Building. There are limits to the design, where it is ineffective and cost prohibitive to design for all unknown or potential conditions. Sea level rise projections are variable, so one needs to make an assumption of tolerable risk when considering the limits to the design regarding sea level rise.
- With respect to Massachusetts Accessibility Regulations, there is a 30% threshold of the value of the structure whereby if this amount is exceeded, accessibility will need to be provided to the deck and building.

The following tasks were completed as part of the scope of work:

- Inspection of MEP and Site Components
- Inspection of Existing Conditions at Fish Packing Building and Wharfinger Building
- Inspection of Existing Conditions of Waterfront Infrastructure
- Resiliency and Adaptation Review
Based on the available drawings, mapping, and information obtained from the Town of Chatham, much of the site was constructed between 1943 and 1948, and included the Fish Packing Building, Wharfinger building, Chatham Pier Fish Market, and waterfront infrastructure. The existing South Jog Pier was constructed in approximately 1976. Various repairs were made to the site’s structures, infrastructures, and utilities circa 1981, 1997, 2000, and 2002.

SITE INFRASTRUCTURE

Although no problems with the existing stormwater system were reported, it is possible that during severe storms the 900 gallon maximum capacity may be exceeded. It is also recommended that a full investigation of the stormwater system be completed, and that consideration is made to separate runoff from Black Pond.

The pavement does not appear to need full replacement at this time, and problem areas or deficiencies can be addressed as they arise. Based upon the observations made during the inspection, the pavement at the upper parking area appears to be fair; however, the depressions may develop into larger deficiencies and spot repair is recommended. To assist with the separation of pedestrian traffic and commercial truck traffic at the site, an elevated pedestrian walkway (Skybridge) between the Wharfinger Deck and the Observation Deck at the Fish Packing Building has been discussed. Considerations for this structure need to include the length of ADA-compliant ramp to the Skybridge from the ground elevation, the approximate 14 foot height clearance required by trucks, the potential impact on vehicle traffic routes, and safety concerns while the site is unattended.

The existing electric company pad-mounted transformer and underground electric services to the Fish Packing Building and the Wharfinger Building should be replaced as they are in poor condition. The existing parking lot lighting should be replaced as it is in poor condition due to rusting and corrosion. Aluminum poles with marine grade paint and LED site lighting heads should be provided to avoid accelerated corrosion in close proximity to the waterfront, and should be in accordance with Illuminating Engineering Society North America (IESNA) Standards for industrial work and tourism.

If the tank is considered an SQG, self-transport of the waste oil maybe non-compliant. Additionally, if the tank is single-walled steel, the tank must be removed or permanently closed in-place by August 7, 2017. Relocation of the waste oil shed is likely impractical, due to cost restriction, permitting requirements, and lack of a more accessible location outside of the flood zone. Formalizing the existing grassed area at the waste oil shed into a paved access way specifically designed to contain and treat spills is recommended, and may reduce the potential for contamination. It is also recommended that spill prevention, control, and countermeasures (SPCC) plan be developed for the site and implemented with the fishermen.

FISH PACKING BUILDING

The structural components of the Fish Pier were observed to be in generally fair to good condition; however, it was observed that the first floor windows and overhead doors on all sides reduce the ability of the timber framed building to resist the lateral load due to wind. Additionally, the corrosion of the concrete filled steel columns located on the outside gable walls of the Fish Packing Building may be accelerated by electrical currents due to the proximity of electrical wiring. Pare recommends replacing these 4 concrete-filled steel columns with new
columns coated with epoxy paint. In addition, the interior steel columns and beams should be inspected yearly for any corrosion for repair.

The timber framing of the observation deck is proposed to be replaced with a galvanized HS steel tube frame. The frame is to bear on the existing foundation wall and the sheet pile concrete cap.

The Fish Packaging Building is located within the VE-15 Zone on the FEMA flood maps with a Base Flood Elevation of 18.14 Mean Low Water (MLW) inclusive of wave action. Restrictions for Massachusetts State Building Codes require the lowest horizontal supporting member to be above this elevation. The existing Fish Packaging Building has a shallow foundation; however, building foundations in this flood zone are typically required to be deep foundations in order to resist failure due to scour. The building has a minimum finished floor elevation of approximately 10.8 MLW, thus potentially subjecting the timber 2x4 wall to flood and wave forces.

The framing of the Fish Packing Building deck was observed to be in fair condition at the time of Pare’s review. A majority of the steel hangers appear to have been replaced at one point in time and most are stainless steel. The deck was reported to have been moving on the north side, possibly due to an inferior connection in the existing wall for the posts. Previous studies indicated that the maximum allowable live load for the deck system is 70 pounds per square foot, translating to at least three square feet of deck area per person. Pare is in agreement with this due to the span conditions for the existing 2x12 joists.

The most problematic aspect the HVAC system of the Fish Packing Building is how exhaust and make-up air is handled to accommodate the ice making equipment. This system should be completely renovated as part of the possible renovations so that there is efficient management of exhaust and make-up air flow whenever the ice making equipment is operational.

The existing power distribution should be replaced as the current metering situation is not acceptable per electric company standards and is in poor condition. A weatherproof metercenter rated at a minimum of 800 amperes, 120/208 volt, three phase, four wire should be located in the second floor Main Electric Room so it is not susceptible to flooding.

In order to improve the structural resiliency of the Fish Packing Building, it is recommended that a new steel frame wall be designed to support the roof structure in place of the 2x4 timber exterior walls. This would be in conjunction with “break-away-walls” to reduce the lateral loads on the structure. The interior walls should also be replaced with reinforced masonry or concrete to better resist the lateral loads due to flood water.

It is recommended that areas below the FEMA flood elevation be reconfigured to allow free flow of flood water through the building, including moving important office style areas and sensitive equipment above the flood zone.

**WHARFINGER BUILDING**

The Town has requested that the pressure treated deck and stairs attached to the Wharfinger Building be redesigned. It is the intent of the design to incorporate ADA accessibility, low maintenance building materials, and to incorporate as much of the existing structure into the final design as possible. Although the HVAC equipment is operational and appears to be in fair condition, it is approaching the end of its useful service life.
Therefore, replacement of this equipment should be considered a part of any renovation project. Electrical upgrades to lights, outlet, meters and enclosures are recommended to meet current code requirements and address current deficiencies and wear.

**WATERFRONT INFRASTRUCTURE**

The steel sheet piling along the south jog and south embayment is approximately 40 years old, and is nearing the end of its useful life. Significant weather events may impose additional loadings on the weakened structure, and the system will remain prone to storm damage in until the bulkhead is rehabilitated.

The south jog float is in generally good condition, and should provide good service for a number of years to come.

The main pier was most recently reconstructed in approximately 2000, and was observed to be in generally good condition. Due to the presence of aggressive pitting of the steel sheet piling, it is recommended that a cathodic protection system be added to the sheeting to reduce the corrosion and extend the remaining life of the bulkhead structure.

The main pier amenities, such as the fendering system, ladders, and hoists should be repaired as needed to extend the service life.

The steel pipe piles and framing of the north and south wave-break piers were observed to have significant corrosion, and the installation of a cathodic protection system will prolong the useful life of the members.

The Coast Guard floating dock was observed to have a list at the southeastern edge of the float. As this list is not considered to be critical at this time, it is recommended that the float continue to be monitored for any increases in list, especially after a significant event.

The north jog dingy dock was observed to be in good condition, with no deficiencies observed.

In conjunction with providing new cathodic protection for steel sheet and pipe piling, it is recommended that all steel surfaces apart from the recommended south jog and embayment reconstruction be cleaned of marine growth, patched where necessary, and provided with new epoxy coating.

It is recommended that the davits on the north and south side of the Main Pier be replaced.

It is recommended that new resilient fresh water lines and electrical service be provided to North and South jogs. Replacement of concrete pad apron along South jog would be included for facilitation of conduit burial. Upgrades to the existing services should be considered with the increase in voltage and amperage.

**OPINION OF PROBABLE COST**

Based upon the recommendations and discussions contained herein, Pare estimated the cost to implement the project, including repairs and maintenance that are considered necessary to continue ongoing operations, as well as improvements and upgrades that are less critical. It
should be noted that a significant cost savings may be realized by completing multiple recommendations concurrently.

To assist the Town in planning for later phases, Pare has developed future costs for the repairs and upgrades utilizing a standard escalator to account for possible inflation, market variability, material costs, and other variables beyond our control. The future costs are included in Section 6.0 of this report.

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### Wharfinger Building

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</tbody>
</table>

**PROJECT TOTAL: $5,593,000**
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXECUTIVE SUMMARY</td>
<td>i</td>
</tr>
<tr>
<td>1.0 DESCRIPTION OF PROJECT</td>
<td></td>
</tr>
<tr>
<td>1.1 INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>1.2 SCOPE OF WORK</td>
<td></td>
</tr>
<tr>
<td>1.2.1 Inspection of MEP and Site Components</td>
<td>2</td>
</tr>
<tr>
<td>1.2.2 Inspection of Existing Conditions at Fish Packing Building</td>
<td></td>
</tr>
<tr>
<td>1.2.3 Inspection of Existing Conditions at Wharfinger Building</td>
<td></td>
</tr>
<tr>
<td>1.2.4 Resiliency and Adaptation Review</td>
<td>3</td>
</tr>
<tr>
<td>1.2.5 Preparation of Inspection Findings Report</td>
<td>3</td>
</tr>
<tr>
<td>1.3 DESCRIPTION OF SITE</td>
<td>3</td>
</tr>
<tr>
<td>1.4 EXISTING DRAWINGS AND DOCUMENTS</td>
<td>4</td>
</tr>
<tr>
<td>1.5 EXISTING SUBSURFACE AND TOPOGRAPHIC INFORMATION</td>
<td>4</td>
</tr>
<tr>
<td>1.6 EXISTING SITE ELEVATIONS</td>
<td>4</td>
</tr>
<tr>
<td>1.7 SEA LEVEL RISE AND RESILIENCY</td>
<td>5</td>
</tr>
<tr>
<td>2.0 SITE ASSESSMENT</td>
<td></td>
</tr>
<tr>
<td>2.1 EXISTING CONDITIONS</td>
<td></td>
</tr>
<tr>
<td>2.1.2 Stormwater Systems</td>
<td>6</td>
</tr>
<tr>
<td>2.1.3 Pavement and Accessibility</td>
<td>7</td>
</tr>
<tr>
<td>2.1.4 Septic System</td>
<td>7</td>
</tr>
<tr>
<td>2.1.5 Utilities</td>
<td>8</td>
</tr>
<tr>
<td>2.1.6 Waste Oil</td>
<td>8</td>
</tr>
<tr>
<td>2.2 EVALUATION AND RECOMMENDATIONS</td>
<td>9</td>
</tr>
<tr>
<td>2.2.1 Stormwater Recommendations</td>
<td>9</td>
</tr>
<tr>
<td>2.2.2 Pavement and Accessibility Recommendations</td>
<td>9</td>
</tr>
<tr>
<td>2.2.3 Septic Recommendations</td>
<td>10</td>
</tr>
<tr>
<td>2.2.4 Utility Recommendations</td>
<td>10</td>
</tr>
<tr>
<td>2.2.5 Waste Oil Collection Recommendations</td>
<td>11</td>
</tr>
<tr>
<td>2.2.6 Resilient Design Recommendations</td>
<td>11</td>
</tr>
<tr>
<td>2.3 OPINION OF PROBABLE COST</td>
<td></td>
</tr>
<tr>
<td>2.3.1 Repairs</td>
<td>12</td>
</tr>
<tr>
<td>2.3.2 Upgrades</td>
<td>12</td>
</tr>
<tr>
<td>3.0 FISH PACKING BUILDING ASSESSMENT</td>
<td></td>
</tr>
<tr>
<td>3.1 EXISTING CONDITIONS</td>
<td></td>
</tr>
<tr>
<td>3.1.1 Building Framework and Foundation</td>
<td>13</td>
</tr>
<tr>
<td>3.1.2 Observation Deck Framework</td>
<td>14</td>
</tr>
<tr>
<td>3.1.3 HVAC System</td>
<td>15</td>
</tr>
<tr>
<td>3.1.4 Electrical</td>
<td>16</td>
</tr>
<tr>
<td>3.1.5 Plumbing</td>
<td>17</td>
</tr>
<tr>
<td>3.1.6 Architectural Components</td>
<td>17</td>
</tr>
<tr>
<td>3.2 EVALUATION AND RECOMMENDATIONS</td>
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</tr>
<tr>
<td>3.2.1 Structural Recommendations</td>
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</tr>
</tbody>
</table>
Appendix C: FEMA Flood Map
Appendix D: Prioritization of Blizzard 2015 Damages
Appendix E: Structural Inspection and Evaluation Report
Appendix F: Waterfront Inspection and Evaluation Report
Appendix G: Site Inspection and Evaluation Report
Appendix H: MEP Inspection and Evaluation Report
Appendix I: Architectural Inspection and Evaluation Report
Appendix J: Underwater Inspection Report
Appendix K: Backup Data for Opinion of Probable Costs
1.0 DESCRIPTION OF PROJECT

1.1 INTRODUCTION

The Town of Chatham has retained Pare Corporation (Pare) to complete an “Overall Site Assessment of Facility Conditions” at the Chatham Fish Pier site. The purpose of this assessment is to evaluate physical conditions, recommend improvements, provide budget level cost estimates, and identify areas to improve long-term resiliency.

The Chatham Fish Pier serves as a thriving coastal commercial establishment as well as a popular tourist attraction. In the process of conducting the Overall Site Assessment of Facility Conditions at the Chatham Fish Pier site, Pare incorporated the resiliency of structures to survive weather and Sea Level Rise (SLR) projections. By considering effects from dynamic weather and sea level conditions, the Town can better ensure post-storm continuity of the Chatham Fish Pier’s major infrastructure components and utilities, and reduce the amount of maintenance and repair that may be required from storm damage.

The Chatham Fish Pier site is comprised of the following components:

- Fish Packing Building – This 5,500 square foot structure has a singular function and use as a fish packing facility, in support of the commercial fishing industry. In conjunction with the steel sheetpile bulkhead, it enables fish to be unloaded from boats and trucked off-site to market.

- Observation Deck – the existing timber framed observation deck provides a safe viewing point for tourists to observe the timeless fish unloading operation from an elevated viewpoint. This tourist attraction is an important, but secondary, function of the Fish Packing Building.

- Wharfinger Building – This building provides public restroom facilities, a Wharfinger Office, and a bait storage room at grade level. Parking is available, and timber stairs provide access to the lower part of the site.

- Bulkhead and Piers – a steel sheet pile bulkhead provides berthing around the perimeter of the site. Several pile supported piers and floating docks extend from the bulkhead into the harbor.

There are several important points of fact that may impact how the Town views the future of this facility:

- Although the Town of Chatham is the largest tourist destination on the Cape, and the Fish Pier Observation Deck is the largest tourist destination in Chatham, the primary use of this facility is to support the commercial fishing industry. The purpose of the Observation Deck is to provide safety for tourists wishing to observe the commercial fishing unloading operation.

- Presently, the peak commercial fishing season overlaps with the peak tourism season, such that both uses are operating at their peak capacity at the same time. This overlap offers its own set of challenges, with respect to parking, pedestrian
safety, and commercial trucking. Pedestrian access via the south end of the site has been considered, as well as an elevated pedestrian bridge; the practicality is that the site is only so big, and can accommodate only so much.

- The current FEMA Flood Elevation (#25001C0629J, effective July 16, 2014) is approximately nine (9) feet above the finished floor elevation of the Fish Packing Building. The Fish Packing Building and Observation Deck are completely within this VE 15 Zone. If the proposed renovations or rehabilitations of the structure exceeds 50% of the actual value of the structure, then the whole building will have to meet FEMA’s requirement that the lowest supporting member be located two (2) feet above the Base Flood Elevation (BFE). The foundation would have to have a deep (pile supported) foundation, with breakaway walls and flood proof construction below the BFE. This height requirement would not be practical for disadvantage the offloading and truck loading operations. The 2016 Tax Card for the Fish Packing Building indicates a value of $449,400. The Town may wish to have a building appraisal carried out to determine the actual cash value of the building and deck.

- With respect to Massachusetts Accessibility Regulations, there is a 30% threshold of the value of the structure whereby if this amount is exceeded, accessibility will need to be provided to the deck and building. Ramp switchback structures or an elevator/lift would need to be provided at the facility.

### 1.2 SCOPE OF WORK

The scope of this investigation is to provide an inspection and assessment of the existing conditions on the site, including repair and upgrade recommendations to provide the desired service life taking into account dynamic weather and sea level conditions.

The following tasks were completed as part of the scope of work:

#### 1.2.1 Inspection of MEP and Site Components

- Review main electrical distribution system and equipment located upstairs, and consider changes or improvements to the aged equipment.
- Review building plumbing and water supply needs, including improved freeze protection.
- Evaluate onsite stormwater systems, utilities, pavement and septic disposal systems for function.

#### 1.2.2 Inspection of Existing Conditions at Fish Packing Building and Wharfinger Building

- Review existing structural engineering reports and review concerns, particularly those related to corrosion of the building columns and deck framing.
- Complete a visual inspection of the Fish Packing Building structural steel, the timber observation deck, and the Wharfinger Building deck.
- Observe and document the site’s existing conditions, taking photographs during the inspection to document existing conditions.
- Review potential Building Code issues.
• Consider modifications to the overhead door systems to accommodate use and corrosion concerns.

1.2.3 Inspection of Existing Conditions of Waterfront Infrastructure

• Review existing drawings and prior repairs to all infrastructure.
• Complete an inspection of the existing conditions of the waterfront infrastructure components from a boat at low water, below water using divers, and from the topside.
• Observe and document existing conditions, taking photographs during the inspection to document existing conditions.
• Provide recommendations to repair deficiencies and to extend the design life of waterfront infrastructure.

1.2.4 Resiliency and Adaptation Review

• Review and present potential impacts that changing sea levels could have upon the operations of the facility.
• Provide general recommendations for adaptations or improvements to enable resiliency to accommodate changing conditions (i.e. wave resistant walls, electrical service, receptacles, etc.).
• Consider options for flood proofing the main electrical power service to the building.
• Evaluate on-site stormwater systems and utilities for resiliency.

1.2.5 Preparation of Inspection Findings Report

• Prepare existing conditions drawings and data. Existing conditions drawings will include topographic information from previous surveys along with existing structures and utilities. Test pit and subsurface information is not included in the scope of work.
• Prepare and submit an “Overall Site Assessment of Facility Conditions” report presenting the inspection findings, evaluation of existing facilities including any deficiencies observed during visual inspections, recommendations for remedial actions, and opinions of probable cost.

1.3 DESCRIPTION OF SITE

Based on available drawings, mapping, and information obtained from the Town of Chatham, much of the site was constructed between 1943 and 1948, and included the Fish Packing Building, Wharfinger building, Chatham Pier Fish Market, and waterfront infrastructure. The existing South Jog Pier was constructed in approximately 1976. Various repairs were made to the site’s structures, infrastructures, and utilities circa 1981, 1997, 2000, and 2002.

Repairs and improvements to the site completed in approximately 1981 appear to include the removal and reconstruction of the existing Fish Packing Building, removal of a bait shed to the north of the Fish Packing Building, removal and reconstruction of the existing Wharfinger Building including a new timber deck, a sewage system for the restrooms at the Wharfinger building, and street lighting with new telephone and electrical conduits.
Repairs to bulkhead completed circa 1997 included new steel sheet piling along the North Jog and Main Pier covering the existing timber bulkhead; removal and replacement of concrete deck and new rubber fender piles along the Main Pier; a new concrete deck, timber fender piles, pile supported finger piers, and concrete floats along the North Jog; and dredging in front of the bulkhead.

Improvements to the waterfront infrastructure circa 2000 included the addition of a supplemental helical anchorage system along the South Jog sheet piling. The rehabilitation of the Fish Packing Building was completed in approximately 2002 and included MEP improvements, new floor slab, structural improvements, and reconfiguration of the offices to the second floor.

1.4 EXISTING DRAWINGS AND DOCUMENTS

Pare reviewed existing available information and drawings provided by the Town of Chatham. Several historical maps and figures were also identified via MassGIS, NETRonline, and the USGS. The information from the available existing material has been incorporated into this report. A list of references is included in Appendix C.

1.5 EXISTING SUBSURFACE AND TOPOGRAPHIC INFORMATION

Subsurface and topographic information was provided within several available documents identified during the review of existing materials. The available information provided sufficient detail for the general site evaluation and the development of preliminary repair recommendations; however, additional investigations may be required for several of the repairs and improvements recommended herein.

1.6 EXISTING SITE ELEVATIONS

The following elevations have been utilized in the preparation of this report. The site is located within the VE 15 Zone, and all elevations provided herein are in reference to the Mean Low Water (MLW) datum. -A FEMA Map (2014) has been included in Appendix C.

100 Year Flood (FEMA Zone VE) Elevation +18.14 MLW
Mean High Water Elevation +5.77 MLW
Mean Low Water Elevation 0.00 MLW
Existing Top of Wall: Main Pier
   a. North Jog Elevation +9.00 MLW
   b. Main Pier Elevation +10.00 MLW
   c. South Jog (Varies) Elevation +7.70 MLW
Finished Floor Elevation: Fish Packaging Building
   a. Max Elevation +12.00 MLW
   b. Min Elevation +10.80 MLW
   c. Observation Deck Elevation +20.50 MLW
Finished Floor Elevation: Wharfinger Building
   a. Lower Level Elevation +19.00 MLW
1.7 SEA LEVEL RISE AND RESILIENCE

Structures are typically designed with an estimated design life, which often times controls the cost of the structure (i.e. the longer the design life, the more money it generally costs to build.) There are limits to the design where it is inappropriate and cost prohibitive to design for all unknown or potential conditions. Sea level rise projections are variable, so one needs to make an assumption of tolerable risk when considering the limits to the design regarding sea level rise.

In the case of the Chatham Fish Pier, a majority of the site is susceptible to flooding and storm damage, with the waterfront infrastructure, fish packing building, fish market, and lower parking area all within the FEMA 100 year flood plain. The FEMA Maps indicate the site is located within the “VE-15 Zone”, with a Base Flood Elevation of 18.14 MLW inclusive of wave action. However, FEMA does not consider predicted sea level rise in their flood elevation determination.

The National Oceanic and Atmospheric Administration (NOAA) has collected water level data in the area for the past 50 to 90 years. Using this data, NOAA is able to determine an estimate of the average rate of sea level rise over that time period, and extrapolate for future scenarios. Based on buoy data in the area provided by NOAA, sea level over the collection period has risen at an average rate of 0.11 in/year, with a total projected sea level rise of approximately one foot over the next 100 years.

As indicated above, one needs to make an assumption of tolerable risk when considering the limits to the design regarding sea level rise. The Fish Pier has reportedly flooded twice in recent memory, with approximately one foot of water reported in the Fish Packing Building in the 1991 No Name Storm and again during a nor’easter in January 2015. The Town expended a significant amount of money to repair the most critical damage caused by the 2015 storm, as indicated in Appendix D - Prioritization of Blizzard 2015 Damages. Initial construction costs for incorporating adaptive measures and resilient design may be more costly; however, each measure is intended to not only reduce repair costs but also to limit down time after the storm.
2.0 SITE ASSESSMENT

The stormwater systems, pavement, and septic design at the Chatham Fish Pier site were visually inspected by Pare professional engineering staff on October 22, 2015. A video inspection of the conduit was not completed, nor was there evidence of conditions that would currently warrant such an evaluation. The mechanical, electrical, and plumbing (MEP) components were visually inspected by Griffith & Vary, Inc. (G&V) of Wareham, MA on January 19, 2016. A copy of G&V’s MEP report is included in Appendix H. The results of the reviews are included herein.

Deficiencies observed during the inspection were made referencing their location in relation to existing site features as indicated on Figure 3 – Existing Site Plan and Sections, and as noted herein. Photographs documenting existing conditions are provided in Appendix A.

2.1 EXISTING CONDITIONS

The Chatham Fish Pier is comprised of an operational Fish Packing Building, which is used for the unloading and transfer of fish. The building is provided with a very popular observation deck. To the north and west of the Fish Packing Building is the Chatham Pier Fish Market and a Wharfinger Building, respectively. The Wharfinger building provides office space and public restrooms, along with public parking outside the building. A steel sheet pile bulkhead and steel pile and floating docks provide operational space and berthing on the waterfront. Based on observations obtained from the site inspection, the following provides our assessment of the overall site layout.

2.1.2 Stormwater Systems

The existing on-site stormwater system incorporates a series of standard reinforced concrete pipes (RCP) ranging from 12” to 30” in diameter, a number of catch basin and drain manhole structures, as well as a Stormceptor® 900i unit located in the parking lot to the southwest of the Fish Packing Building. There is also an in-line slot drain system located to the west side of the Fish Packing Building running below the bay doors. The drainage system starts at the west of the site on Shore Road at a high invert elevation of 21.9, and ends at the Stormceptor® 900i unit at an invert elevation of 3.0.

This Stormceptor® 900i unit is a non-mechanical, non-electrical (hydrodynamic) structure that separates oil, pollutants, and sediment from stormwater runoff prior to being discharged. The unit used on-site is designed to have a capacity of 900 gallons maximum. This unit collects runoff from the entire site, prior to exiting to the harbor.

The unit is approximately 13 years old, and under normal operating conditions with routine scheduled maintenance, the unit would be in proper working condition. However, given the fact that the unit is located in an area that puts it under greater than normal storm surge with greater than
normal amount of sediment, a full inspection and cleaning of the unit should be performed in order to provide a confident response as to its working condition. At that time it would be determined if there is any replacement of the unit needed. No reports of storm runoff exceeding the design capacity were identified during the preparation of this report.

The newer of the catch basin structures that were installed around the time of the Stormceptor® 900i unit are in good condition from surface inspection. The older of the structures at the higher elevations toward Shore Road are in fine working condition, but it is unknown if there are any repairs that are needed without further investigation. It is necessary in any case, however, that all structures and lines be cleaned of sediment. It is possible that a video be necessary to run down the lines to provide feedback on scouring, cracks, debris, or any other adverse bearing that exists in the pipes.

2.1.3 Pavement and Accessibility

The asphalt pavement on-site is in good condition overall with some minor settling and cracking near the change of grade at the beginning of Barcliff Avenue Extension. No puddles were observed during the time of inspection, although no recent rainfall had occurred.

The upper parking lot is vertically irregular with numerous depressions and settled areas, particularly around catch basins, manhole structures, and underground fuel tanks. Minor cracks were noted during the inspection.

Several handicap parking spaces were noted in the upper parking lot. There is currently no ramp or lift providing access from the upper parking area to the lower parking area.

2.1.4 Septic System

Site sewage is currently treated by an existing leaching septic system, which is comprised of a 2,000 gallon septic tank, distribution box (d-box) and two (2) 820 gallon dry wells with crushed stone. The tank is used to remove solids, oil and grease in order to send waste water only to be leached into the soil. The system was proposed as part of the 1981 Chatham Fish Pier Improvements project and accommodates the existing bathroom facilities that are located in the Wharfinger Building.

For facilities with greater than 1,000 gpd design capacity, a two part tank is required. The design capacity for the tank is 1,300 gpd for the one compartment 2,000 gallon tank, therefore, the tank is not Title 5 compliant. The tanks shall be in accordance with 310 CMR 15.224 for multi-compartment tanks and 15.225 for tanks in series. The liquid depth of the tank measured from the outlet tee invert to the tank bottom shall be a minimum of 4-ft. The depth of the tank was observed to be 7'-4". Additionally, the tank shall have a minimum side length to width ratio of 1.5 to 1 and a minimum inside width of 3-ft. The tank was observed to have dimensions of 5’x10’ for a ratio of 2:1.

The tank is situated to the north of the fore mentioned building at an elevation that appears to be high enough to prevent buoyancy or floatation based on water levels. While records were not available, the Harbormaster reported that the tank does not fill very quickly despite the heavy summer use, and gets pumped out approximately every
3 years. This would indicate that the septic system is most likely in good working order.

2.1.5 Utilities

The electric company pad-mounted transformer, located in the parking lot between the Fish Packing Building and the Wharfinger Building, appears to be fed underground from a riser pole on Shore Road from visual inspection. The pad-mounted transformer casing was observed to be rusting and is in poor condition.

From visual inspection, secondary conductors in conduit then appear to feed the switchboard in the second floor Main Electric Room of the Fish Packing Building via an exterior pull box. The pull box has been enclosed in wood. When the wooden box was opened during our site visit, it appears that originally there was a metal enclosure protecting the secondary conductors which has long ago rusted out and is in very poor condition.

Another set of secondary conductors in conduit then appear to feed the wireway on the first floor of the Wharfinger Building via an exterior enclosure which houses three electric company meters. The enclosure has been enclosed in wood and is in poor condition.

The parking lot is lit via single and dual head steel pole mounted LED site lighting, wooden pole mounted flood lights, a ground mounted flood light for the flag pole, and ground mounted light bollards. Poles for site lighting are showing signs of rust. By visual inspection the exterior lighting fixtures appear to be in poor condition. In September of 2015, the existing light pole adjacent to the South Jog was struck by a fish packing distribution truck and knocked over.

2.1.6 Waste Oil

There is a small timber-framed shed on the southeast corner of the Wharfinger Building which houses the opening to a 500 gallon waste oil tank. The underground storage tank (UST) is reportedly made of stainless steel, but has not been recently inspected. Existing documents were unavailable and inspection of the tank is beyond the scope of this investigation, therefore the age, type (e.g., single-walled), and condition of the tank is unknown.

Current oil handling operations consist of transporting waste oil across the parking lot using large buckets from the fishing vessels at the North and South Jog to the waste oil shed, and emptying the oil into the tank by hand.

It is unknown whether the site has been permitted with the MassDEP as a generator of waste oil or as a UST facility. That said, before generating, accumulating, or shipping any hazardous waste or waste oil, businesses are required to register with the MassDEP and obtain a Massachusetts Identification Number pursuant to 310 CMR 30.303. To determine the generator category, the rate at which the client generates waste oil onsite
and how much waste oil is stored onsite must be known. Should the site be considered a Small Quantity Generator (SQG) of waste oil only, it is not subject to an annual compliance assurance fee. However, there will be waste oil accumulation limits and housekeeping standards that the Client must be in compliance with as promulgated in 310 CMR 30.000 (Hazardous Waste Regulations). Emergency preparation and response requirements also apply to an SQG.

As a generator responsible for the waste oil, the Client must maintain records of the type and quantity of waste generated as well as the date and method of treatment, recycling, or disposal. The client must complete the generator portion of the hazardous waste shipping document, called the **Uniform Hazardous Waste Manifest** (310 CMR 30.310). Should the client be an SQG, self-transport of waste oil is prohibited. Manifests of waste shipped and records of waste analysis must be maintained for at least three (3) years or for the duration of any enforcement action by the MassDEP. The facility shall handle all waste oil generated, accumulated, or treated in a manner which neither could nor does endanger public health, safety, or welfare, or the environment, and must be in compliance with all applicable local, state, and federal laws and regulations. The Client must also register the waste oil UST and meet the requirements of 310 CMR 80.00 (UST Regulations). Moreover, should the tank be a single-walled steel tank, 310 CMR 80.15 requires that all single-walled steel tanks must be removed or permanently closed in-place by August 7, 2017.

### 2.2 EVALUATION AND RECOMMENDATIONS

The following recommendations provide a practical approach to address current deficiencies at the site. Prior to undertaking recommended maintenance, repairs and remedial measures, the applicability of environmental permits needs to be determined for activities that may occur within resource areas under jurisdiction of the local Conservation Commission, MADEP, or other regulatory agencies.

#### 2.2.1 Stormwater Recommendations

Although no problems with the existing stormwater system were reported, it is possible that during severe storms the 900 gallon maximum capacity may be exceeded of the Stormceptor® 900i unit. In this case, the system may not filter all surface water as designed, causing potentially polluted runoff to discharge directly into the harbor.

Although a full stormwater analysis needs to be performed prior to making any critical decisions, it may be beneficial to capture and separate runoff from Black Pond. This would allow the current system to gain more storage and treatment, while not compromising the natural flows. Upgrades to the stormwater system are discussed further under the resilient design recommendations in Section 2.2.6.

#### 2.2.2 Pavement and Accessibility Recommendations

The pavement does not appear to need full replacement at this time. Problem areas or deficiencies can be addressed as they arise. Based upon the observations made during the inspection, the pavement at the upper parking area appears to be fair; however, the depressions may develop into larger deficiencies and spot repair is recommended. Filling of cracks and seal coating the pavement will extend the life expectancy of the
pavement and is recommended to be completed as new cracks appear. It is also recommended that routine inspection and maintenance be completed on an annual basis.

To assist with the separation of pedestrian traffic and commercial truck traffic at the site, an elevated pedestrian walkway (Skybridge) between the Wharfinger Deck (Elevation +29) and the Observation Deck (Elevation +20) at the Fish Packing Building has been discussed. The Skybridge would need to be approximately 10 feet wide, 170 feet long, and be provided with ADA compliant handrails and slopes. At this conceptual level, the Skybridge is anticipated to be an open-air walkway.

The Skybridge would require bridge support towers with ramps at each building, and will require at least one pier support in the middle of the span. Other considerations include the length of ADA-compliant ramp to the Skybridge from the ground elevation, the approximate 14 foot height clearance required by trucks, the potential impact on vehicle traffic routes, and safety concerns while the site is unattended.

2.2.3 Septic Recommendations

Based upon the observations made during the inspection, it appears as though the septic system is functioning as designed and is adequate for its current use. It is recommended that the Town continue to monitor the system and pump waste as necessary.

2.2.4 Utility Recommendations

The existing pad-mounted transformer and underground electric services to the Fish Packing Building and the Wharfinger Building should be replaced as they are in poor condition. Additionally, the transformer is in a location that is susceptible to flooding and is discussed further under the resilient design recommendations in Section 2.2.6. The transformer and primary cabling to the transformer would be replaced by the electric utility company, while the primary conduit and secondary feeders and conduit would be replaced by the Owner.

The new electric plan should include primary service conduits in concrete duct bank provided from an electric utility pole on Shore Road to the transformer via electric company standard manholes. Secondary service feeders and conduits in concrete duct bank should be provided from the transformer to each building.

The existing parking lot lighting should be replaced as it is in poor condition due to rust and corrosion. Aluminum poles with marine grade paint and LED site lighting heads should be provided to avoid accelerated corrosion in close proximity to the waterfront, and should be in accordance with Illuminating Engineering Society North America (IESNA) Standards for industrial work and tourism. New parking lot lighting should be further examined for potential light pollution for the neighboring residential properties. It is anticipated, based upon the existing light pole information shown on the 2002 repair drawings, that the existing light pole foundations can be reused.

It is recommended that the light pole that was knocked over and damaged in September 2015 be replaced and relocated to the western edge of the lower parking lot.
2.2.5 Waste Oil Collection Recommendations

The inefficiency of disposing oil by hand can lead to accidental spillage and leakage. The current location of the waste oil tank outside the Wharfinger Building also provides opportunity for waste oil spillage onto grassed areas, and in turn possible contamination of soil, groundwater, and potentially surface runoff into the Harbor is possible due to the transportation of oil across the site. If the tank is considered an SQG, self-transport of the waste oil maybe non-compliant. Additionally, if the tank is single-walled steel, the tank must be removed or permanently closed in-place by August 7, 2017.

Relocation of the shed closer to the Harbor is likely impractical due to cost restriction, permitting requirements, and lack of a more accessible location outside of the flood zone. Formalizing the existing grassed area at the waste oil shed into a paved access way specifically designed to contain and treat spills is recommended, and may reduce the potential for contamination. It is also recommended that a spill prevention, control, and countermeasures (SPCC) plan be developed for the site and implemented with the fishermen.

2.2.6 Resilient Design Recommendations

As discussed above, the existing stormwater system has sufficient capacity to accommodate the current design runoff. Resiliency upgrades to the stormwater system are recommended to include additional underground storage and treatment units. The purpose of the storage is to temporarily hold the storm flows in order to provide higher capacity. This will not necessarily eliminate the drainage issues which may arise from the flooding; however, it will reduce the amount of untreated surface runoff that enters the harbor. Other considerations could include flap gates, backflow preventers, and tide gates at all discharge locations.

Based upon the observations made during the inspection the existing transformer requires replacement. In addition, the location of the existing transformer is within the FEMA flood plain. To increase the resiliency at the site, it is recommended that the new pad-mounted transformer, as provided by the electric company, be located on higher ground to minimize the potential for hazards associated with flood waters.

2.3 OPINION OF PROBABLE COST

Opinions of probable cost were generated based upon current industry unit prices and contractor input for similar work. The estimate includes allowances for engineering, permitting, and construction administration, and are based upon current year dollars. A 25 percent contingency on the construction costs is included. The opinions shown herein are based on a limited investigation and are provided for general information only. This should not be considered an engineer’s estimate, as actual construction costs may be somewhat less or considerably more than indicated, due to fluctuations in the market and the actual repair implemented.

The following provides an opinion of probable cost for the recommended repairs to the site.
### 2.3.1 Repairs

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<th>Item</th>
<th>Detail</th>
<th>Magnitude of Cost</th>
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<tr>
<td>Localized Pavement Repairs</td>
<td>Fill depressions, patch pavement, seal cracks</td>
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<tr>
<td>Septic Maintenance</td>
<td>Annual inspection and pumping</td>
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<tr>
<td>Electric Service</td>
<td>New relocated pad-mounted transformer and new underground conduits in duct bank</td>
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<tr>
<td>Lighting</td>
<td>New aluminum pole LED lighting at both parking lots</td>
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<tr>
<td>Waste Oil Shed</td>
<td>SPCC plan, waste oil study, facility improvements (estimated)</td>
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### 2.3.2 Upgrades

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<td>Stormwater System</td>
<td>Additional storage and treatment capacity</td>
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<td>Septic System</td>
<td>Investigation, design, and installation</td>
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<tr>
<td>Skybridge</td>
<td>New pedestrian timber bridge</td>
<td>$1,060,000</td>
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3.0 FISH PACKING BUILDING ASSESSMENT

The structural components of the Fish Packing Building and observation deck for public viewing were visually inspected by Pare professional engineering staff on October 22, 2015. It should be noted that prior to Pare’s structural inspection, McKenzie Engineering Consultants, Inc. (MEC) completed an annual review of the structural elements of the deck and accompanying connections on September 30, 2015. The MEP components of the building were visually inspected by G&V on January 19, 2016. The results of the reviews are included herein.

Deficiencies observed during the inspection were made referencing their location in relation to infrastructure as indicated on Figure 3 – Existing Site Plan and Sections, and as noted herein. Photographs documenting existing conditions are provided in Appendix A. A copy of Pare’s structural inspection report and G&V’s MEP report are included in Appendix E and Appendix H, respectively.

3.1 EXISTING CONDITIONS

The Fish Packing Building is a timber framed one and a half story structure situated approximately 19 feet behind the sheet pile bulkhead. The building is approximately 58’-0” x 95’-0” in plan size and is set on a 10” thick foundation wall with a 24” wide spread footing. Two steel beams run the long direction supporting a partial second floor area used for storage and office space. The steel beams are supported by steel columns bearing on foundation walls and interior footings. The second floor is comprised of steel bar joists with steel decking and concrete floor. The roof has several dormers and miscellaneous roof top equipment.

The deck and associated stairs are comprised of pressure treated lumber and wrap around the north and east side of the Fish Packing Building. The deck is comprised of large timber beams bearing on timber posts with metal connectors and wood joists and decking. The deck is open to the public for viewing purposes. There is currently no handicap access to the deck.

The building is used to unload fish from boats, package, and ship out products. This process is allowed by FEMA regulation.

Based on the observations obtained from the site inspections, the following provides our assessment of the various structural components of the Fish Pier Building with deck and associated stairs; and existing mechanical, electrical, and plumbing components. Existing conditions were based on visual and tactile observations only, and were limited to accessible and visible portions of the structures.

3.1.1 Building Framework and Foundation

The structural components of the Fish Pier were observed to be in generally fair to good condition; however, it was observed that the first floor windows and overhead doors on all sides reduce the ability of the timber framed building to resist the lateral load due to wind. The metal bar joists spanning between the beams appear to be in good condition and the metal decking has visible repairs but appears to be in fair condition. The steel beams have been reported to have been cleaned and painted in the past, and were observed to be in good condition. The beams rest on concrete filled steel columns, which are located on the outside gable walls that bear on top of the perimeter concrete foundation. These 4 concrete filled steel columns appear to be in fair to poor condition and have experienced enough section loss, visible at the wall finish interface,
to warrant replacement. The interior columns appear to be in much better condition and appear to be sufficient to carry the loads.

As indicated in Section 1.7, the Fish Packaging Building is located within the VE-15 Zone on the FEMA flood maps with a Base Flood Elevation of 18.14 MLW inclusive of wave action. Restrictions for Massachusetts State Building Codes require the lowest horizontal supporting member to be above this elevation.

The existing Fish Packaging Building has a shallow foundation; however, building foundations in this flood zone are typically required to be deep foundations in order to resist failure due to scour. The building has a minimum finished floor elevation of approximately 10.8 MLW, thus potentially subjecting the timber 2x4 wall to flood and wave forces with a FEMA 100 year flood elevation of 18.14 MLW. Although the site is provided with pavement, scour of the shallow foundation is still a potential issue during extreme flood events.

For structures within this flood zone, it is required that the vertical structural elements resist wave forces, flowing water, and wind loads. It is reported that at times of impending storms the garage-style doors are opened to allow for flood waters to flow through which helps in reducing the lateral loads on the structure due to building flooding. Although this may reduce the loads on the exterior walls, the center of the interior of the building is enclosed with walls. These walls, along with the portions of exterior walls not opened by the garage-style doors, will impede the flow of flood water thus transferring loads due to floodwater to the structure.

3.1.2 Observation Deck Framework

The framing of the Fish Packing Building deck was observed to be in fair condition at the time of Pare’s review. A majority of the steel hangers appear to have been replaced at one point in time and most are stainless steel. The deck was reported to have been moving on the north side, possibly due to an inferior connection in the existing wall for the posts. The review completed by MEC indicates that there are no visual changes to the condition of the deck structural elements compared to the prior review in 2014. The limiting factors in the system, as indicated by MEC, are the deck joists and the uncertainty of the lag screw connections between the deck and the ledger board on the building.
MEC indicated that the maximum allowable live load for the deck system is 70 pounds per square foot, translating to at least three square feet of deck area per person. Pare is in agreement with this due to the span conditions for the existing 2x12 joists.

The observation deck is accessed via a set of timber stairs to the north of the building with a secondary means of egress provided via the second floor of the building. However, the observation deck is currently not in compliance with ADA requirements due to the absence of proper handicap ramps. While the main pier is provided with ADA access to the waterfront, it is considered a working commercial area and ADA access should be provided to the observation deck in order to create a separation between tourists and workers.

3.1.3 HVAC System

A combination of gas fired horizontal unit heaters and console type gas furnaces provide heat for the occupants.

The lower level open work spaces are provided with horizontal gas fired unit heaters, manufactured by Reznor. Each unit has an input of 200,000 BTUH and an output of 160,000 BTUH. These units are controlled by wall mounted thermostat. The gas fired unit heaters appear to be in good condition and fully operational.

The upper level open areas are also provided with horizontal gas fired unit heaters, manufactured by Reznor. Each unit has an input of 100,000 BTUH and an output of 80,000 BTUH. These units are controlled by wall mounted thermostat. The gas fired unit heaters appear to be in good condition and fully operational.

The vents from the upper and lower unit heaters are connected to a common flue, which exits the building at the roof level.

The lower level offices are heated by console gas furnaces installed at the exterior walls, which have an input of 15,000 BTUH and an output of 12,000 BTUH. These furnaces are controlled by integral thermostats. These units appear to be in fair condition.

Ventilation for the Fish Packing Building is achieved through a combination of sidewall propeller exhaust fans and a roof propeller exhaust fan. The exhaust fans provide combined exhaust air flow rate of 93,500 CFM. The exhaust fans draw in air through sidewall hoods with motorized dampers. This ventilation system is also used to relieve the heat produced by the ice making refrigeration equipment. As reported during the field investigation, the system used to control heat and provide air circulation to the ice making equipment is problematic, and it is reported that the automatic controls no longer perform as originally intended. Furthermore, dampers are not fully functional and building personnel must control airflow with sheets of plywood, which is impractical.
The heat in the sprinkler service room is maintained by an electric unit heater with a heating capacity of 2.0kW. This unit heater has been provided with an integral thermostat and is considered to be in good condition. Ventilation in the sprinkler service room is provided by a small inline exhaust fan.

3.1.4 Electrical

The 800 amp, 120/208 volt, three phase, four wire switchboard with an 803/3 main circuit breaker feeds the South Side, North Side, Town of Chatham, and the Fuel Shed panelboards, as well as the Coast Guard enclosed circuit breaker.

The South Side and North Side panelboards are located on the second floor on the south side and north side of the building, respectively, and are fed by the switchboard via a wireway, CT cabinet, and an electric company meter, which is located in the Main Electric Room. The North Side CT cabinet also feeds an enclosed circuit breaker for the icemaker on the north side of the building. The North Side panelboard feeds a sub panelboard which is located next to it.

The Town of Chatham, Fuel Shed, and Coast Guard panelboards are located in the Main Electric Room and are also fed by the switchboard via a wireway, and an electric company meter, located in the Main Electric Room. The Town of Chatham panelboard feeds a sub panelboard which is located in the Main Electric Room.

The above mentioned meters are all cold sequence, meaning the metering is after the main circuit breaker, which is unusual and not acceptable to the electric company as per their current standards. Hot sequence metering is an electric utility company standard.

By visual inspection, the electrical equipment in the Main Electric Room appears to be in fair condition. The South Side panelboard, North Side panelboard, and North Side sub panelboard by comparison appear to be rusting and are in poor condition.

Interior lighting in the Fish Packing Building consists of striplights and fiberglass body dust/moisture resistant type lighting fixtures. Lighting is switched via local toggles switches. Switches on the first floor are weatherproof type. By visual inspection the interior lighting fixtures appear to be in fair condition.

Exterior building-mounted lighting consists of nautical type wall sconces, wall packs, square surface mounted lighting fixtures under the deck, and flood lights. Lighting is controlled by timeclock. By visual inspection the exterior lighting fixtures appear to be in poor condition, with corrosion and deterioration typical.

Receptacles on the first floor are GFCI type with weatherproof covers and are located high so as to protect them from flooding. The second floor also has receptacles.
The emergency lighting consists of emergency battery units with integral dual light heads and exit signs with backup battery. Most of the rooms have emergency lighting and most egresses have exit signs above them. Some deficiencies of the emergency lighting system include no exterior remote emergency light heads at egresses, some areas without emergency lighting, and some egresses without exit signs. Due to deficiencies, the emergency lighting appears to be in poor condition.

The building does not have a bi-directional amplifier system as required by the International Building Code (IBC) with Massachusetts Amendments.

3.1.5 Plumbing

The Fish Packing Building’s salt water wash down is supplied from a well system; a new Well Mate tank and pump was reportedly installed on February 11, 1999. The system is designed with 1-1/2 HP pump at 35 GPM and a tank pressure of 30 PSI. The piping from the well to the tank and out to hose stations is schedule 40 PVC. The system is piped from the well to the upper level fire water room. There are two water meters and backflow preventers provided to meter each tenant.

The building’s domestic water is supplied from 1 ½-in service which runs up into the sprinkler room. There are two water meters and backflow preventers provided to meter each tenant.

There is a mix of cold water piping (copper) out to the spaces which supply hand sinks, wall hydrants, and hose bibs. The sinks are supplied with electric water heaters located at the sinks. Some of the water systems are provided with Raychem heat trace systems. The systems pipe insulation is not installed tight or sealed at most elbows.

The building is supplied with two gas meters for the tenants. There is a trench drain system on the outside of the loading dock with a gasoline/sand interceptor. There are currently no bathrooms.

3.1.6 Architectural Components

The building was observed to be in fair condition on the interior with ample egress doors throughout the first floor and adequate exit signs installed around the building.

The stairs leading up to the second floor is an open stair with no fire rated enclosure on either floor; however, there is a presumption in the Building Code that the existing condition met the code requirements at the time of construction. Current codes do not require the stairs to be in a fire rated enclosure. It was also noted that riser heights of the stairs range from 7 ¼” to 8 ¼” which exceeds the codes 3/16” maximum riser variation. While the risers do not need to meet the current code, the stairs are a potential tripping hazard and should be redone with the correct riser variation.

The second floor is provided with two storage rooms that are accessed from a corridor off of the stairs and two exterior doors that allow access to the exterior deck. Each door has a pull station and there is a horn strobe located next to one of the doors. While areas on the second floor are subdivided by a chain-link fence, the horn strobe is currently complaint. If a solid wall was constructed in place of the chain-link, the horn strobe would be obstructed and another would be required.
There is an exit sign over one of the doors leading to the deck; however, there is no exit sign over the second door. Although one sign is compliant with the building code, but in the event of a smoke filled room the door could easily be missed.

There are no restroom facilities located in the building. While the building is not a public facility and is exempt from the MAAB for accessible bathrooms, there are workers in the building and restrooms are required.

The building is provided with old wood shingles which appeared to be in fair condition with a few areas under the deck that have been stripped of shingles and require refinishing. The trim was observed to be decayed with several trim boards failing or missing. There is a missing fascia board and decayed door casing for the garage on the west side of the building.

The observation deck has one means of egress that is wrapped around the building at the end of the deck with a travel distance of 131-ft to the second floor doors, which is the only means of egress for the second story of the building. Building code requires two means of egress for occupancy loads greater than 50, therefore, a second set of stairs is required with an occupancy load listed as 100 occupants. There are two other small stairs that extend from a platform located in front of the two second story doors. Building codes require that two handrails be provided on each stair, effectively creating a guard at the outside edge of the door. The existing guard rails on the deck are code compliant; however, they are badly weathered and in need of future replacement.

3.2 EVALUATION AND RECOMMENDATIONS

The following recommendations provide a practical approach to address current deficiencies at the Fish Packing Building. Prior to undertaking recommended maintenance, repairs and remedial measures, the applicability of environmental permits needs to be determined for activities that may occur within resource areas under the jurisdiction of local conservation commissions, MADEP, or other regulatory agencies.

3.2.1 Structural Recommendations

The corrosion of the concrete filled steel columns located on the outside gable walls of the Fish Packing Building may be accelerated by electrical currents due to the proximity of electrical wiring. Pare recommends replacing these 4 concrete-filled steel columns with new columns coated with epoxy paint. In addition, the interior steel columns and beams should be inspected yearly for any corrosion for repair.

The timber framing of the observation deck is proposed to be replaced with a galvanized HS steel tube frame. The frame is to bear on the existing foundation wall and the sheet pile concrete cap. This configuration will provide better access for the fisherman below by moving the columns off the existing slab. The concrete pile cap will provide the frost protection required by code for the structure. This frame will be designed to remove any lateral load on the timber portion of the Fish Packing Building, and will eliminate the need for the ledger with the blind connections. The existing horizontal framing can be utilized with the design to minimize the impact on the use of the structure. The frames will be spaced to provide the deck with an allowable loading of 100 pounds per square foot (PSF) as required by code. Additional framing in the
form of blocking is suggested for the spans of 2x12 joists. With the relocation of the support onto the sheet pile cap, the deck could be widened to enable ease of passing pedestrians and provide a larger viewing area.

3.2.2 Mechanical, Electrical, and Plumbing Recommendations

The most problematic aspect the HVAC system of the Fish Packing Building is how exhaust and make-up air is handled to accommodate the ice making equipment. This system should be completely renovated as part of the possible renovations so that there is efficient management of exhaust and make-up air flow whenever the ice making equipment is operational. This work should include full replacement of dampers and damper actuators. Furthermore, new dampers and actuators should be as corrosion resistant as possible by using materials such as anodized aluminum or fiberglass damper blades, stainless steel shafts and linkages, as well as nylon bushings.

The existing power distribution should be replaced as the current metering situation is not acceptable per electric company standards and is in poor condition. A weatherproof metercenter rated at a minimum of 800 amperes, 120/208 volt, three phase, four wire should be located in the second floor Main Electric Room so it is not susceptible to flooding. The metercenter would better organize the power distribution as opposed to the current arrangement which utilizes multiple CT cabinets, meters, etc. It is recommended that additional assessment be completed to determine how many meters are required so loads could be organized accordingly. Panelboards should be provided on the second floor as required to meet the metering needs. Hot sequence metering as per electric utility company standards would be provided.

The GFCI type receptacles with weatherproof covers should be raised above the 100 Year FEMA Flood Elevation so as to protect them from water damage. It is recommended that all receptacles on the second floor be replaced with GFCI type receptacles as well.

The existing emergency lighting should be replaced as it is in poor condition. Emergency battery units with integral dual light heads and exit signs with backup battery should be provided to identify exit discharge routes. Exterior dual remote emergency light heads should be provided to comply with the International Building Code (IBC), with Massachusetts Amendments.

A bi-directional amplifier with coaxial cabling above accessible ceilings should be provided to amplify Fire Department and Police frequencies as required by the IBC with Massachusetts Amendments. This system will ensure that there are no “dead” spots for communication within the building.

3.2.3 Architectural Recommendations

It is recommended that the deck be extended 2-ft to the south so that a second stair could be installed. The stair would need to be a minimum of 44-in wide and could extend down to a platform by the corner, wrap around the building, and terminate at the double window’s edge without interfering with the main door.

The missing fascia board should be replaced to prevent moisture damage to the timber roof elements. The trim and door casing should also be replaced as they are in poor
condition. Although the existing siding was observed to be in fair condition, it is recommended that the building siding be removed and replaced in-kind.

The Plumbing Code requires a restroom be provided for each sex within the work area if there are more than two workers present at any given time. Although the Plumbing Code also requires a restroom on each level, a variance may be possible to have them only on the second floor which serves as a staff area.

Since the observation deck is a public venue, it is required by MAAB regulations to be barrier-free, or handicap accessible. An exterior shaft housed elevator/lift could be considered on the north face of the Fish Packing Building; however, flood resistant design requires that any electrical motors, pumps, or machinery be elevated above the flood plain. With a deck and flood elevation of 20.5 MLW and 18.14 MLW, respectively, a lift or elevator would be impractical or excessive in cost. It is recommended that proper ADA access be provided to the observation deck via an aluminum framed switchback ramp extending towards the retaining wall separating the North Jog and Main Pier.

A schematic design for a new deck has been provided within the report by JMBA Architects in Appendix I. The set of stairs near the northwest corner of the building are recommended to move further west to accommodate the proposed aluminum framed switchback ramp. The ramp would be maintained for worker access to the pier behind the building, but closed to the public. A van accessible handicap parking space and public drop off area could be included near the new ramp to provide easier access.

Although the building is located within a VE velocity zone, one of the more stringent flood zones, the current Massachusetts Building Code (Appendix G – Section G301.3.2 Flood Hazard Areas Subject to High Velocity Wave Action) has an exemption which allows the building means of egress to be below the flood plain elevation. This means that the observation deck, which serves as a means of egress from the second floor, is exempt from the requirements for having the lowest structural member being 2-ft above the flood zone. This allows the deck to be reconstructed at its current finish floor elevation. Additionally, in the opinion of JMBA Architects, the building is also exempt from the Flood Plain regulation because it could be considered a water dependent use.

3.2.4 Upgrade Recommendations

Although the sidewall exhaust fans are operational and appear to be in fair condition, they are approaching the end of their useful service life and replacement is recommended as part of the possible renovations. If fan replacement is not included in the renovation plans, it is recommended that at a minimum the fan bearing belts and sheaves should be replaced.

Although the existing gas fired unit heaters are operational and appear to be in fair condition, they are starting to show signs of rust and corrosion and are approaching the end of their useful service life. Therefore, replacement of this equipment should be considered as a part of any renovation project.

The existing interior lighting appears to be in fair condition, but replacement should be considered in order to provide adequate lighting for work to be performed. Highly efficient LED lighting fixtures should be provided throughout the building. Lighting
levels should be in accordance with IESNA recommendations and the Massachusetts State Building Code energy requirements. Lighting fixtures in rooms less than 900 square feet should be controlled primarily by room occupancy sensors and local low voltages switches. Larger areas not controlled by occupancy sensors should be controlled through lighting relay panels and local low voltage switches. Digital timer switches should be provided in storage rooms. Switches on the first floor should be of weatherproof type.

The existing exterior building-mounted lighting should be replaced as it is in poor condition. Building-mounted LED lighting fixtures should be provided in accordance with Illuminating Engineering Society North America (IESNA) Standards for industrial work and tourism, and controlled through lighting relay panels.

3.2.5 Resilient Design Recommendations

In order to improve the structural resiliency of the Fish Packing Building, it is recommended that a new steel frame wall be designed to support the roof structure in place of the 2x4 timber exterior walls. This would be in conjunction with “break-away-walls” to reduce the lateral loads on the structure. The interior walls should also be replaced with reinforced masonry or concrete to better resist the lateral loads due to flood water.

It is recommended that areas below the FEMA flood elevation be reconfigured to allow free flow of flood water through the building, including moving important office style areas and sensitive equipment above the flood zone.

3.3 OPINION OF PROBABLE COST

Opinions of probable cost were generated based upon current industry unit prices and contractor input for similar work. The estimate includes allowances for engineering, permitting, and construction administration, and are based upon current year dollars. A 25 percent contingency on the construction costs is included. The opinions shown herein are based on a limited investigation and are provided for general information only. This should not be considered an engineer’s estimate, as actual construction costs may be somewhat less or considerably more than indicated, due to fluctuations in the market and the actual repair implemented.

The following provides an opinion of probable cost for the recommended repairs to the Fish Packing Building.

3.3.1 Repairs

<table>
<thead>
<tr>
<th>Item</th>
<th>Detail</th>
<th>Magnitude of Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Columns</td>
<td>Replace 4 concrete-filled steel columns</td>
<td>$20,000</td>
</tr>
<tr>
<td>Observation Deck</td>
<td>New timber/composite deck with steel HSS columns, switchback ramp, wrap around stairs</td>
<td>$475,000</td>
</tr>
<tr>
<td>HVAC System</td>
<td>New simple air filtration system</td>
<td>$40,000</td>
</tr>
<tr>
<td>Power Distribution</td>
<td>New metercenter and panelboards</td>
<td>$35,000</td>
</tr>
<tr>
<td>Receptacles</td>
<td>New GFCI receptacles</td>
<td>$10,000</td>
</tr>
<tr>
<td>Emergency Lighting</td>
<td>Replace existing emergency lighting</td>
<td>$15,000</td>
</tr>
<tr>
<td>Amplifier</td>
<td>New bi-directional amplifier</td>
<td>$20,000</td>
</tr>
</tbody>
</table>
### 3.3.2 Upgrades

<table>
<thead>
<tr>
<th>Item</th>
<th>Detail</th>
<th>Magnitude of Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Exhaust System</strong></td>
<td>New sidewall exhaust fans</td>
<td>$26,000</td>
</tr>
<tr>
<td><strong>Heating System</strong></td>
<td>New gas fired unit heaters</td>
<td>$99,000</td>
</tr>
<tr>
<td><strong>Interior Lighting</strong></td>
<td>New LED lights and timer switches</td>
<td>$26,000</td>
</tr>
<tr>
<td><strong>Exterior Lighting</strong></td>
<td>New building mounted LED lighting</td>
<td>$26,000</td>
</tr>
<tr>
<td><strong>Building Framing</strong></td>
<td>New steel frame and break-away-walls</td>
<td>$255,000</td>
</tr>
</tbody>
</table>
4.0 WHARFINGER BUILDING ASSESSMENT

The structural components of the Wharfinger Building and timber deck were visually inspected by Pare professional engineering staff on October 22, 2015. The MEP components were visually inspected by G&V on January 19, 2016. The results of the reviews are included herein.

Deficiencies observed during the inspection were made referencing their location in relation to infrastructure as indicated on Figure 3 – Existing Site Plan and Sections, and as noted herein. Photographs documenting existing conditions are provided in Appendix A. A copy of Pare’s structural inspection report and G&V’s MEP report are included in Appendix E and Appendix H, respectively.

It is understood that the Town of Chatham wishes to make the Wharfinger Building code compliant, as well as consider superficial repairs and updates that will not affect the structural integrity of the building itself. Based upon on-site investigations and building standards, recommendations for these repairs and updates are included herein.

4.1 EXISTING CONDITIONS

The Wharfinger Building is located up gradient from the Fish Packing Building and is comprised of reinforced concrete foundation walls with a timber structure above. The building primarily houses office space and public restrooms. Adjacent to the structure is a set of stairs and short decks which provide access to the site below. The stairways and deck are attached to the Wharfinger Building and are constructed from pressure treated timber.

Based on the observations obtained from the site inspection, the following provides our assessment of the various structural components and assessment of code compliance and suggested upgrades of the Wharfinger Building with associated deck and stairs. Existing conditions were based on visual and tactile observations only, and were limited to accessible and visible portions of the structures.

4.1.1 Structural Components

The Wharfinger Building Deck appears to bear on concrete footings and a structural ledger attached to the north wall of the Wharfinger Building. The posts and beams appear to be in fair condition. The Town’s goal is to expand the width and improve access to the site. The existing footings may be reused if the frost depth of four feet is met. The anchors to the existing building will have to be reviewed and improved with any additional loads.

The Wharfinger Building is a timber frame structure supported by a cast in place concrete foundation. No major structural deficiencies were noted during the inspection; however, the cedar shingles are reaching the end of their useful life, and the paint on the wooden trim is typically peeling and chipped.

4.1.2 Architectural Components

The Wharfinger Building deck is below the pitch requirements for a ramp, therefore it does not need to meet the provisions of the Massachusetts Architectural Access Board (MAAB). The restrooms appear to meet the requirements of the MAAB with the exception of the bathroom door thresholds from the exterior deck.
and the Wharfinger office door. MAAB requires a threshold no greater than ½-in, and the thresholds are approximately 1 ½-in to 2-in high, making them non-compliant. MAAB requires a threshold no greater than ½-in, and they are therefore non-compliant.

The basement of the building contains two coolers; one of which is inoperable. The area is currently used by fisherman to bait their hooks and is technically not a habitable area without any egress doors. This area can be considered a water dependent operation as it is used by the fisherman; and therefore, is not required to be made flood proof.

The exterior of the building has a relatively new roof; however, the wood sidewall shingles and trim are deteriorated and in need of replacement. The shingles have been patched, are badly cupped or curled, and have exceeded their useful life. The wood trim was also found to be in poor condition with deterioration and badly decayed areas. It was noted that there is a gutter on the deck side of the building; however, there is no gutter located on the south side of the building.

The windows of the building appear to be of vinyl clad wood and an Andersen Co. thermal pane window original to the building. The window were observed to be in fair condition.

4.1.3 HVAC System

The Wharfinger’s office located on the upper level is heated by electric baseboard heat located at the exterior walls. The Wharfinger’s office does not currently have any air conditioning. Ventilation for the Wharfinger’s office is limited to operable windows.

The public toilet rooms are heated by electric unit heaters suspended from the ceiling and controlled by wall mounted thermostats, which are protected with tamperproof covers. Exhaust for the public toilet rooms is accomplished by inline exhaust fans that draw air out of the spaces through ceiling grilles and ductwork. The toilet room exhausts out through eave-mounted grilles. The toilet room heating and equipment appears to be in fair to good condition; however, the exhaust is not currently functioning.

The lower level of the Wharfinger Building is heated by a ceiling hung electric unit heater, which is starting to show signs of rust and corrosion typical of close proximity to salt water.

4.1.4 Electrical

The wireway feeds three disconnect switches labeled as North Side Freezer and Town of Chatham, with the last disconnect switch having no label.

The North Side disconnect switch appears to feed the load center above the wireway with same labeling. The Town of Chatham disconnect switch appears to feed the panelboard which is located in the second floor Wharfinger’s Office. The panelboard feeds an enclosed circuit breaker which in turn feeds a load center with gas and diesel loads as well as circuits throughout the building. The circuit breaker
and load center are located next to the panelboard. The disconnect switch with no
labeling appears to feed the load center above the wireway labeled South Side
Freezer.

By visual inspection the first floor wireway, disconnect switches, and load centers
appear to be rusting and are in poor condition. The panelboard, enclosed circuit
breaker, and the load center in the Wharfinger’s Office appear to be in fair
condition.

Interior lighting consists of wraparounds, porcelain sockets, drum lighting fixtures,
and downlights. Lighting is mostly switched via local toggle switches. The Toilet
Room lighting is controlled by local keyed switches and occupancy sensors. By
visual inspection the interior lighting fixtures appear to be in fair condition.

Exterior building-mounted lighting consists of wall packs and recessed lensed
downlights. Lighting is controlled by timeclock. There are two red and two white
industrial glass globe with cage lighting fixtures which may be part of the
communication with boats. By visual inspection the exterior lighting fixtures
appear to be in poor condition with corrosion and deterioration typical.

Grounded receptacles are located throughout the Wharfinger Building. The building does not have
emergency lighting or a bi-directional amplifier system as required by the IBC with Massachusetts
Amendments.

On the east face of the Wharfinger Building, an
electrical junction box and meters are covered by a
plywood box. There is a cutout covered by plastic in
order to view the meters, and a small, hinged, plywood
opening for access. The enclosure does not appear to
be watertight or completely secure.

4.1.5 Plumbing

The plumbing fixtures in the Wharfinger Building are manufactured by TOTO
Company. The toilets and urinals are wall mounted, china with TOTO flush valve
1.6 GPF and 1.0 GPF, respectively. Lavatories are wall mounted, china with TOTO
faucet and tempering valve.

The toilet rooms are provided with a floor drain and hose bib. A drinking fountain
is provided on the outside of the toilet rooms. The domestic hot water is supplied
from an electric hot water storage tank and the domestic cold water service is
provided with a water meter. The building is supplied with a natural gas meter and
a storm water gutter system discharged to grade.
4.2 EVALUATION AND RECOMMENDATIONS

The following recommendations provide a practical approach to address current deficiencies at the Wharfinger Building. Prior to undertaking recommended maintenance, repairs and remedial measures, the applicability of environmental permits needs to be determined for activities that may occur within resource areas under the jurisdiction of local conservation commissions, MADEP, or other regulatory agencies.

4.2.1 Structural Recommendations

The Town has requested that the pressure treated deck and stairs attached to the Wharfinger Building be redesigned. It is the intent of the design to incorporate ADA accessibility, low maintenance building materials, and to incorporate as much of the existing structure into the final design as possible. The ledger connection at the building foundation will be revised to provide support for the proposed loads.

4.2.2 Mechanical, Electrical, and Plumbing Recommendations

Although the HVAC equipment is operational and appears to be in fair condition, it is approaching the end of its useful service life. Therefore, replacement of this equipment should be considered a part of any renovation project.

GFCI type receptacles with weatherproof covers should be provided on the first floor, located high so as to protect them from flooding. Any receptacles that aren’t grounded should be replaced with grounded type receptacles on the second floor.

The existing interior lighting appears to be in fair condition, but replacement should be considered with the possible renovations in order to provide adequate lighting for work to be performed. Highly efficient LED lighting fixtures should be provided throughout the building. Lighting levels should be in accordance with IESNA recommendations and the Massachusetts State Building Code energy requirements. Lighting fixtures in rooms less than 900 square feet should be controlled primarily by room occupancy sensors and local low voltages switches. Larger areas not controlled by occupancy sensors should be controlled through lighting relay panels and local low voltages switches. Digital timer switches should be provided in storage rooms. Switches on the first floor should be of weatherproof type.

The existing exterior building-mounted lighting should be replaced as it is in poor condition. Building-mounted LED lighting fixtures should be provided and controlled through lighting relay panels.

Emergency battery units with integral dual light heads and exit signs with backup battery should be provided to identify exit discharge routes. Exterior dual remote emergency light heads should be provided to comply with the IBC, with Massachusetts Amendments.

A bi-directional amplifier with coaxial cabling above accessible ceilings should be provided to amplify Fire Department and Police frequencies as required by the IBC with Massachusetts Amendments. This system will ensure that there are no “dead” spots for communication within the building.
A weatherproof metercenter rated at approximately 800 amperes, 120/208 volt, three phase, four wire should be located in a new Second Floor Main Electric room or on the exterior of the building facing the street so it is not susceptible to flooding. It is recommended that the enclosure be stainless steel, watertight, and secure with a lock. The metercenter would better organize the power distribution as opposed to the current arrangement which utilizes multiple meters. The Town would determine how many meters and panelboards are required so loads could be organized accordingly. Panelboards should be provided on the second floor. Hot sequence metering as per electric utility company standards would be provided.

4.2.3 Architectural Recommendations

Due to the age of the deck and the need for a minimum ½-in threshold height, it is recommended that the deck be replaced. While the stairs to the lower parking lot are code compliant, they are narrow and not user friendly. It is recommended that the stairs be widened to 5-ft to accommodate two people ascending/descending at once with the proposed deck.

The exterior finish of the building, trim boards, and wood shingles are all reaching the end of their effective life and are recommended to be replaced. It is also recommended that a gutter be installed on the south side of the building to prevent further deterioration of the shingles from rain and snow.

4.2.4 Resilient Design Recommendations

As shown in Figure 3 – Site Plan, the Wharfinger Building is located outside of the FEMA 100 year flood plain. The recommendations presented above and below will increase resiliency and the estimated service life of the structures, but are not necessarily related to the current FEMA 100 year flood elevation.

The Wharfinger Building is currently sided with cedar shakes. Although the existing siding was observed to be in fair condition, it is recommended that the building siding be removed and replaced with wood-grained cement board, fiber cement board, or composite siding to extend the life of the siding and to minimize maintenance associated with the cleaning, painting, and repair of wood shingles. It should be noted that prior to replacing the existing cedar siding, coordination with the Chatham Historic Commission may be required.

4.3 OPINION OF PROBABLE COST

Opinions of probable cost were generated based upon current industry unit prices and contractor input for similar work. The estimate includes allowances for engineering, permitting, and construction administration, and are based upon current year dollars. A 25 percent contingency on the construction costs is included. The opinions shown herein are based on a limited investigation and are provided for general information only. This should not be considered an engineer’s estimate, as actual construction costs may be somewhat less or considerably more than indicated, due to fluctuations in the market and the actual repair implemented.

The following provides an opinion of probable cost for the recommended repairs to the Wharfinger Building.
### 4.3.1 Repairs

<table>
<thead>
<tr>
<th>Item</th>
<th>Detail</th>
<th>Magnitude of Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Composite Deck and Stairs</td>
<td>New deck and supports</td>
<td>$55,000</td>
</tr>
<tr>
<td>HVAC System</td>
<td>New simple air filtration system</td>
<td>$15,000</td>
</tr>
<tr>
<td>Power Distribution/Receptacles</td>
<td>New metercenter and GFCI receptacles</td>
<td>$20,000</td>
</tr>
<tr>
<td>Exhaust System</td>
<td>New restroom exhaust system</td>
<td>$26,000</td>
</tr>
<tr>
<td>Interior Lighting</td>
<td>New LED lights and timer switches</td>
<td>$15,000</td>
</tr>
<tr>
<td>Exterior Lighting</td>
<td>New building mounted LED lighting</td>
<td>$10,000</td>
</tr>
<tr>
<td>Emergency Lighting</td>
<td>New exit signs, battery backup</td>
<td>$10,000</td>
</tr>
<tr>
<td>Amplifier</td>
<td>New bi-directional amplifier</td>
<td>$20,000</td>
</tr>
</tbody>
</table>

### 4.3.2 Upgrades

<table>
<thead>
<tr>
<th>Item</th>
<th>Detail</th>
<th>Magnitude of Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Siding</td>
<td>New alternative material siding, new trim boards, and gutter</td>
<td>$35,000</td>
</tr>
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</table>
5.0 WATERFRONT INFRASTRUCTURE ASSESSMENT

The waterfront infrastructure for the Chatham Fish Pier site was inspected by Pare professional engineering staff on October 16, 2015, with underwater inspection performed concurrently by Inner Tech Marine Services LLC. (InnerTech) of Warwick, Rhode Island. The utilities located along the bulkhead were visually inspected by G&V on January 19, 2016. The results of the reviews are located herein.

Deficiencies observed during the inspection were made referencing their location in relation to infrastructure as indicated on Figure 3 – Existing Site Plan and Sections, and as noted herein. Photographs documenting existing conditions are provided in Appendix A. A copy of InnerTech’s underwater inspection report and G&V’s MEP report are included in Appendix J and Appendix H, respectively.

5.1 EXISTING CONDITIONS

The waterfront infrastructure is comprised of a steel sheet pile bulkhead separated into sections as the South Jog, Main Pier, and North Jog with associated finger piers and concrete floats.

The existing South Jog is comprised of steel sheet piling and retained fill, with steel tie rods and a timber tie back wale. The deck is comprised of concrete and asphalt, and is provided with a timber curb. A timber fender system is provided along the perimeter of the pier. The southern face of the sheeting terminates in the sandy beach, which is armored to provide scour protection against wave action.

To the north, the steel sheet pilewall between the South Jog and Main Pier is of similar construction with the addition of a supplemental helical anchorage system installed circa 2000.

The Main Pier comprises the U-shaped steel sheeting bulkhead with a concrete cap around the Fish Packing Building, and northward toward the first finger pier. The Main Pier bulkhead was constructed outboard of a timber bulkhead in circa 1999. The North Jog is of similar construction as the Main Pier.

Based on the observations obtained from the site inspections, the following provides our assessment of the waterfront infrastructure, including the South Jog, Main Pier, North Jog, and associated finger piers and floats. Observations of existing conditions were based on visual and tactile observations, along with select random ultrasonic thickness readings of the steel members.

5.1.1 South Jog Pier and Embayment

The existing steel sheet piling was observed to be significantly corroded, with heavy pitting. Random ultrasonic thickness readings indicate remaining thicknesses with low readings of 0.13 inches to 0.17 inches, in comparison to the original steel thickness of 0.375 inches.

In January, 2015 a section of the steel sheeting failed as a result of holes in the sheeting, resulting in the substantial loss of fill. The sheeting was subsequently
patched from the inside, and the fill was replaced. This occurrence made the head of the pier unusable for a period of time.

The steel sheet piling tie back rods are severely corroded at the ends of the rods against the timber wale. Most of the square washers are missing entirely, and the tie rod nuts were observed to have most of the nut section corroded entirely. The timber curb was observed to be intact, although the fixing bolts and clip angle connection to the sheeting were observed to be significantly corroded.

The south jog floating dock, float guide piles and access gangway were observed to be in good condition, with no major deficiencies observed.

The south embayment sheeting is significantly corroded, similar to the South Jog sheeting. The upper wale for the helical tie back anchors was observed to have some corrosion on the bottom. The wall was observed to have deflected approximately two inches towards the water, as evidenced by the separation from the top of the sheeting to the concrete slab directly behind the sheeting. Voids were observed under sections of the concrete slab near the face of the sheeting, as evidence of measurements at the gap between the concrete and the steel, and by sounding of the concrete. Similar to the South Jog, the majority of the tie rod nuts and washers on the lower wale are severely corroded or missing entirely.

5.1.2 Main Pier

The steel sheet piling is in generally good condition with the coating generally intact; however, some areas evidenced spots of significant pitting due to corrosion. A quarter-sized hole was observed on the southwest corner, which was apparently leaking sand. The concrete cap and concrete deck were observed to be in generally good condition. The rubber fender system was observed to be in generally good condition; however, the lower steel blocking off of the sheeting was observed to have significant corrosion on the bottom part of the HSS member. Several of the ladders were noted to be in need of minor repairs.

5.1.3 North Jog and Finger Piers

The west steel sheet piling bulkhead wall, from the north of the Fish Packing Building to the end of the north jog was observed to be in good condition overall. The epoxy coating was observed to be mostly intact, with random areas of pitting observed similar to the main pier. Accelerated corrosion was observed in areas below electrical locations, such as the light pole and shore power locations. The tie rod nut located below the light pole was observed to be much more corroded than the adjacent locations, which were noted to be in good condition. The concrete cap
and concrete deck were observed to be in generally good condition, with no significant deficiencies noted.

The south wave-break pier was observed to be in generally good condition, with observed corrosion of the piles and steel framing above the waterline. The timber wave-break components were observed to be in generally good condition. Below the waterline, the coating was noted to be missing and the piles were covered with layer of thick rust. Thickness measurements indicated an average remaining thickness of 0.30 inches, as compared to an original thickness of 0.375 inches.

The north wave-break pier was observed to be in similar condition to the south wave-break pier, with pile thickness measurements averaging 0.25 inches at the mud line.

The concrete Coast Guard float was observed to be in generally good condition, with some listing of the easternmost float observed. Underwater inspection of this float did not reveal the presence of any physical damage or cracking, although the concrete was covered with a heavy layer of marine growth. The guide piles were observed to be in good condition underwater, with the coating mostly intact. Thickness readings indicate remaining thicknesses of 0.4 inches in areas of pitting, and 0.48 to 0.50 inches over the coated areas as compared to an original thickness of 0.5 inches. The wear surfaces of the float guide collars were noted to be worn, but intact.

The north Dinghy Float was observed to be in good condition, with the steel guide piles showing intact coating and minimal corrosion.

Over the last several years the fishermen have indicated that the davits located on the north and south of the Main Pier do not provide the required height for unloading of equipment over the concrete pile cap onto the Main Pier. The davits appear to be constructed of welded steel tube and rotate freely about the base support. Some deflection of the steel tube has also been reported.

5.1.4 Utilities

Most of the receptacles on the pier are 120 volt, GFCI type, with weatherproof covers. A few of the receptacles are not ground fault protected. Specialty receptacles include a NEMA L5-30 (30A, 125V) and two 120 volt, 100 amp, single phase special receptacles. Most of the boxes for receptacles are made of plastic, except for the two 120 volt, 100 amp, single phase special receptacles which are in aluminum boxes. Wiring stubbing up from the pier walk is rigid steel type and transitions above ground to PVC conduit and flexible liquid tight conduit. By visual inspection, the pier power distribution appears to be in poor condition.
5.2 EVALUATION AND RECOMMENDATIONS

The following recommendations provide a practical approach to address current deficiencies observed along the waterfront infrastructure. Prior to undertaking recommended maintenance, repairs and remedial measures, the applicability of environmental permits needs to be determined for activities that may occur within resource areas under the jurisdiction of local conservation commissions, MADEP, or other regulatory agencies.

5.2.2 Structural Recommendations

The steel sheet piling along the south jog and south embayment is approximately 40 years old, and is nearing the end of its useful life. As evidence by the holes observed in the steel sheet piling, the remaining steel thickness continues to decrease and will continue to develop more holes over time. As the majority of the tie rod nuts and washers have corroded entirely, the bulkhead system has weakened considerably and full replacement is recommended. Significant weather events may impose additional loadings on the weakened structure, and the system will remain prone to storm damage in until the bulkhead is rehabilitated.

The south jog float is in generally good condition, and should provide good service for a number of years to come. Periodic tightening of the thru-rod connections will reduce articulation and extend the service life of the float.

The main pier was most recently reconstructed in approximately 2000, and was observed to be in generally good condition. Due to the presence of aggressive pitting of the steel sheet piling, it is recommended that a cathodic protection system be added to the sheeting to reduce the corrosion and extend the remaining life of the bulkhead structure. Additionally, areas of electrical service should be examined and provided with a grounding system that does not increase corrosion of the adjacent steel.

The main pier amenities, such as the fendering system, ladders, and hoists should be repaired as needed to extend the service life. The corroded lower section of fender blocking can be replaced or built up to provide a satisfactory blocking section. The installation of a cathodic protection system will likely reduce rate of corrosion on these members.

The steel pipe piles and framing of the north and south wave-break piers were observed to have significant corrosion, and the installation of a cathodic protection system will prolong the useful life of the members.

The Coast Guard floating dock was observed to have a list at the southeastern edge of the float. As this list is not considered to be critical at this time, it is recommended that the float continue to be monitored for any increases in list, especially after a significant event.

The north jog dingy dock was observed to be in good condition, with no deficiencies observed. However, as the access gangway is hinged on the land side, the float reportedly makes contact with the underside of the gangway near the
hinge during periods of high water levels. This connection should be provided with freedom of movement in the vertical direction, or be provided with a tripod and winch to place the gangway on the float during periods of high water levels.

In conjunction with providing new cathodic protection for steel sheet and pipe piling, it is recommended that all steel surfaces apart from the recommended south jog and embayment reconstruction be cleaned of marine growth, patched where necessary, and provided with new epoxy coating.

It is recommended that the davits on the north and south side of the Main Pier be replaced. The new davits should be designed to accommodate the existing height of the concrete curb, varying water heights, and anticipated hauling loads.

5.2.3 Utility Recommendations

The existing pier lighting should be replaced as it is in poor condition. Aluminum poles with marine grade paint and LED site lighting heads should be provided to avoid accelerated corrosion in close proximity to the waterfront, and should be to IESNA Standards.

The existing pier power distribution should be replaced, including all receptacles, boxes, conduit, etc. as it is in poor condition. Marine grade receptacles for general purposes and specialty receptacles should be provided on the pier as required by the Town. Wiring should be provided via PVC conduit and flexible liquid tight conduit.

The Town has indicated that it wishes to provide water service and electrical shore power to the north and south jog. The electrical service would consist of 220 volt, 50 amp service. It is recommended that the existing services be upgraded to consider the increase in voltage and amperage.

5.2.4 Resilient Design Recommendations

As the entire waterfront infrastructure is within the FEMA 100 year flood zone, raising of the structures would be the best solution; however, raising the site is not only cost prohibitive but is not feasible as it would leave the site unusable except during extreme events.

Resilient waterfront infrastructure allows the facility to be inundated, and suffer minimal damage after the flood waters have receded. The reconstruction of the South Jog will improve its structural capacity, and will allow for the structure and utility to become submerged with negligible effect. The Main Pier and North Jog waterfront structures can withstand elevated water levels, provided that the gangway connections and the utilities are raised to provide a moderate freeboard above observed flood water levels. Typically on sheet pile structures similar to this, electrical and water services are provided on the outside of the bulkhead via conduits which are mounted to the face of the wall or a timber wale, which also serves to protect the utilities.
5.3 OPINION OF PROBABLE COST

Opinions of probable cost were generated based upon current industry unit prices and contractor input for similar work. The estimates include allowances for engineering, permitting, and construction administration, and are based upon current year dollars. A 25 percent contingency on the construction costs is included. The opinions shown herein are based on a limited investigation and are provided for general information only. This should not be considered an engineer’s estimate, as actual construction costs may be somewhat less or considerably more than indicated, due to fluctuations in the market and the actual repair implemented.

5.3.1 Repairs

The following provides an opinion of probable cost for the recommended repairs to waterfront infrastructure.

<table>
<thead>
<tr>
<th>Item</th>
<th>Detail</th>
<th>Magnitude of Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Jog and Embayment Reconstruction</td>
<td>New bulkhead with steel sheet piling and concrete cap</td>
<td>$1,588,000</td>
</tr>
<tr>
<td>Coating Protection</td>
<td>Cleaning and patching of deteriorated steel and application of new epoxy coating</td>
<td>$179,000</td>
</tr>
<tr>
<td>Cathodic Protection</td>
<td>Zinc anodes for steel sheet piling and steel pipe piling</td>
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</tr>
<tr>
<td>Gangway Gallows</td>
<td>Steel tripod and winch system</td>
<td>$45,000</td>
</tr>
<tr>
<td>Concrete Float</td>
<td>Replacement in-kind</td>
<td>$123,000</td>
</tr>
<tr>
<td>North and South Davit</td>
<td>Raise elevation of swing arm via raising base grade or extending pole</td>
<td>$75,000</td>
</tr>
<tr>
<td>Pier Maintenance</td>
<td>Fender, ladder, blocking, and hoist repair as required</td>
<td>$50,000</td>
</tr>
<tr>
<td>Electric Shore Power</td>
<td>Raise Pedestals – solve grounding issues</td>
<td>$33,000</td>
</tr>
<tr>
<td>Lighting</td>
<td>Upgrade to aluminum pole LED lighting</td>
<td>$187,000</td>
</tr>
<tr>
<td>South Jog Conductor and Water Conduit</td>
<td>Upgrade to PVC conduit and flexible liquid tight conduit</td>
<td>$99,000</td>
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5.3.2 Upgrades

<table>
<thead>
<tr>
<th>Item</th>
<th>Detail</th>
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</tr>
</thead>
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<tr>
<td>North Jog Electric and Water Service</td>
<td>New 220 volt 50 amp service and new water conduits</td>
<td>$85,000</td>
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6.0 RECOMMENDATION SUMMARY

The Chatham Fish Pier site is an undeniable asset for the Town of Chatham providing for the fishing industry and serving as a tourism destination. As described herein, this presents its own challenges for operation, maintenance, and improvement. However by undertaking the recommended improvements, and completing regular maintenance, the Town can enable both activities to continue. Execution of these recommendations and the timing of the work is critical for impacts to the facility, allocation of capital, and efficiency in design.

As this program is based upon conceptual approaches, we have included recommended contingencies for construction costs, and provided engineer, permitting, and design estimates based upon common percentages of construction. This is not a final engineer’s estimate and may under or over predict final costs which will be directly influenced by factors unknown at this time. This opinion of cost should be considered a guide and be updated as the design progresses.

To assist the Town, Pare has developed the following matrix of work phased over a five year period, to create a capital improvement program that addresses industry, tourism, code compliance, and resiliency. For later phases, a standard escalator has been applied to account for possible inflation, market variability, and material costs. The costs shown below do not include the benefits of the repairs nor the potential liability from deferred maintenance. The annual cost of repairs due to the deterioration of the structures is assumed to increase 10% annually. The inflation rate is assumed to be 2%, in accordance with the stated target rate of the Federal Reserve. All dollar values shown are in current year dollars.

<table>
<thead>
<tr>
<th>Report Section</th>
<th>Recommended Repair/Upgrade</th>
<th>Projected Cost in Current Year Dollars</th>
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<tr>
<td>Site Assessment</td>
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<td>2.2.2 Skybridge</td>
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<td>2.2.5 Waste Oil Shed</td>
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<td>3.2.1 Observation Deck</td>
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<td>3.2.2 HVAC System</td>
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<td></td>
<td>3.2.2 Power Distribution</td>
<td>$35,000</td>
</tr>
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<td></td>
<td>3.2.2 Receptacles</td>
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<td>3.2.2 Emergency Lighting</td>
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### Chatham Fish Pier Recommendation Summary

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<th>4-year</th>
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<td>$20,000</td>
<td>$21,778</td>
<td>$23,714</td>
<td>$25,821</td>
<td>$28,117</td>
<td>$30,616</td>
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<td><strong>3.2.3 Siding</strong></td>
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<td>$10,329</td>
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<td><strong>3.2.4 Exhaust System</strong></td>
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<td>$28,311</td>
<td>$30,828</td>
<td>$33,568</td>
<td>$36,552</td>
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### Wharfinger Building Assessment

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<tr>
<td><strong>4.2.1/4.2.3 Composite Deck and Stairs</strong></td>
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<td><strong>4.2.2 Exhaust System</strong></td>
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### Waterfront Infrastructure Assessment

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<th>5-year</th>
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<tbody>
<tr>
<td><strong>5.2.1 South Jog and Embayment Reconstruction</strong></td>
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**PROJECT TOTAL:** $5,593,000 $6,090,156 $6,631,503 $7,220,970 $7,862,834 $8,561,752
Figures
Chatham Fish Pier
*Chatham, Massachusetts*
Appendix A
Photographs
Chatham Fish Pier
Chatham, Massachusetts
Chatham Fish Pier, Chatham, MA

Waterfront Inspection Photographs

Inspection Date: October 16, 2015

Photo No. 1: South side of South Jog.

Photo No. 2: South Jog float gangway platform.
Photo No. 3: South Jog float.

Photo No. 4: +/- Settlement of deck at South Jog Embayment.
Photo No. 5: +/- South Jog embayment.

Photo No. 6: South Jog separation of steel sheet piling and concrete deck.
Photo No. 7: Deck layout of South Jog Pier.

Photo No. 8: South Jog sheet piling failure.
Photo No. 9: South Jog loss of fill from sheet piling failure.

Photo No. 10: South Jog embayment.
Photo No. 11: South face of Main Pier.

Photo No. 12: Corroded tie rod nut and washer on South Jog wale.
Photo No. 13: Example of remaining nut and washer.

Photo No. 14: Electrical conduit under timber fender wale.
Photo No. 15: Helical anchor nut and plate washer.

Photo No. 16: Helical anchor nut and plate washer.
Photo No. 17: Outfall near southwest corner of Main Pier.

Photo No. 18: South face of Main Pier.
Photo No. 19: Corrosion of fender blocking.

Photo No. 20: Corrosion of fender blocking.
Photo No. 21: Typical ladder damage.

Photo No. 22: West face of Main Pier.
Photo No. 23: North face of Main Pier.

Photo No. 24: Full section tie rod nut.
Photo No. 25: Corroded tie rod nut near light pole.

Photo No. 26: North Jog sheeting at USCG float.
Photo No. 27: Listing of USCG float.

Photo No. 28: Head of south wave break pier.
Photo No. 29: South wave break pier.

Photo No. 30: Damage to south wave break pier.
Chatham Fish Pier, Chatham, MA

Waterfront Inspection Photographs

Inspection Date: October 16, 2015

Photo No. 31: North wave break pier.

Photo No. 32: North wave break pier.
Photo No. 33: USCG float gangway.
Photo No. 1: West face of Fish Packing Building.

Photo No. 2: Steel beam bearing detail at Fish Packing Building.
Photo No. 3: Metal bar joists and steel decking at Fish Packing Building.

Photo No. 4: Joist bearing detail at Fish Packing Building.
Photo No. 5: Apparent steel decking repairs at Fish Packing Building.

Photo No. 6: Interior steel HSS column supporting mezzanine second floor area at Fish Packing Building.
Photo No. 7: Exterior concrete filled steel column at Fish Packing Building.

Photo No. 8: Corrosion of exterior concrete filled steel column at Fish Packing Building.
Photo No. 9: Second floor office space at Fish Packing Building.

Photo No. 10: Overhead-style door at Fish Packing Building.
Photo No. 11: Stairs leading to north portion of timber deck at Fish Packing Building.

Photo No. 12: North portion of timber deck at Fish Packing Building.
Photo No. 13: Framing of timber deck at north portion of the Fish Packing Building.

Photo No. 14: Ledger board of east portion of timber deck at Fish Packing Building.
Photo No. 15: Recently replaced column of timber deck at northwest corner of Fish Packing Building.

Photo No. 16: Timber deck beam connection detail at north face of Fish Packing Building.
Photo No. 17: Recent sistered column addition near the northeast corner of timber deck at Fish Packing Building.

Photo No. 18: East portion of timber deck at Fish Packing Building.
Photo No. 19: Timber stairs and decking on the north side of the Wharfinger Building.

Photo No. 20: Framing detail of timber deck at Wharfinger Building.
Photo No. 1: View of Fish Packing Building and Chatham Pier Fish Market from deck of Wharfinger Building.

Photo No. 2: View of Fish Packing Building from deck of Wharfinger Building.
Photo No. 3: Public viewing deck at east face of Fish Packing Building.

Photo No. 4: View of Chatham Fish Pier Market from deck of Fish Packing Building.
Photo No. 5: Fish bucket hoist at east face of Fish Packing Building.

Photo No. 6: Walls of interior storage area of Fish Packing Building.
Photo No. 7: View of Wharfinger Building from attached deck.

Photo No. 8: East face of Wharfinger Building.
Photo No. 9: Electrical junction box at east face of Wharfinger Building.

Photo No. 10: Waste oil shed at southeast corner of Wharfinger Building.
Chatham Fish Pier, Chatham, MA

Site Inspection Photographs

Inspection Date: October 22, 2015

Photo No. 11: Parking area at Chatham Fish Pier site.

Photo No. 12: Parking area at Chatham Fish Pier site.
Photo No. 13: View of Barcliff Avenue Extension entrance to Chatham Fish Pier site.
Appendix B
Previous Reports and References
Chatham Fish Pier
Chatham, Massachusetts
PREVIOUS REPORTS AND REFERENCES

The following references were utilized during the preparation of this report and the development of the recommendations presented herein:


2. Chatham Town Pier Wharf Improvements – Nucci Vine Associates, Newburyport, MA (October 1997)


Appendix C
FEMA Flood Map
Chatham Fish Pier
Chatham, Massachusetts
Appendix D

Prioritization of Blizzard 2015 Damages
Chatham Fish Pier
*Chatham, Massachusetts*
Prioritization of Blizzard 2015 Damages

MUNICIPAL FISH PIER: $171,950

Priority:

1- High
   a. replace 3 fuel dispensers- ($21,000)
   b. repair/replace north side personnel doors- ($2,200)
   c. north jog gangway (full replacement)- ($14,000)
   d. replace and bring up to code, all outside damaged electrical conduits, panels, receptacles and other misc. electrical repairs- ($70,000)

2- Medium
   a. repair/replace 2 overhead rollup doors- ($9,000)
   b. dredging/sand removal from north float system- ($13,000)
   c. replace water piping along bulkhead- ($3,000)
   d. remove 2 existing flooded fuel containment wells and replace with sealed wells- ($10,000)

3- Low
   a. repair timber “cap log” in south jog- ($900)
   b. repair/replace chain link fencing- ($8,700)
   c. north jog stairway- ($350)
   d. replace 25 ft public bench- ($800)
   e. repair/replace 3 bulkhead ladders- ($3,200)
   f. repair/reset broken NOAA tide gauge- ($13,500)

4- Completed Projects
   a. US Coast Guard gangway- $250
   b. south jog gangway- $450
   c. fuel shed space heater and electrical repairs- $800
   d. replace fuel shed door- $800
Appendix E
Structural Inspection and Evaluation Report
Chatham Fish Pier
Chatham, Massachusetts
A. INTRODUCTION AND GENERAL INFORMATION

On October 22, 2015, Pare personnel observed the physical condition of the Fish Packing Building and attached observation deck, as well as the Wharfinger Building and associated stairs. The structural investigation was limited to visual observation with limited destructive investigation. Areas that were uncovered during the investigation were utilized as representative conditions for the structure as a whole. Visual observations were recorded regarding the general state of the structure and specific areas where significant deterioration was noted.

This letter report presents the results of a structural assessment of the buildings and associated deck conducted by Pare Corporation (Pare) for the purpose of determining the overall structural condition of the buildings and observation deck. The report includes a description of the structures, a description of the evaluation process, discussion of findings, and recommendations concerning the needs for particular actions.

B. INSPECTION FINDINGS

B.1 Fish Packaging Building

The Fish Packing Building is a timber framed one and a half story structure situated approximately 19’ from the sheet pile bulkhead. The building is approximately 58’-0” x 95’-0” in plan size and is set on a 10” thick foundation wall with a 24” wide spread footing. Two steel beams run the long direction supporting a partial second floor area used for storage and office space. The steel beams are supported by steel columns bearing on foundation walls and interior footings. The second floor is comprised of steel bar joists with steel decking and concrete floor. The roof has several dormers and miscellaneous roof top equipment.

The wood framed building is situated approximately 19’ from the water. Sheet pile and concrete cap surround the structure on three sides. The timber framed structure bears on a concrete frost wall with an associated spread footing located below frost depths. The first floor has garage doors on all sides along with windowed entry doors. The penetrations limit the lengths of full framed exterior walls from foundation to roof and reduces the ability to resist the lateral load due to wind. The second floor area is supported by steel beams located in the middle third of the building. There are metal bar joists spanning between the beams with steel decking and concrete floor. The bar joists are in good condition and the metal deck has visible repairs but appear to be in fair condition. The steel beams have been reported to have been cleaned and painted in the past and are in good condition as of this inspection. The beams rest on concrete filled steel columns on the outside gable walls and bear on top of the perimeter concrete foundation. These 4 concrete filled steel columns have experienced enough section loss, visible at the wall finish interface, to warrant replacement. The interior columns are in much better condition and appear to be sufficient to carry the loads. The roof is supported by...
the outside walls and by the second floor knee walls located over the steel beams. There is only a small portion of second floor within a framed dormer located on the east side centrally located and provides access to the deck. The walls are framed into the second floor with 2x4 framing members located at each side of the two dormers on the west side of the structure.

B.2 Observation Deck

The observation deck and associated stairs attached to the deck wrap around the north and east side of the Fish Packing Building. The deck is comprised of large timber beams bearing on timber posts with metal connectors with wood joists and decking. The deck is open to the public for viewing purposes.

The wood framed deck wraps around the north and east sides of the Fish Packaging Building and provides a viewing angle both down at the fisherman’s unloading areas and the ocean. The deck frame is comprised of pressure treated lumber throughout. The timber beams located on the north side of the building are supported by timber posts bearing on the existing foundation wall for the Fish Packaging Building and on the concrete slab with post bottom anchors. The 2x12 joists are spaced 12” on center and are supported by joist hangers at the beams. The east side of the structure is supported by beams parallel with the building face and a ledger lagged into the existing wall. There appears to be a multitude of ledger lag bolts along this building face. In some joist bays there are as many as three lag bolts. The 2x12 floor joists are supported by joist hangers attached to the ledger and the beams. The deck has a guard/railing system above along with timber decking spanning the floor joists. The observation deck is approximately 9.5’ from finished deck to paved area below. Access to the observation deck is provided via a set of stairs interrupted by an intermediate landing. The framing appears to be in fair condition at the time of the review. Most of the steel hangers appear to have been replaced at one point in time and most are stainless steel. The deck was reported to have been moving on the north side possibly due to an inferior connection in the existing wall for the posts.

There is a letter entitled Annual Review of Allowable Live Load for Existing Conditions at the Chatham Fish Pier, Barcliff Ave. Ext. which limits the live load to 70 pounds per square foot. The letter is dated September 30, 2015 and is prepared by Mark McKenzie P.E. for the Building Commissioner of the Town of Chatham. Pare is in agreement with this due to the span conditions for the existing 2x12 Joists.

B.2 Wharfinger Building Deck and Stairs:

The Wharfinger building is located up-gradient from the Fish Packing Building and is comprised of reinforced concrete foundation walls with a timber structure above. The building houses office space and public restrooms. Adjacent to the structure is a set of stairs and short decks which provides access to the site down below. The stairways and deck are attached to the Wharfinger Building and are constructed from pressure treated lumber.

The existing pressure treated deck and stairs attached to the Wharfinger Building are in fair condition. The deck provides access to the Wharfinger Building which houses the public bathrooms. The stairs provide access to the lower portion of the site. The structure appears to bear on concrete footings and a structural ledger attached to the Wharfinger Building north wall. The posts and beams appear to be in fair condition. The goal is to expand the width and improve access to the site. The existing footings may be reused if the frost depth of four feet
is met. The anchors to the existing building will have to be reviewed and improved with any additional loads.

C. EVALUATION OF STRUCTURAL COMPONENTS

The (4) concrete filled steel round columns supporting the two steel beams bearing on the gable end walls of the Fish Packaging Building foundation walls should be replaced with HSS 4” x 4” x ½” columns with associated top and bottom plates. The interior steel columns and beams should be inspected yearly for any corrosion in need of repair.

The timber framing of the observation deck is proposed to be replaced with a galvanized HSS steel tube frame. The frame is to bear on the existing foundation wall and the steel pile concrete cap. This configuration will provide better access for the fisherman below by moving the columns off the existing slab. The concrete pile cap will provide the frost protection required by code for the structure. This frame will be designed to remove any lateral load on the timber portion of the Fish Packaging Building. This design will eliminate the need for the ledger with the blind connections. The existing horizontal framing can be utilized with the design to minimize the impact on the use of the structure. The frames will be spaced to provide the deck with the 100 pounds per square foot (psf) required by code. Additional framing in the form of blocking is suggested for the spans of 2x12 joists.

The pressure treated deck and stairs attached to the Wharfinger Building are in the process of being redesigned. The new deck and stairs layout will be proposed and if any existing components are able to be utilized they will be incorporated in the final design. The ledger connection at the building foundation will be revised to provide support for the proposed loads.

D. RESILIENCY DESIGN LIFE

The FEMA flood Maps (2014) show the Fish Packaging Building within the VE-15 Zone. This flood zone is determined to have a Base Flood Elevation of 18.14 MLW (Mean Low Water) with wave action. This zone has restrictions for construction and requires the lowest horizontal supporting member to be above this elevation. The foundations in this zone are typically required to be deep foundations to resist failure due to scour action. This zone would also require the vertical elements to resist the wave forces and flowing water as well as wind. This elevation of flood waters is expected to rise approximately a foot over the next 100 years based on buoy data from NOAA over the last 50 to 90 years in the area.

The Fish Packaging Building has a shallow foundation with a minimum finished floor elevation of approximately 10.8 MLW. This is below the required elevation thus subjecting the timber 2x4 wall to flood and wave action. At times of impending storms, it is reported that the overhead style doors are opened to allow for the flood waters to flow through. This helps in reducing the lateral loads on the structure. The center of the interior of the building is enclosed with walls. These walls along with the exterior walls impede the flow thus imparting additional and potentially excessive loads to the structure.

Structures are usually designed based on a design life. This design life basically controls the cost of the structure overall. The longer the design life, the more money it generally costs to build. There is a limit where it is ineffective and cost preventive to design for. The sea level elevation rise of a foot

1 NOAA Station 8449130 Nantucket Island, Massachusetts. Mean sea level trend December 2015.
over the next 100 years in the design may be the limit of consideration. Without tearing down a reasonably good building there are a few things we can suggest. These suggestions could be staged over the lifetime of the structure.

- Designing steel frames to support the roof structure in place of the 2x4 timber exterior walls. This would be in conjunction with “Break-away-walls” to reduce the lateral loads on the structure.

- Replacing the interior walls with reinforced masonry or concrete to resist the lateral loads on them by the water.

- Moving any important office style areas out of the flood zone.

- Reducing any interior structures to allow free flow of water through the building.

- Plan to remove any loose items such as containers, fork lifts, etc. from the flood zone prior to a storm event.

- Windows located on the second floor could have shutters ready to be installed to protect the glazing from wind born debris during a storm event.

- Surrounding area should be cleared of loose items as well to reduce the amount of debris impact to the structure.

We look forward to discussing the findings of this report at your convenience. Should you have any questions, please feel free to contact us.
Appendix F
Waterfront Inspection and Evaluation Report
Chatham Fish Pier
Chatham, Massachusetts
WATERFRONT INSPECTION AND EVALUATION

CHATHAM FISH PIER
CHATHAM, MASSACHUSETTS

A. INTRODUCTION AND GENERAL INFORMATION

The waterfront infrastructure of the Chatham Fish Pier site was inspected by Pare professional engineering staff on October 16, 2015, with underwater inspection performed concurrently by InnerTech Marine Services LLC. (InnerTech) of Warwick, Rhode Island. A copy of the underwater inspection report is provided in Appendix J. Deficiencies observed during the inspection were made referencing their location in relation to infrastructure as indicated on Figure 3 – Existing Site Plan and Sections, and as noted herein. Photographs provided in Appendix A document existing conditions.

The waterfront infrastructure is comprised of a steel sheet pile bulkhead separated into sections as the South Jog Pier and Embayment, Main Pier, and North Jog and Finger Piers. Based on observations obtained from the inspection, the following provides our assessment of the existing conditions of waterfront infrastructure. Unless otherwise noted, findings in this report are limited to visual observations from the surface.

B. INSPECTION FINDINGS

B.1 South Jog Pier and Embayment

The existing South Jog Pier was constructed in 1976 and is approximately 40 years old. It is comprised of steel sheet piling and retained fill, with a timber tie back wale and steel tie rods. The deck is comprised of concrete and asphalt, and is provided with a timber curb. A timber fendering system is provided along the perimeter of the pier. The southern face of the sheeting terminates in a sandy beach, which is armored to provide scour protection against wave action. To the north, the steel sheet pile embayment wall is of similar construction as the pier, with the addition of a supplemental helical anchorage system installed in 2000.

The existing steel sheet piling was observed to be significantly corroded, with heavy pitting. Random ultrasonic thickness readings indicate remaining thicknesses with low readings of 0.13 inches to 0.17 inches, in comparison to the original steel thickness of 0.375 inches.

In January, 2015 a section of the steel sheeting failed as a result of holes in the sheeting, resulting in the loss of a major amount of fill. The sheeting was subsequently patched from the inside, and the fill was replaced. This occurrence made the head of the pier unusable for a period of time.

The steel sheet piling tie back rods are severely corroded at the ends of the rods, against the timber wale. Most of the square washers are missing entirely, and the tie rod nuts were observed to have most of the nut section corroded entirely. The timber curb was observed to be intact, although the fixing bolts and clip angle connection to the sheeting were observed to be significantly corroded.
The south jog floating dock, float guide piles and access gangway were observed to be in good condition, with no major deficiencies observed.

The south embayment sheeting is significantly corroded, similar to the South Jog sheeting. The upper wale for the helical tie back anchors was observed to have some corrosion on the bottom. The wall was observed to have deflected approximately two inches towards the water, as evidenced by the separation from the top of the sheeting to the concrete slab directly behind the sheeting. Similar to the South Jog, the majority of the tie rod nuts and washers on the lower wale are severely corroded or missing entirely.

B.2 Main Pier

The Main Pier comprises the U-shaped steel sheeting bulkhead around the Fish Packing Building, and northward toward the first finger pier. The bulkhead was constructed outboard of a timber bulkhead in 2000 and is approximately 16 years old. The steel sheet piling is in generally good condition overall, with the coating generally intact, however some areas evidenced spots of significant pitting due to corrosion. A quarter-sized hole was observed on the southwest corner, which was leaking sand. The concrete cap and concrete deck were observed to be in generally good condition. The rubber fender system was observed to be in generally good condition, however the lower steel HSS blocking off of the sheeting was observed to have significant corrosion on the bottom portion of the member. Several of the ladders were noted to be in need of minor repairs.

B.3 North Jog and Finger Piers

The west steel sheet piling bulkhead wall, from the north of the Fish Packing Building to the end of the north jog was observed to be in good condition overall. The epoxy coating was observed to be mostly intact, with random areas of pitting observed similar to the main pier. Accelerated corrosion was observed in areas below electrical locations, such as the light pole and shore power locations. The tie rod nut located below the light pole was observed to be much more corroded than the adjacent locations, which were noted to be in good condition. The concrete cap and concrete deck were observed to be in generally good condition, with no significant deficiencies noted.

The south wave break pier was observed to be in generally good condition, with observed corrosion of the piles and steel framing above the waterline. The timber wave break was observed to be in generally good condition, with a small area of impact damage on the eastern end. Below the waterline, the coating was noted to be missing and the piles were covered with a layer of thick rust. Thickness measurements indicated an average remaining thickness of 0.30 inches, as compared to an original thickness of 0.375 inches.

The north wave break pier was observed to be in a condition similar to the south pier, with pile thickness measurements averaging 0.25 inches at the mud line.

The concrete Coast Guard Float was observed to be in generally good condition, with some listing of the easternmost float observed. Underwater inspection of this float did not reveal the presence of any physical damage or cracking, although the concrete was covered with a heavy layer of marine growth. The guide piles were observed to be in good condition underwater,
with the coating mostly intact. Thickness readings indicate remaining thicknesses of 0.4 inches in areas of pitting, and 0.48 to 0.50 inches over the coated areas as compared to an original thickness of 0.5 inches. The wear surfaces of the float guide collars were noted to be worn, but intact.

The north Dinghy Float was observed to be in good condition, with the steel guide piles showing intact coating and minimal corrosion.

C. EVALUATION OF WATERFRONT INFRASTRUCTURE

The steel sheet piling along the south jog and south embayment is in the order of 40 years old, and is nearing the end of its useful life. As evidence by the recent holes that have developed in the steel sheet piling, the remaining steel thickness continues to decrease and will continue to develop more holes over time. As the majority of the tie rod nuts and washers have corroded entirely, the bulkhead system has weakened considerably and full replacement is recommended. Significant weather events will impose significant loadings on the weakened structure, and the system is prone to storm damage until the bulkhead is rehabilitated.

The south jog float is in generally good condition, and should provide good service for a number of years to come. Periodic tightening of the thru-rod connections will reduce articulation and extend the service life of the float.

The main pier was reconstructed in 2000, and was observed to be in generally good condition. Due to the presence of aggressive pitting of the steel sheet piling, it is recommended that a cathodic protection system be added to the sheeting to reduce the corrosion and extend the remaining life of the bulkhead structure. Additionally, areas of electrical service should be examined and provided with a grounding system that does not increase corrosion of the adjacent steel.

The main pier amenities, such as the fendering system, ladders and hoists should be repaired as needed to extend the service life. The corroded lower section of fender blocking can be replaced or built up to provide a satisfactory blocking section. The installation of a cathodic protection system will likely reduce rate of corrosion on these members.

The steel pipe piles and framing of the north and south wave break piers were observed to have significant corrosion, and the installation of a cathodic protection system will prolong the useful life of the members.

The Coast Guard floating dock was observed to have a list at the southeastern edge of the float. As this list is not considered to be critical at this time, it is recommended that the float continue to be monitored for any increases in list, especially after a significant event.

The north jog dingy dock was observed to be in good condition, with no deficiencies observed. However, as the access gangway is hinged on the land side, at high water levels the float will make contact with the underside of the gangway near the hinge. This connection should be provided with freedom of movement in the vertical direction, or be provided with a tripod and winch to place the gangway on the float during periods of high water levels.
D. OPINION OF PROBABLE COST

Opinions of probable cost were generated based upon current industry unit prices and marine contractor input for similar work. The opinions provided are for construction only. The estimate does not include allowances for engineering, permitting, or construction administration. A 20 percent contingency has been included with these costs. The opinions shown herein are based on a limited investigation and are provide for general information only. This should not be considered an engineer’s estimate, as actual construction costs may be somewhat less or considerably more than indicated, due to fluctuations in the market and the actual repair implemented. A copy of the Opinions of Probable Cost are provided in Appendix C.

D.1 South Jog Rehabilitation

The rehabilitation of the south jog sheeting and tieback system will likely be accomplished by overlaying the sheeting and filling the void between the new and old sheets with concrete. The existing tie rods may be extended or replaced. The rehabilitation will incorporate a new concrete deck, curb and utilities. The opinion of probable construction cost is approximately $1,245,000.

D.2 Main Pier Cathodic Protection

The existing sheeting can be provided with an aluminum or zinc sacrificial anode system to extend the useful life of the sheeting. Heavy duty anodes (185 pounds each) are typically spaced at 6 feet on center, and the sheeting is provided with a welded continuity strap. The opinion of probable construction cost for the sheeting and pile structures is approximately $240,000.
Appendix G
Site Inspection and Evaluation Report
Chatham Fish Pier
Chatham, Massachusetts
SITE INSPECTION AND EVALUATION

CHATHAM FISH PIER
CHATHAM, MASSACHUSETTS

A. INTRODUCTION AND GENERAL INFORMATION

The stormwater systems, utilities, pavement, and septic design at the Chatham Fish Pier site were visually inspected by Pare professional engineering staff on October 22, 2015. Deficiencies observed during the inspection were made referencing their location in relation to existing site features as indicated on Figure 3 – Existing Site Plan and Sections, and as noted herein. Photographs provided in Appendix A document existing conditions.

The Chatham Fish Pier is comprised of an operational Fish Packing Building, which is used for the unloading and transfer of fish. The building is provided with a very popular observation deck, whereby tourists can observe the timeless operation. To the north and east of the Fish Packing Building is the Chatham Pier Fish Market and a Wharfinger Building, respectively. The Wharfinger building provides office space and public restrooms, along with public parking outside the building. A steel sheet pile bulkhead and steel pile and floating docks provide operational space and berthing on the waterfront. Based on observations obtained from the site inspection, the following provides our assessment of the overall site layout.

B. INSPECTION FINDINGS

B.1 Stormwater Systems

The existing on-site stormwater system incorporates a series of standard reinforced concrete pipes (RCP) ranging from 12” to 30” in diameter, a number of catch basin and drain manhole structures, as well as a Stormceptor® 900i unit located in the parking lot to the southwest of the Fish Packing Building. There is also an in-line slot drain system located to the west side of the Fish Packing Building running below the bay doors. The drainage system starts at the west of the site on Shore Road at a high invert elevation of 21.9, and ends at the Stormceptor® 900i unit at an invert elevation of 3.0.

This Stormceptor® 900i unit is a non-mechanical, non-electrical (hydrodynamic) structure that separates oil, pollutants, and sediment from stormwater runoff prior to being discharged. The unit used on-site is designed to have a capacity of 900 gallons maximum. This unit collects runoff from the entire site, prior to exiting to the harbor.

The unit is approximately 13 years old, and under normal operating conditions with routine scheduled maintenance, the unit would be in proper working condition. However, given the fact that the unit is located in an area that puts it under greater than normal storm surge with greater than normal amount of sediment, a full inspection and cleaning of the unit should be performed in order to provide a confident response as to its working condition. At that time it would be determined if there is any replacement of the unit needed. No reports of storm runoff exceeding the design capacity were identified during the preparation of this report.
The newer of the catch basin structures that were installed around the time of the Stormceptor® 900i unit are in good condition from surface inspection. The older of the structures at the higher elevations toward Shore Road are in fine working condition, but it is unknown if there are any repairs that are needed without further investigation. It is necessary in any case, however, that all structures and lines be cleaned of sediment. It is possible that a video be necessary to run down the lines to provide feedback on scouring, cracks, debris, or any other adverse bearing that exists in the pipes.

B.2 Utilities

Overall the existing utilities seem to function properly throughout the site, and are included within the MEP report. A video inspection of the conduit was not completed, nor was there evidence of conditions that would currently warrant such an evaluation.

B.3 Pavement

Pavement on-site is in good condition overall with perhaps some minor settling and cracking near the change of grade. No puddles were observed during the time of inspection. The pavement does not appear to need replacing at this time, however, there seems to be lack of proper ADA accessibility to the Fish Packing Building and to other locations at lower elevations. No ramp or lift is provided from the ADA stalls at upper parking lot.

B.4 Septic System

The site sewage is currently treated by an existing leaching septic system, which is comprised of a 2000 gallon septic tank, distribution box (d-box) and two (2) 820 gallon dry wells with crushed stone. The tank is used to remove solids, oil and grease in order to send waste water only to be leached into the soil. The system is made to accommodate the existing bathroom facilities that are located in the Wharfinger Building. The tank is situated to the north of the fore mentioned building at an elevation that is high enough to prevent buoyancy or floatation based on water levels. While records were not available, the Harbormaster indicated that the tank does not fill very quickly, even with heavy summer use, and gets pumped out approximately every 3 years. This would indicate that the septic system is most likely in good working order.
Appendix H
MEP Inspection and Evaluation Report
Chatham Fish Pier
*Chatham, Massachusetts*
Mechanical, Electrical, Plumbing and Fire Protection Existing Conditions Assessment for the Chatham Fish Pier Renovations Project

Chatham Fish Pier
Chatham, Massachusetts

September 15, 2016
# TABLE OF CONTENTS

EXISTING CONDITIONS .................................................................................................................. 2
HVAC SYSTEMS .......................................................................................................................... 2
ELECTRICAL ............................................................................................................................... 5
PLUMBING ................................................................................................................................. 17

PROPOSED RENOVATION ......................................................................................................... 23
ELECTRICAL ............................................................................................................................... 23
HVAC .......................................................................................................................................... 28
EXISTING CONDITIONS

HVAC SYSTEMS

Fish Packing Building:

A combination of gas fired horizontal unit heaters and console type gas furnaces provide heat for the occupants.

The lower level open work spaces are provided with horizontal gas fired unit heaters, manufactured by Reznor. Each unit has an input of 200,000 BTUH and an output of 160,000 BTUH. These units are controlled by wall mounted thermostat. The gas fired unit heaters appear to be in good condition and fully operational.

The upper level open areas are also provided with horizontal gas fired unit heaters, manufactured by Reznor. Each unit has an input of 100,000 BTUH and an output of 80,000 BTUH. These units are controlled by wall mounted thermostat. The gas fired unit heaters appear to be in good condition and fully operational.
The vents from the upper and lower unit heaters are connected to a common flue, which exits the building at the roof level.

The lower level offices are heated by console gas furnaces installed at the exterior walls, which have an input of 15,000 BTUH and an output of 12,000 BTUH. These furnaces are controlled by integral thermostats. These units appear to be in fair condition.

Ventilation for the fish packing building is achieved through sidewall propeller exhaust fans. The exhaust fans draw in air through sidewall hoods with motorized dampers. This ventilation system is used primarily to relieve the heat produced by the ice making refrigeration equipment. As reported during the field investigation, the system used to control heat and provide air circulation to the ice making equipment is problematic. Furthermore, dampers are not fully functional and building personnel must control airflow with sheets of plywood, which is impractical.
The heat in the sprinkler service room is maintained by an electric unit heater with a heating capacity of 2.0kW. This unit heater has been provided with an integral thermostat. The electric unit heater is considered to be in good condition. Ventilation in the sprinkler service room is provided by a small inline exhaust fan.

**Bait Shed:**

The Wharfinger’s office located on the upper level is heated by electric baseboard radiation located at the exterior walls. The Wharfinger’s office does not currently have any air conditioning. Ventilation for the Wharfinger’s office is limited to operable windows.

The public toilet rooms are heated by electric unit heaters suspended from the ceiling and controlled by wall mounted thermostats, which are protected with tamperproof covers. Exhaust for the public toilet rooms is accomplished by inline exhaust fans that draw air out of the spaces through ceiling grilles and ductwork. The toilet room exhausts out through eave-mounted grilles. The toilet room heating and ventilating equipment appears to be in fair to good condition.

The bait shed lower level is heated by a ceiling hung electric unit heater, which is starting to show signs of rust and corrosion typical of close proximity to salt water.
**ELECTRICAL**

*Electric Service:*

The electric utility co. pad mounted transformer, located in the parking lot between the Fish Packing Building and the Bait Shed is fed underground from a riser pole on Shore Road. The pad mounted transformer casing is rusting and is in poor condition.

Secondary conductors in conduit then feed the switchboard in the Second Floor Main Electric Room of the Fish Packing Building, via an exterior pull box. The pullbox has been enclosed in wood. When the wooden box was opened during our site visit it appears that originally there was a metal enclosure protecting the secondary conductors which has long ago rusted out and is in very poor condition.
Another set of secondary conductors in conduit then appear to feed the wireway on the First Floor of the Bait Shed, via an exterior enclosure which houses three electric utility company meters. The enclosure has been enclosed in wood and is in poor condition.

Site Lighting:

The parking lot and the pier is lit via single and dual head steel pole mounted LED site lighting, wooden pole mounted flood lights, a ground mounted flood light for the flag pole, and ground mounted light bollards. Poles for site lighting are showing signs of rust. By visual inspection the exterior lighting fixtures appear to be in poor condition.
Pier Power Distribution:

Most of the receptacles on the pier are 120 volt, GFCI type, with weatherproof covers. A few of the receptacles are not ground fault protected. Specialty receptacles include a Nema L5-30 (30A, 125V) and two 120 volt, 100 amp, single phase special receptacles. Most of the boxes for receptacles are made of plastic, except for the two 120 volt, 100 amp, single phase special receptacles which are in aluminum boxes. Wiring stubbing up from the pier walk is rigid steel type and transitions above ground to PVC conduit and flexible liquid tight conduit. By visual inspection the pier power distribution appears to be in poor condition.
Fish Packing Building:

Power Distribution:

The 800 amp, 120/208 volt, three phase, four wire switchboard with an 800/3 main circuit breaker feeds the South Side, North Side, Town of Chatham, and the Fuel Shed panelboards, as well as the Coast Guard enclosed circuit breaker.

The South Side panelboard is located on the Second Floor on the South Side of the Building and is fed by the switchboard via a wireway, CT cabinet, and an electric utility co. meter, located in the Main Electric Room.
The North Side panelboard is located on the Second Floor on the North Side of the Building and is fed by the switchboard via a wireway, CT cabinet, and an electric utility co. meter, located in the Main Electric Room. The CT cabinet also feeds an enclosed circuit breaker for the icemaker on the North Side. The North Side panelboard feeds a sub panelboard which is located next to it.

The Town of Chatham panelboard is located in the Main Electric Room and is fed by the switchboard via a wireway, and an electric utility co. meter, also located in the Main Electric Room. The Town of Chatham panelboard feeds a sub panelboard which is located in the Main Electric Room.
The Fuel Shed panelboard is located in the Main Electric Room and is fed by the switchboard via a wireway, and an electric utility co. meter, also located in the Main Electric Room.

The Coast Guard enclosed circuit breaker is located in the Main Electric Room and is fed by the switchboard via a wireway, and an electric utility co. meter, also located in the Main Electric Room.
The above mentioned meters are all cold sequence, meaning the metering is after the main circuit breaker, which is unusual and not acceptable to the electric utility company as per current standards.

By visual inspection the electrical equipment in the Main Electric Room appears to be in fair condition. The South Side panelboard, North Side panelboard, and North Side sub panelboard by comparison appear to be rusting and are in poor condition.

Fire Alarm:

The 12 zone conventional FCI-72 fire alarm control panel is located in Main Electric Room. The used zones are labeled as follows; Water Flow, Low Air, Tamper, Floor 1, Floor 2, Floor 2. The rest of the six zones are empty, with no zone modules. The fire alarm system includes smoke detectors, pull stations, horn/strobes, and monitors sprinkler tamper and flow switches. The building has a limited quantity of smoke detectors; one on the First Floor, one in the Second Floor Corridor, and one in the Main Electric Room. The radio master box is located adjacent to the fire alarm control panel. A key box, a bell, a red beacon, and a fire alarm annunciator is located on the exterior of the Building. The fire alarm annunciator is labeled with following zones; Water Flow, Low Air, Tamper, First Floor, Second Floor Pull Station, and Second Floor Smoke. Deficiencies of the fire alarm system include egress doors with no pull stations, pull stations not at ADA heights, and insufficient horn/strobe coverage. By visual inspection the fire alarm system appears to be in poor condition.
Receptacles:

Receptacles on the First Floor are GFCI type with weatherproof covers and are located high so as to protect them from flooding. Second Floor also has receptacles.

Lighting:

Interior - Lighting consists of striplights and fiberglass body dust/moisture resistant type lighting fixtures. Lighting is switched via local toggle switches. Switches on the First Floor are weatherproof type. By visual inspection the interior lighting fixtures appear to be in fair condition.
Exterior – Building mounted lighting consists of nautical type wall sconces, wall packs, square surface mounted lighting fixtures under the deck, and flood lights. Lighting is controlled by timeclock. By visual inspection the exterior lighting fixtures appear to be in poor condition.

Emergency Lighting:

The emergency lighting consists of emergency battery units with integral dual light heads, and exit signs with backup battery. Most of the rooms have emergency lighting and most egresses have exit signs above them. Some deficiencies of the emergency lighting system include, no exterior remote emergency light heads at egresses, some areas without emergency lighting, and some egresses without exit signs. Due to deficiencies, the emergency lighting appears to be in poor condition.
Public Safety Booster System:

The building does not have a bi-directional amplifier system.

Bait Shed:

Power Distribution:

The wireway feeds three disconnect switches labeled as North Side Freezer, Town of Chatham, with one disconnect switch having no labeling.

The North Side disconnect switch appears to feed the load center above the wireway with same labeling.
The Town of Chatham disconnect switch appears to feed the panelboard which is located in the Second Floor Wharfinger’s Office. The panelboard feeds an enclosed circuit breaker which in turn feeds a load center with gas and diesel equipment circuits as well as circuits throughout the building. The circuit breaker and load center are located next to the panelboard.

The disconnect switch with no labeling appears to feed the load center above the wireway labeled South Side Freezer.
By visual inspection the First Floor wireway, disconnect switches, and load centers appear to be rusting and are in poor condition. The panelboard, the enclosed circuit breaker, and the load center in the Wharfinger’s Office appear to be in fair condition.

*Fire Alarm:*

This Building does not have a fire alarm system.

*Receptacles:*

Grounded type receptacles are located throughout the Building.

*Lighting:*

Interior - Lighting consists of wraparounds, porcelain sockets, drum lighting fixtures, and downlights. Lighting is mostly switched via local toggle switches. The Toilet Room lighting is controlled by local keyed switches and occupancy sensors. By visual inspection the interior lighting fixtures appear to be in fair condition.
Exterior – Building mounted lighting consists of wall packs and recessed lensed downlights. Lighting is controlled by timeclock. There are two red and two white industrial glass globe with cage lighting fixtures which may be part of the communication with boats. By visual inspection the exterior lighting fixtures appear to be in poor condition.

Emergency Lighting:

The Building does not emergency lighting.

Public Safety Booster System:

The building does not have a bi-directional amplifier system.

PLUMBING

Bait Shed Building:

Plumbing Fixtures:

The plumbing fixtures are manufactured by TOTO Company. The toilets are wall mounted, china with TOTO flush valve 1.6 GPF. Urinals are wall mounted, china with TOTO flush valve, 1.0 GPF. Lavatories are wall mounted, china with TOTO faucet and tempering valve.

The toilet rooms are provided with floor drain and hose bib.

Drinking fountain is provided on the outside of the toilet rooms.

The domestic hot water is supplied from an electric hot water storage tank.

The domestic cold water service is provided with a water meter.
The building is supplied with a natural gas meter.

The building is provided with storm water gutter system discharged to grade.
Fish Packing Building:

Plumbing Systems:

The building salt water wash down is supplied from a well system, a new Well Mate tank and pump was installed in 2-11-99. The system is designed with 1-1/2 HP pump @ 35 GPM, tank pressure @ 30 PSI. The piping from the well to the tank and out to hose stations is schedule 40 PVC.
There are two water meters and backflow preventers provided to meter each tenant.
The building domestic water is supplied from 1-1/2” service. the supply rises up into the sprinkler room. There are two water meters and backflow preventers provided to meter each tenant.

The building is supplied with two gas meters for the tenants.
There is mix of cold water piping (copper) out to the spaces which supply hand sinks and wall hydrants and hose bibs. The sinks are supplied with electric water heaters located at the sinks.
Some of the water systems are provided with Raychem heat trace system, the systems pipe insulation is not installed tight or sealed at most elbows.
There is a trench drain system on the outside of the loading dock with a gasoline/sand interceptor.

PROPOSED RENOVATION

ELECTRICAL

Electric Service:

The existing electric utility co. pad mounted transformer and underground electric services to the Fish Packing Building and the Bait Shed should be removed as they are in poor condition and the transformer is in a location that is susceptible to flooding.
The Fish Packing Building and the Bait Shed electric services should be served via a pad mounted transformer, as provided by the electric utility company, located on higher ground, closer to Shore Road. Primary service conduits in concrete duct bank should be provided from an electric utility pole on Shore Road to the transformer via electric utility co. standard manholes. Secondary service feeders and conduits in concrete duct bank should be provided from the transformer to each building.

Site Lighting:

The existing parking lot and pier lighting should be removed as it is in poor condition.

Aluminum poles with marine grade paint and LED site lighting heads should be provided to light the parking lot and the pier to Illuminating Engineering Society North America Standards.

Pier Power Distribution:

The existing pier power distribution should be removed including receptacles, boxes, conduit, etc. as it is in poor condition.

Marine grade receptacles for general purposes and specialty receptacles should be provided on the pier as required by the Town. Wiring should be provided via PVC conduit and flexible liquid tight conduit.

Fish Packing Building:

Power Distribution:

The existing power distribution should be removed as the current metering situation is not acceptable per electric utility co. standards and it is in poor condition.

A weatherproof metercenter rated at minimum 800 amperes, 120/208 volt, three phase, four wire should be located in the Second Floor Main Electric Room so it is not susceptible to flooding. The metercenter would better organize the power distribution as opposed to the current arrangement which utilizes multiple CT cabinets, meters, etc. The Town would determine how many meters are required so loads could be organized accordingly. Panelboards as required to meet the metering needs should be provided on Second Floor. Hot sequence metering as per electric utility co. standards would be provided.

Fire Alarm:
The fire alarm system should be removed as it is in poor condition.

An addressable manual and automatic fire alarm system should be provided. The fire alarm control panel should be located in the Second Floor Main Electric Room so it is not susceptible to flooding. The existing radio master box could be reused to connect to the new fire alarm control panel so it can call the Fire Department in case of an event. A remote annunciator panel should be provided where required by the Fire Department. A map of the entire building should be framed and mounted adjacent to the annunciator. A key box should be provided outside the Fire Department entry. Manual pull stations should be located within five feet (5’) of each egress door and at the entrance to each Stair. Heat detectors should be provided in any areas which are not provided with protection by the fire suppression system. Smoke detectors should be provided in Corridors, in Stairs at each floor level, and in the Main Electric Room which houses the fire alarm control panel. All devices including tamper, flow, pressure switches, and PIV, associated with the fire suppression system should be connected to the fire alarm system. Audio/visual appliances should be provided in the large rooms and Corridors. Visual devices should be provided in Toilet and rooms of gathering. Mechanical equipment should be shut down by the fire alarm system as required by Code.

**Receptacles:**

GFCI type receptacles with weatherproof covers should be provided on First Floor, located high so as to protect them from flooding. Grounded type receptacles should be provided on Second Floor.

**Lighting:**

**Interior –**

The existing lighting should be removed as it is in fair condition.

Highly efficient LED lighting fixtures should be provided throughout the building. Lighting levels should be in accordance with IESNA recommendations and the Massachusetts State Building Code energy requirements. Lighting fixtures in rooms less than 900 square feet should be controlled primarily by room occupancy sensors and local low voltage switches. Larger areas not controlled by occupancy sensors should be controlled through lighting relay panels and local low voltage switches. Digital timer switches should be provided in Storage rooms. Switches on the First Floor should be weatherproof type.

**Exterior –**
The existing lighting should be removed as it is in poor condition.

Building mounted LED lighting fixtures should be provided. Exterior lighting should be controlled through lighting relay panels.

Emergency Lighting:

The existing emergency lighting should be removed as it is in poor condition.

Emergency battery units with integral dual light heads and exit signs with backup battery should be provided to identify exit discharge routes. Exterior dual remote emergency light heads should be provided to comply with the International Building Code, with Massachusetts Amendments.

Public Safety Booster System:

A bi-directional amplifier with coaxial cabling above accessible ceilings should be provided to amplify Fire Department and Police frequencies to ensure that there are no “dead” spots in the building for communication within building as required by the International Building Code, with Massachusetts Amendments.

Bait Shed:

Power Distribution:

The existing power distribution should be removed as it is in poor condition.

A weatherproof metercenter rated at approximately 800 amperes, 120/208 volt, three phase, four wire should be located in a new Second Floor Main Electric Room or on the exterior of the building on the side of the building facing the street so it is not susceptible to flooding. The metercenter would better organize the power distribution as opposed to the current arrangement which utilizes multiple meters, etc. The Town would determine how many meters are required so loads could be organized accordingly. Panelboards as required to meet the metering needs should be provided on Second Floor. Hot sequence metering as per electric utility co. standards would be provided.

Fire Alarm:

An addressable manual and automatic fire alarm system should be provided. The fire alarm control panel should be located on Second Floor so it is not susceptible to flooding. A radio master box should be provided to connect to the fire alarm control panel so it can call the Fire Department in case of an event. A remote annunciator panel should be provided where required by the Fire Department. A map of the entire building should be
framed and mounted adjacent to the annunciator. A keyed box should be provided outside the Fire Department entry. Manual pull stations should be located within five feet (5’) of each egress door and at the entrance to each Stair. Heat detectors should be provided in any areas which are not provided with protection by the fire suppression system. Smoke detectors should be provided in Corridors, in Stairs at each floor level, and in the Main Electric Room which houses the fire alarm control panel. All devices including tamper, flow, pressure switches, and PIV, associated with the fire suppression system should be connected to the fire alarm system. Audio/visual appliances should be provided in the large rooms and Corridors. Visual devices should be provided in Toilet and rooms of gathering. Mechanical equipment should be shut down by the fire alarm system as required by Code.

Receptacles:

GFCI type receptacles with weatherproof covers should be provided on First Floor, located high so as to protect them from flooding. Grounded type receptacles should be provided on Second Floor.

Lighting:

Interior –

The existing lighting should be removed as it is in fair condition.

Highly efficient LED lighting fixtures should be provided throughout the building. Lighting levels should be in accordance with IESNA recommendations and the Massachusetts State Building Code energy requirements. Lighting fixtures in rooms less than 900 square feet should be controlled primarily by room occupancy sensors and local low voltage switches. Larger areas not controlled by occupancy sensors should be controlled through lighting relay panels and local low voltage switches. Digital timer switches should be provided in Storage rooms. Switches on the First Floor should be weatherproof type.

Exterior –

The existing lighting should be removed as it is in fair condition.

Building mounted LED lighting fixtures should be provided. Exterior lighting should be controlled through lighting relay panels.

Emergency Lighting:

Emergency battery units with integral dual light heads and exit signs with backup battery should be provided to identify exit discharge routes. Exterior dual remote emergency
light heads should be provided to comply with the International Building Code, with Massachusetts Amendments.

Public Safety Booster System:

A bi-directional amplifier with coaxial cabling above accessible ceilings should be provided to amplify Fire Department and Police frequencies to ensure that there are no “dead” spots in the building for communication within building as required by the International Building Code, with Massachusetts Amendments.

HVAC

Fish Packing Building:

The most problematic aspect of this building is how exhaust and make-up air is handled to accommodate the ice making equipment. This system should be completely renovated as part of the renovation project so that there is efficient management of exhaust and make-up air flow whenever the ice making equipment is operational. This work should include full replacement of dampers and damper actuators. Furthermore, new dampers and actuators shall be selected to be as corrosion resistant as possible by using materials such as anodized aluminum or fiberglass damper blades, stainless steel shafts and linkages as well as nylon bushings.

Although the sidewall exhaust fans are operational and appear to be in fair condition, they are approaching the end of their useful service life and replacement would be recommended as part of a renovation project. If fan replacement is not included in the renovation plans, it is recommended that the fan bearings belts and sheaves should be replaced at a minimum.

Although the existing gas fired unit heaters are operational and appear to be in fair condition, they are starting to show signs of rust and corrosion and are approaching the end of their useful service life. Therefore, replacement of this equipment should be considered a part of any renovation project.

Bait Shed:

Although the existing HVAC equipment is operational and appears to be in fair condition, it is approaching the end of its useful service life. Therefore, replacement of this equipment should be considered a part of any renovation project.
Appendix I

Architectural Inspection and Evaluation Report

Chatham Fish Pier

Chatham, Massachusetts
Purpose

Jeba Architects was commissioned by Paree Corporation to prepare a report on existing conditions of the two buildings located at 45 Barcliff Ave Extension, known collectively as the Chatham Fish Pier. The buildings include a small wharfinger building and a fish packing building. A large wooden deck structure is located on the back of the fish packing building overlooking the harbor. We were informed that it is one of the major attractions on Cape Cod and frequently used by the general public. The deck is elevated approximately 9’-6” above the pier and overlooks the fishing boat offloading operation. It is not accessible and has been limited to 100 occupants due to the structural condition, which will not be discussed in this report. Pare Corp will discuss the structural condition

This report will focus on the accessibility issues, general condition of each building and make recommendations for building improvements.
General Building Description

Site

The site is zoned M Municipal. The surrounding area is a residential zone. The site contains 90,567 square feet, or 2.08 acres. It is a sloping site with a grade elevation change of approximately 24 feet, as indicated on plans dated Jul 27 1981, as prepared by Robert A Barmen P.E.

The majority of the site is paved impervious surface, with both public and permit parking on two levels. Public parking is located on the Upper Lot while permit parking is located in the Lower Lot. There is no accessible parking in the lower parking area. No Accessible route was seen from the upper parking to the public viewing deck at the fish packing building.

A large monument is located adjacent to the upper parking area with a wooden ramp for barrier-free access. A wooden deck with a slight pitch leads from the parking area down to the wharfinger building where there are public restrooms and the Wharfinger Office. A set of stairs lead down from the wharfinger deck to the lower parking area and a public access path to the viewing deck.

Wharfinger Building

The wharfinger building is located adjacent to the upper parking lot. It is accessed from the upper lot via a low pitched deck. The deck is below the pitch requirements for a ramp and, therefore, does not need to meet the provisions of the Massachusetts Architectural Access Board (MAAB). The deck allows access to the public restrooms and the Wharfinger Office. There are two sets of stairs, one leading down to the monument, and another leading down to the lower parking lot.

The restrooms appear to meet the requirements of the MAAB with the exception of the door threshold. The thresholds into the restrooms from the exterior deck are non-compliant. MAAB requires a threshold to be no greater than ½”, the doors to the restroom and the Wharfinger’s office are approximately 1 1/2” to 2” above the deck.
The deck outside the building will require modification. The need for a 1/2” threshold height, along with the age of the deck could require it to be replaced. This deck was installed in 1981, the structure will be discussed by Pare Corp. Guard Rails and the like can be made compliant with the new deck design. The stair to the lower parking, although code compliant, is not user friendly. We were asked to widen the stair to accommodate two people ascending/descending at once. This would require the stair to be widened to 5'-0”, there is enough room to accommodate this change.

The exterior finish of the building is old and in need of replacement. Many trim boards are decayed and need to be replaced. The wood shingle finish is also reaching its effective life.

The Basement of the building contains two coolers; one is inoperable, while the other is fully functional. The area is used by fisherman to bait their hooks. It is technically not a habitable area and does not have any egress doors. This area can be considered a water dependent operation as it is used by the fisherman and, therefore, not required to be made flood proof.

The exterior of the building has a relatively new roof, however, the wood sidewall shingles are deteriorated and in need of replacement. Seen in the photograph to the right, the shingles have been patched and are badly cupped, or curled. The shingles were found to be in a brittle condition and, in our opinion, have exceeded their useful life. Likewise, the wood trim was found to be deteriorated, in many cases it is badly decayed and should be replaced. Gutters were placed on the deck side of the building, but as seen in this photograph, were not on the South side. We suggest that a gutter be installed to prevent deterioration of the shingles from wind borne rain and snow.

The windows of the building appear to be a vinyl clad wood window in fair condition. Seen in the photograph above, they appear to be an Andersen Co. thermal pane window, original to the buildings.
Fish Packing Building

This building, built at the wharf’s edge, is used to unload fish from the boats, package and ship out. This is an allowed use by the FEMA regulation.

Ample egress doors exist throughout the first floor, adequate exit signs are installed and the building appeared in fair condition on the interior. The stair to the second floor is an open stair with no fire rated enclosure either at the first or second floor. There is a presumption in the Existing Building Code that the existing condition met the code at the time of its construction. Current codes do not require the stair to be in a fire rated enclosure.

The stair exceeds code requirements for variations in riser heights. We found the deviation in the riser heights to vary from 7 ¼” to 8 ¼”, this variation can result in a tripping hazard and should be changed to a more uniform riser height along the entire run of stairs. This does not mean that the risers will need to meet current code; rather, the current Building Code does allow the stair to be rebuilt within the confines of the overall run of the stair. It is a simple wood structure that needs to be modified to avoid a falling hazard. The risers need to be consistent in height and not exceed 3/16” variation.

The stair should be rebuilt to conform to riser height, maintaining a consistent riser height from tread to tread. We do not believe that the stair is required to be in a fire rated enclosure as it complies with International Building Code 2009 Section 1022 Exit Enclosure 1022.1 exception 1.1 which allows it to be open.
The second floor has two large storage rooms accessed from a short corridor off the stair noted above. Two exterior doors, seen at the right, access the exterior deck. Each door has a pull station and there is a horn strobe to the left of the left door. Although the areas are subdivided by a chain-link fence the horn strobe is compliant. Should the solid wall be constructed obscuring this fire device, an additional horn strobe will be required.

An exit sign over the second door, seen at the right, needs to be installed. Technically the one sign will comply, but in the event of a smoke filled room the door could be easily missed. The sign can be added with surface mounted conduit connected to the adjacent sign.

There are no restroom facilities in the building. In our opinion these are required as there are workers in the building. The Plumbing Code has no exceptions for this and requires restrooms for each sex within the work area if there are more than 2 workers present at any given time. The restrooms do not have to be accessible as the building is not a public facility and in our opinion, is exempt from the MAAB. Although the Plumbing code requires restrooms on each level, a variance may be possible to have them on the second floor which serves as a staff area.

The building is in relatively good condition, although there are several columns within the building walls that will need to be repaired due to rusting. The interior has adequate fire protection with automatic sprinkler systems, exit signs at critical locations and emergency lighting illuminating the path of travel. The stair should be rebuilt to conform to riser height, maintaining a consistent riser height from tread to tread. We do not believe that the stair is required to be in a fire rated enclosure as first suggested as it complies with International Building Code 2009 Section 1022 Exit Enclosure 1022.1 exception 1.1 which allows it to be open.
The exterior of the building has old wood shingles and trim which is decayed. Several of the trim boards are either failing or missing. The missing roof fascia board, and the decayed door casing are seen in the photograph to the right. Unlike the Wharfinger building the shingles are in fair condition. Several areas under the deck have been stripped of the shingles and require refinishing.

Public Observation Exterior Deck
At the water side of the fish packing building a public deck was found. Elevated above the lower grade approximately 9'-6”, we were informed that it is a popular tourist destination. Accessed from a stair and side deck, see at the right, the deck has only one means of egress, a wide stair located at the end of the deck at the right of the photograph. Travel distance to that stair from the second floor doors is 131 feet to the existing stair. A second stair is required by code due to the occupancy load listed at 100 occupants.

This deck is in poor condition structurally. The decking is badly decayed and requires replacement. The structural report will discuss the inadequacies of the deck frame. Guard rails are within code, but are badly weathered. Although structurally sound they will require replacement in the near future. The platform seen in the top photograph at the two doors, is the means of egress from the second floor. No handrails, or guards are present on the stair. Two sets of stairs exist one for each door. Code requires there to be two handrails on each stair, effectively creating a guard at the outside edge of the door.

We understand that occupancy has been limited to 100 people due to the structural capacity of the deck. The actual capacity of the deck will require review should the deck be rebuilt as is being considered. The Building Code lists platforms as a net floor area of 15 s.f./occupant, or approximately a floor space of 3 feet x 5 feet. This may be an effective area, but we should consider planning for a larger load for those unique events when there are more people on the deck. This would have to be discussed with the Building Inspector, but could also be designed into the structural loading. If we consider 7 s.f. per occupant, or an area of 2 feet x 3.5 feet the number of occupants would grow. The depth of the deck, currently 12 feet, could be increased to 14 feet making the total area approximately 1,240 s.f. The following occupancy load for both considerations is:

\[
\frac{1240 \text{ s.f.}}{15 \text{ net s.f.}} = 83 \text{ occupants} \\
\frac{1240 \text{ s.f.}}{7 \text{ net s.f.}} = 177 \text{ occupants}
\]

In either case a second stair, or means of egress is required. We recommend that a second stair be created at the south end of the deck. By extending the deck 2 feet to the south a stair could be installed that wraps the corner without interference with the main door seen in the photograph to the right. The stair, required to be a minimum of 44 inches wide, would extend down to a platform and then down along the
face of the building heading to the south (see plan below). It would terminate at the double window’s edge. In our opinion, this is critical with the number of occupants that are allowed on the deck. The building code requires any area with an occupancy load greater than 50 to have two means of egress. This requirement would also apply to the exterior deck.

The deck, which is a public venue, is required by Massachusetts Architectural Access Board regulations to be barrier-free, or handicap accessible. There are several ways to accomplish this, a mechanical lift, elevator, or ramp. Flood resistant design requires that any electrical motors, pumps, or machinery be elevated above the flood plain. The deck is at elevation 20.5 while the flood plain elevation is 18.14. A lift or elevator would require the machinery be above the flood plain, making these devices impractical and excessive in cost. Both of these machines would require significant maintenance in a salt air/water environment. An elevator would require a standalone building. We recommend therefore, that a ramp be considered for the purpose of accessibility.

We have provided a schematic design of the ramp (see drawing below), as well as the second stair for consideration. The design of the new ramp would supplement the stair seen in the photograph. The new deck design (top right in drawing below) would extend to the face of the building and have a new ell shaped stair that ties into the upper deck, rather than the current configuration. The dumpster will need to move to allow the new deck and ramp to be created. The new ramp would close the pier to the right of the stair with the necessary switchback ramps. The pier area behind the ramp is used for pallet storage. The existing grade ramp seen near the building will be maintained for worker access to the pier behind the building, but closed to the public. A Van Accessible Handicap parking space can be included at the new ramp as well as a public drop off area to allow all to experience the observation deck. The second stair, seen at the lower left of the drawing, will complete the design.
Federal Emergency Management Agency Regulations.

These buildings are within a VE velocity zone, one of the more stringent flood zones. This designation requires structures to be placed above the floor plain. The lowest structural member of a structure is required to be 2’-0” above the high water level. The current MA Building Code Appendix G Section G301.2.2 In Flood Hazard Areas Subject to High Velocity Wave Action requires the lowest structural member excluding bracing to be 2 feet above the mean high water level. G301.3.2 Flood Hazard Areas Subject to High Velocity Wave Action has an exemption allowing the building means of egress to be below the flood plain elevation making the observation deck, which serve as the means of egress from the second floor, exempt from the flood elevation. This will allow it to be reconstructed at its current finish floor elevation.

The building, in our opinion, is also exempt from the Flood Plain regulation. The Fish Packing Building, in our opinion, is considered a water dependent use. Exempt from the regulation because it is a Functionally Dependent Use as indicated in the FEMA regulation below. Unit 7 of the National Flood Insurance Program regulation states:

Functionally dependent use

A variance may be issued for new construction, substantial improvements and other development necessary for the conduct of a functionally dependent use. A functionally dependent use is one that must be located or carried out close to water—such as a docking or port facility necessary for the unloading of cargo or passengers, shipbuilding and ship repair.

A functionally dependent use variance could be issued provided that:

- There is good and sufficient cause for providing relief from the regulations.
- The variance will be the minimum necessary to provide relief.
- The variance does not cause a rise in the 100-year flood level within a regulatory floodway.

The structure or other development must be protected by methods that minimize flood damage during the base flood and create no additional threats to public safety. One way of accomplishing this is to use wet-flood proofing techniques such as using flood resistant materials, elevating mechanical equipment, locating offices above the BFE, using ground fault interrupt electrical circuits, or developing an emergency plan to remove contents before a flood.

Under limited circumstances, variances may be issued for functionally dependent uses provided that the structure is protected by methods that minimize flood damages during the base flood and there are no additional threats to public safety.

The work associated with the construction of the observation deck will be a substantial improvement to the fish packing building. It is, however, the second means of egress from the building’s second floor. As defined by the MA state building code noted herein, it can be built below the BFE without affecting the building.
The Unit 7 regulation goes on to say that manufacturing is not considered a functionally dependent use and as such the processing of fish could be performed away from the water. By Unit 7 definition the offloading of fish from boats is a water dependent operation, however, in our opinion the processing of fish is not. If the building were to be changed to fish processing a variance from the local board of appeals would be required. In our opinion, there is not sufficient enough cause for the approval of the variance as there is no extreme hardship, which is the main criteria of the regulation for the issuance of a variance. The seafood can easily be transported to a facility that is either outside of the flood zone or to a building that meets the flood zone codes.
UNDERWATER INSPECTION OF THE CHATHAM TOWN PIER

CHATHAM, MASSACHUSETTS

OCTOBER 2015

Inspection conducted for
PARE CORPORATION
10 Lincoln Road
Foxborough, MA 02035

Inspection conducted by
INNER TECH MARINE SERVICES LLC
PO BOX 9123
WARWICK, RI 02889
LOCATION OF INSPECTION: The street address for the project is 45 Barcliff Avenue, Chatham Massachusetts

DATE OF INSPECTION: October 16, 2015

SCOPE OF WORK: Conduct a swim-by and random NDT steel thickness testing of the sheet pile sea wall from the South Pier to the Northern limit of the Timber Pier behind the Nickerson Fish Market. Swim–by of the steel piles.

PERSONEL PRESENT

Inner Tech
Stephen Antoniou- Inspector
Richard Callen- Top side supervisor
Anthony Carroll, Tender

Pare Corporation
Karl Hammond, P.E.

DIVE STATION: A trailer mounted dive station was taken to the site. After review of the safety plan and morning “safety” meeting, the trailer was backed down onto the pier to the south of the fish packing house. A Coast Guard vessel patrolling the area was notified of the inspection, fishing vessels docking in the area were notified of the inspection. Surface air supplied system was utilized for breathing air along with umbilical hoses, communications cable and heated water exposure support system.


PELIMINARY DISCUSSION PROJECT HISTORY: For the purposes of this report, the Chatham town dock has been divided into three sections, The south pier and adjacent seawall at the parking lot, the seawall surrounding the fish packing house and the area to the north of the packing house including the seawall, concrete float area and wooden float area. The inspection was conducted during a low tide and rising period, thus, the underwater areas inspected consisted primarily of those below the whalers and fender systems. The inspection of the areas above the whalers and fender systems are not covered in the report.
The sheet pile in this area is covered with a thick coating of hard rust and marine growth. Random areas cleaned for NDT testing showed the metal to be very rough and heavily pitted. NDT metal thickness readings were taken at random locations. The readings were taken on the out facing flange unless otherwise stated. A hole in the sheet pile was repaired, the hole was located on the outside facing wall. Areas of bright red rust and active corrosion were noted beneath the electrical service boxes on the out facing south dock wall and beneath the ladder and light pole toward the corner of the parking lot area wall near the fish packing house. A NDT reading was taken of the square tubing whale. Table 1 details the results of the NDT study, underwater photographs of the sheet pile are following.
Photo No. 1, typical South Dock sheet pile surface with rust removed. Note pitting corrosion of steel.

Photo No. 2, typical areas of bright red rust and active corrosion on the sheet pile, under light poles and electrical service boxes.
<table>
<thead>
<tr>
<th>Location</th>
<th>Mud line</th>
<th>MLW (approx.)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall facing the beach</td>
<td>.31</td>
<td>.3</td>
<td>Near the outside corner</td>
</tr>
<tr>
<td>Out facing wall</td>
<td>.34</td>
<td>.24</td>
<td>5ft from the outside corner</td>
</tr>
<tr>
<td>Out facing wall</td>
<td>.2</td>
<td>.23</td>
<td>Middle of wall</td>
</tr>
<tr>
<td>Out facing wall</td>
<td>.29</td>
<td></td>
<td>Under the repair by the electrical service</td>
</tr>
<tr>
<td>Wall facing the fish house</td>
<td>.31</td>
<td>.23</td>
<td>10FT From the outside corner</td>
</tr>
<tr>
<td>Wall facing the fish house</td>
<td>.31</td>
<td>.3</td>
<td>Middle of wall under whale</td>
</tr>
<tr>
<td>Wall adjacent to the lot</td>
<td>.21</td>
<td>.27</td>
<td>Inside corner</td>
</tr>
<tr>
<td>Wall adjacent to the lot</td>
<td>.21</td>
<td>.23</td>
<td>Middle of wall</td>
</tr>
<tr>
<td>Wall adjacent to the lot</td>
<td>.17</td>
<td></td>
<td>Bright red rusted area under the ladder</td>
</tr>
<tr>
<td>Wall adjacent to the lot</td>
<td>.13</td>
<td></td>
<td>Bright red rusted area beneath the light pole</td>
</tr>
<tr>
<td>Reading taken on the square tubing whaler</td>
<td>.20</td>
<td></td>
<td>Random reading taken mid wall on the outside facing surface</td>
</tr>
</tbody>
</table>
The sheet pile wall surrounding the fish packing house was constructed in 1997. As previously stated, the area was inspected during low tide and rising, this report covers sheet pile surfaces just below the fender system. The wall was covered with a thick coating of marine growth. The epoxy coating underwater was essentially intact with the exception of small (1/4 to 1”) round pits observed in the steel surface in random locations where the coating has failed, noted on every sheet. Most of the pitting was superficial, however, some were as deep as 75% of the metal thickness. Two small (1” diameter) holes were located toward the mud line on the south outward corner just under the first rubber fender. The holes were leaking sand. The holes were plugged using wooden bungs. Random NDT thickness readings were taken on the south facing wall and the outside wall. All the readings were .36. An area of bright active rust and corrosion was noted a few feet from the inside (parking lot) corner. The area was 6 inches round and measured .31. This may be associated with the active corrosion area previously noted near the ladder adjacent to the parking lot.
Photo No. 3, metal pitting where coating has failed, South wall surrounding the fish packing house, near the inside corner.

Photo No. 4, 1 inch diameter hole, leaking sand, at the mud line just under the first fender from the Southeast corner.
The sheet pile wall up to the USCG pier and wave break was constructed in 1997. The sheet pile wall was heavily coated with marine growth, the epoxy coating was mostly intact with the exception of random small round areas of pitting as observed in the wall surrounding the fish packing house. Random areas were cleaned and NDT thickness inspected. Readings averaged .355 on coated steel. An area of bright active corrosion was noted in the sheet pile wall beneath the light pole near the fish packing house. The bright active area of corrosion measured .31 in thickness. The Pier adjacent to the USCG and wave break consists of 12 steel pipe piles. All the pipe piles have coating failure and were covered with a hard layer of thick rust. 3 piles adjacent to the sheet pile wall have bright active rust and corrosion at the mud line. This area measured .29 to .32 in thickness. Random piles which where thickness tested measured .31-.32 in thickness, approximately 2ft off the mud line.
**USCG PIER AND CONCRETE PIER**

This area consists of the sheet pile wall continuous with that previously discussed. The wall appears heavily coated with marine growth. The epoxy coating is mostly intact with occasional metal pitting observed as was the condition previously noted in the wall surrounding the fish packing house. The concrete pier is floating between 5 steel pipe piles. The pile surfaces below water appeared mostly epoxy coated. Random piles were NDT thickness tested and typically measured between .48 and .51 with small pitted areas noted below MLW. The small pitted areas measured .4 in thickness. The outer section of concrete float is listing and it is lower than the other sections. It is probable that this section has water in it or is holding more weight. The underwater surfaces were heavily layered with marine growth and without obvious spalls and concrete deterioration. The heavy marine growth may be covering cracks in the concrete.

**NORTH AREA FROM THE CONCRETE PIER TO THE WOODEN PIER**

This area consists on approximately 65lf of sheet pile wall continuous with that previously inspected and a wooden pier supported by 12 steel pipe piles. The sheet pile wall is typical of the sections previously described. An area of bright rust and active corrosion was observed in the sheet pile wall just below a dock box believed to be in the vicinity of a light pole. The metal thickness in the 24inch square effected area measured .24 to .28in.
The 12 steel pipe piles appeared heavily covered with marine growth and a thick hard layer of rust. Cleaned areas of steel pile appeared heavily pitted and random NDT thickness measurements taken on the piles just above the mud line measured .23 to .28 inch.

Just north of the wooden dock and the steel pipe piles is a relatively new section consisting of 5 steel piles and a concrete float. Random areas on the pipe piles below water were cleaned and NDT thickness tested. The areas measured .45 to .5 on epoxy coated, new appearing, steel surfaces.
Appendix K
Backup Data for Opinion of Probable Costs
Chatham Fish Pier
Chatham, Massachusetts
### Opinion of Probable Cost - Site Improvements

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Price</th>
<th>Total</th>
<th>Source</th>
<th>Notes</th>
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</thead>
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<tr>
<td><strong>Site Preparation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trailer and Temporary Utilities</td>
<td>1</td>
<td>LS</td>
<td>$4,000</td>
<td>$4,000</td>
<td>MASS WAP 740</td>
<td>One Trailer, 3 months</td>
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<tr>
<td>Temporary Chainlink Fence</td>
<td>400</td>
<td>LF</td>
<td>$6</td>
<td>$2,400</td>
<td>RS Mean 01500.250.0100</td>
<td></td>
</tr>
<tr>
<td>Remove &amp; Dispose Asphalt Surface</td>
<td>60</td>
<td>SY</td>
<td>$9</td>
<td>$600</td>
<td>RS MEANS 024113.17</td>
<td>4&quot; surface anticipated</td>
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<tr>
<td>Remove &amp; Dispose Concrete Walks</td>
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<td>$600</td>
<td>Past Projects</td>
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<td>Remove and Dispose Tree</td>
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<td>EA</td>
<td>$750</td>
<td>$0</td>
<td>103. MassWAP</td>
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<tr>
<td>Silt Sock</td>
<td>650</td>
<td>LF</td>
<td>$3</td>
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<td>Supplier's Estimate</td>
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<td>2 proposed catch basins</td>
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<td>Cut and Match</td>
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<td>$3</td>
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<td>Export Soils</td>
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<td>CY</td>
<td>$17</td>
<td>$6,800</td>
<td>Past Project</td>
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<td>Fine Grading and Compacting in Paved Areas</td>
<td>250</td>
<td>SY</td>
<td>$3</td>
<td>$800</td>
<td>170.00 Mass WAP</td>
<td>Under paved areas and Gravel Lot Proposed switchback and path to shed</td>
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<tr>
<td>Compacted Gravel</td>
<td>250</td>
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<td>$35</td>
<td>$8,800</td>
<td>151.01 and 170.00 Mass WAP</td>
<td>14&quot; under new Pavement and For Gravel Lot Proposed switchback and path to shed</td>
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<tr>
<td>Bituminous Concrete Parking Binder Course</td>
<td>5</td>
<td>TON</td>
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<td>$500</td>
<td>460.0 Mass WAP</td>
<td>Parking lots &amp; walkway 1.5&quot;</td>
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<tr>
<td>Bituminous Concrete Parking Wearing Course</td>
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<td>TON</td>
<td>$98</td>
<td>$500</td>
<td>460.0 Mass WAP</td>
<td>Parking lots &amp; walkway 1.5&quot;</td>
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<td>Tack Coat</td>
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<td>0.044 Gal per SY, MassDOT Spec</td>
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<td>Concrete Walkway</td>
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<td>4&quot; Epoxy Resin Pavement Markings</td>
<td>30</td>
<td>LF</td>
<td>$1</td>
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<td>860.0 Mass WAP</td>
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<td>ADA Space Markings</td>
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<td>LS</td>
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<td><strong>Systems</strong></td>
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<td>$85,000</td>
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<td>Additional storage</td>
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<td>Septic System</td>
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<td>$48,000</td>
<td>$48,000</td>
<td>Past Project/Engineer Judgement</td>
<td>Investigation, design, and installation</td>
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<tr>
<td>Septic Maintenance</td>
<td>1</td>
<td>LS</td>
<td>$900</td>
<td>$900</td>
<td>Past Project/Engineer Judgement</td>
<td>Annual inspection and pumping</td>
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<td></td>
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<td>$133,000</td>
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<td><strong>Utilities</strong></td>
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<tr>
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<td>LS</td>
<td>$110,000</td>
<td>$110,000</td>
<td>Griffith and Vary</td>
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<tr>
<td>Lighting</td>
<td>1</td>
<td>LS</td>
<td>$100,000</td>
<td>$100,000</td>
<td>Griffith and Vary</td>
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</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td></td>
<td></td>
<td></td>
<td>$210,000</td>
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</table>

**SUBTOTAL OF SITE CONSTRUCTION ITEMS**

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Price</th>
<th>Total</th>
<th>Source</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td>$1,080,400</td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$108,040</td>
<td>10% of price carried</td>
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<tr>
<td>GENERAL CONDITIONS, BOND, CONTRACTOR OH&amp;P</td>
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<td></td>
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<td>$270,100</td>
<td>25% of price carried</td>
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<tr>
<td>25% CONTINGENCY</td>
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<td>$108,040</td>
<td>Engineering</td>
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<td>Engineering</td>
<td></td>
<td></td>
<td></td>
<td>$86,432</td>
<td>Contract Admin</td>
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<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td>$1,654,000</td>
<td>( Rounded to the nearest $1,000)</td>
<td></td>
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</tbody>
</table>
Opinion of Probable Cost - Buildings

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Price</th>
<th>Total</th>
<th>Source</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Site/Building Preparation and Demolition (Fish Packing and Wharfinger)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trailer and Temporary Utilities</td>
<td>1</td>
<td>LS</td>
<td>$4,000</td>
<td>$4,000</td>
<td>MASS WAP 740</td>
<td>One Trailer, 3 months</td>
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<tr>
<td>Temporary Chainlink Fence</td>
<td>170</td>
<td>LF</td>
<td>$6</td>
<td>$1,100</td>
<td>RS Mean 01500.250.0100</td>
<td></td>
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<tr>
<td>Remove and Dispose of Timber Framed Deck</td>
<td>432</td>
<td>LF</td>
<td>$9</td>
<td>$3,900</td>
<td>RS MEANS 06-11 10.28 - 0250 16 Timber frames similar to porch construction.</td>
<td></td>
</tr>
<tr>
<td>Remove &amp; Dispose wood posts</td>
<td>22</td>
<td>EA</td>
<td>$50</td>
<td>$1,100</td>
<td>Past Projects</td>
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<tr>
<td>Remove and Dispose Exterior Wall Locations for New Posts</td>
<td>22</td>
<td>EA</td>
<td>$67</td>
<td>$1,500</td>
<td>RS MEANS 02-41 19.16 - 7410</td>
<td></td>
</tr>
<tr>
<td>Dumpster 20 YD</td>
<td>6</td>
<td>weeks</td>
<td>$1,250</td>
<td>$7,500</td>
<td>RS MEANS 02-41 19.19 - 0700</td>
<td></td>
</tr>
<tr>
<td>Brace and Remove Steel Posts Supporting Interior Steel Beams</td>
<td>4</td>
<td>EA</td>
<td>$850</td>
<td>$3,400</td>
<td>Past Projects</td>
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<tr>
<td><strong>Subtotal</strong></td>
<td></td>
<td></td>
<td></td>
<td>$22,500</td>
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<tr>
<td><strong>Site Improvements</strong></td>
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<td></td>
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<td></td>
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<tr>
<td>Asphalt Paving</td>
<td>44</td>
<td>SY</td>
<td>$5</td>
<td>$300</td>
<td>JMB+A+Architects</td>
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<tr>
<td>Sub Base</td>
<td>9</td>
<td>CY</td>
<td>$32</td>
<td>$300</td>
<td>JMB+A+Architects</td>
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<tr>
<td><strong>Subtotal</strong></td>
<td></td>
<td></td>
<td></td>
<td>$600</td>
<td></td>
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<tr>
<td><strong>Fish Packing Building Deck and Columns</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Galvanized Steel Frames In Place</td>
<td>12</td>
<td>EA</td>
<td>$4,100</td>
<td>$49,200</td>
<td>Engineer's Judgement</td>
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</tr>
<tr>
<td>Epoxy Anchor Each Frame</td>
<td>72</td>
<td>EA</td>
<td>$55</td>
<td>$4,000</td>
<td>RS MEANS 05 - 05 - 23.25 - 1365</td>
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<tr>
<td>New 2x12 Deck Joists</td>
<td>1,928</td>
<td>LF</td>
<td>$3</td>
<td>$6,200</td>
<td>RS MEANS 06 11 10.28 - 0350</td>
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<tr>
<td>New 2x12 Joist Hangers</td>
<td>216</td>
<td>EA</td>
<td>$33</td>
<td>$7,100</td>
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<tr>
<td>Girder Hangers</td>
<td>11</td>
<td>EA</td>
<td>$50</td>
<td>$500</td>
<td>Engineer's Judgement</td>
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</tr>
<tr>
<td>Composite Decking</td>
<td>1,600</td>
<td>SF</td>
<td>$12</td>
<td>$18,700</td>
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<tr>
<td>Railing Guard</td>
<td>291</td>
<td>LF</td>
<td>$47</td>
<td>$13,800</td>
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<td><strong>Subtotal</strong></td>
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<td></td>
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<td>$99,600</td>
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<tr>
<td><strong>Fish Packing Building Ramp and Stairs</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>6x6 Ramp Posts</td>
<td>516</td>
<td>BF</td>
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<tr>
<td>Ramp Composite Decking</td>
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<td>LF</td>
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<td>$38,500</td>
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<tr>
<td>Ramp Railing System</td>
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<td>$11,300</td>
<td>JMB+A+Architects</td>
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</tr>
<tr>
<td>2x12 Stair Stringers</td>
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<td>BF</td>
<td>$13</td>
<td>$2,700</td>
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<tr>
<td>Stair Composite Decking</td>
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<td>$700</td>
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<td>Stair Railing System</td>
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<td>$500</td>
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<td>Metal Railing Fabrication</td>
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<td>$7,800</td>
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<tr>
<td><strong>Subtotal</strong></td>
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<td></td>
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<td>$98,300</td>
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<tr>
<td><strong>Fish Packing Building Improvements</strong></td>
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<tr>
<td>Steel Columns on Interior of Structure installed</td>
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## Opinion of Probable Cost - Buildings

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### Wharfinger Building Deck and Stairs

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<td>$17,500</td>
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### Wharfinger Building Improvements

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<td>Interior Lighting</td>
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**SUBTOTAL OF STRUCTURAL CONSTRUCTION ITEMS**

**TOTAL**

**$859,700**

**GENERAL CONDITIONS, BOND, CONTRACTOR OH&P**

**$85,970**

25% CONTINGENCY

**$214,925**

**$85,970**

**Contract Admin**

**$68,776**

**TOTAL**

**$1,316,000**

(Rounded to the nearest $1,000)
Opinion of Probable Cost - Waterfront Items

<table>
<thead>
<tr>
<th>Bid Item</th>
<th>Item</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Price</th>
<th>Total</th>
<th>Source</th>
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<tr>
<td><strong>A. South Jog and Embayment Reconstruction</strong></td>
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<td>$100,000.00</td>
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<td>Demo/Removal</td>
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<td>Removal of Timber Piles and Timber Cap/Whales</td>
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<td>3</td>
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<td>22&quot;x24&quot; Match Prev. Dwg</td>
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<tr>
<td>4</td>
<td>Concrete Cap</td>
<td>31</td>
<td>CY</td>
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<td>22&quot;x24&quot; Match Prev. Dwg</td>
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<tr>
<td>5</td>
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<tr>
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<td>(Rounded to the nearest $1,000)</td>
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</table>

| Engineering and Design (10%) | $132,800.00 |
| Permitting (Estimate) | $20,000.00 |
| Contract Administration (8%) | $106,240.00 |

**Project Total** | $1,588,000.00 |

| **B. Cleaning and Coating of Steel** | | | | | | | |
| 1 | Mobilization | 1 | LS | $10,000.00 | $10,000.00 | Pare Estimate | |
| 2 | Cleaning and Coating SSP | 4,600 | SF | $15.00 | $69,000.00 | Pare Estimate | |
| 3 | Cleaning and Coating Piles and Piers | 2,500 | SF | $15.00 | $37,500.00 | Pare Estimate | |
| Subtotal Construction | $116,500.00 | | | | | | |
| 25% Contingency | $30,000.00 | | | | | | |
| **Subtotal Construction** | $147,000.00 | | | | | | (Rounded to the nearest $1,000) |

| Engineering and Design (10%) | $14,700.00 |
| Permitting (Estimate) | $5,000.00 |
| Contract Administration (8%) | $11,760.00 |

**Project Total** | $179,000.00 |

| **C. Cathodic Protection** | | | | | | | |
| 1 | Mobilization | 1 | LS | $30,000.00 | $30,000.00 | Pare Estimate | |
| 2 | Demo/Removal | 0 | LS | $0.00 | $0.00 | Pare Estimate | |
| 3 | 185# Anodes for SSP | 72 | EA | $800.00 | $57,600.00 | Recent Project Costs | |
| 4 | Continuity Strap | 1 | LS | $25,000.00 | $25,000.00 | Pare Estimate | |
| 5 | Pipe Pile Anodes | 34 | EA | $800.00 | $27,200.00 | Pare Estimate | |
| 6 | Patching | 1 | LS | $15,000.00 | $15,000.00 | Pare Estimate | |
| Misc. Repairs | 1 | LS | $20,000.00 | $20,000.00 | Pare Estimate | |
| Subtotal Construction | $174,800.00 | | | | | | |
| 25% Contingency | $44,000.00 | | | | | | |
| **Subtotal Construction** | $219,000.00 | | | | | | (Rounded to the nearest $1,000) |

| Engineering and Design (10%) | $21,900.00 |
### Objective of Probable Cost - Waterfront Items

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<th>Bid Item</th>
<th>Item</th>
<th>Quantity</th>
<th>Unit Price</th>
<th>Source</th>
<th>Notes</th>
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<tr>
<td></td>
<td>Permitting (Estimate)</td>
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#### D. North Gangway Gallows

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<tr>
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<th>Unit</th>
<th>Unit Price</th>
<th>Source</th>
<th>Notes</th>
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<td>Pare Estimate</td>
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Subtotal Construction $30,000.00

25% Contingency $8,000

Subtotal Construction $38,000.00 (Rounded to the nearest $1,000)

#### E. Replace Concrete Float

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
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<th>Unit Price</th>
<th>Source</th>
<th>Notes</th>
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<td>Demo/Removal</td>
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Subtotal Construction $80,000.00

25% Contingency $20,000

Subtotal Construction $100,000.00 (Rounded to the nearest $1,000)

#### F. Replace North and South Davits

<table>
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<tr>
<th>Item</th>
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<th>Unit Price</th>
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Subtotal Construction $50,000.00

25% Contingency $13,000

Subtotal Construction $63,000.00 (Rounded to the nearest $1,000)

### Project Total

- **D. North Gangway Gallows**: $45,000.00
- **E. Replace Concrete Float**: $123,000.00
- **F. Replace North and South Davits**: $75,000.00

### Notes

- All costs are rounded to the nearest $1,000.